



Program Progress Performance Report (PPPR) #3

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Competitive Megaregions (CM²)

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Signature of Submitting
Official:

A handwritten signature in black ink, appearing to read 'Inessa Ach', is written over a horizontal line.

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1. ACCOMPLISHMENTS

A. Goals and Objectives

CM² 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 38 students. Additionally, 25 students were supported through matching funds. Research teams were involved in a series of projects analyzing data, laws, policies, and technologies as well as developing solutions through modelling and analysis for cooperative mobility in megaregions. Table 1 outlines the projects completed by the end of this reporting period.

Table 1: Completed Projects by Partner Institutions and PIs

Project Title	Partner	Principal Investigator	Funding Year	Project Status
The Effect of Shadow Evacuation in Megaregion Disasters: A Pilot Study	LSU	Brian Wolshon	Year 1	Completed
Megaregion Truck Flow Estimation Model	TSU	Qisheng Pan	Year 1	Completed
The Philadelphia Story: Urban Renaissance and Shifting Travel Behavior in a Northeast Region	UPenn	Erick Guerra	Year 1	Completed
Equitable access to transit within and across megaregions	UPenn	Vincent Reina	Year 2	Completed
Assessing Changes to Federal and State Law for Megaregion Planning	UT CTR	Lisa Loftus-Otway	Year 1	Completed
Can Crowdsourcing Support Co-productive Transportation Planning in Megaregion? Evidence from Local Practice	UT SOA	Junfeng Jiao	Year 1	Completed
Equitable access to transit within and across mega-regions	UT SOA	Jake Wegmann	Year 2	Completed
Regional Opportunities and Challenges for Transit Oriented Development: The Case of Texas Triangle	UT SOA	Ming Zhang	Year 2	Completed

Table 2 describes the projects that were selected for Year 3 funding.

Table 2: Year 3 Projects by Partner Institutions and PIs

Project Title	Partner	Principal Investigator	Funding Year	Project Status
Spatiotemporal Traffic Characteristics of Megaregion Mass Evacuation	LSU	Brian Wolshon	Year 3	In Progress
Robustness of Transportation Networks under Megaregion Evacuations	LSU	Brian Wolshon	Year 3	In Progress
Application of an Equity Rubric that Defines Purpose and Need for Rural and Low Density Communities In Megaregions	TSU	Carol Lewis	Year 3	In Progress
Develop a GIS-based Megaregion Transportation Planning Model	TSU	Qisheng Pan	Year 3	In Progress
Transportation and land use across US and Mexican cities and megaregions	UPenn	Erick Guerra	Year 3	In Progress
Global Transportation Megaregion/Megaproject Best Practices Manual	UPenn	John Landis	Year 3	In Progress
Further Development of the Northeast Megaregion Multi-modal Transportation Planning and Investment Model	UPenn	John Landis	Year 3	In Progress
Decongesting America's Cities, Regions and Megaregions: Finding Solutions to Metropolitan Congestion	UPenn	Robert Yaro & Marilyn Taylor	Year 3	In Progress
Inter-regional Resiliency: The Role of MPOs in Natural Disaster Planning and Response Preparation	UT CTR	Lisa Loftus-Otway	Year 3	In Progress
Using State Government to Mitigate the Effects of Bracketing on Multijurisdictional Transportation Planning	UT CTR	Lisa Loftus-Otway	Year 3	In Progress
Freight Megaregional Planning and Financial Policy	UT CTR	Michael Walton	Year 3	In Progress
Multi-Modal Modelling: BIM Template for Hub Connectivity and Networks	UT SOA	Danelle Briscoe	Year 3	In Progress
An Alternative Approach to Analyzing Demand Potential for Travel by High Speed Rail in the Texas Triangle	UT SOA	Ming Zhang	Year 3	In Progress
Utilize Crowd-Sourced Data and Machine Learning Technology to Enhance Planning for Transportation Resilience to Flooding	Multi - UT SOA & TSU	Ming Zhang, Qisheng Pan	Year 3	In Progress

The Role of Transportation Networking Companies in Megaregion Mobility: Optimizing multi-modality through the optimal combination and utilization of different modes for intra-megaregion travel	Multi - UT SOA, Penn, TSU	Junfeng Jiao, Erick Guerra, Qisheng Pan	Year 3	In Progress
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Multi-institutional collaboration is one of the goals of our center which we foster by strategically allocating separate funds for such projects. Table 3 highlights current multi-institutional projects.

Table 3: Year 3 Projects by Partner Institutions and PIs

Multi-Institutional				
Mega-Travel in Megaregions: An Update on Growth Trends and Research Needs	UT SOA & Penn	Frederick Steiner, Robert Yaro, and Ming Zhang	Year 2	In Progress
Airport Governance in U.S. Metro Regions: Institutional Models and their Implications for Megaregional Transport	UT SOA & Penn	Gian-Cluadia Sciara, Megan Ryerson	Year 2	In Progress
Utilize Crowd-Sourced Data and Machine Learning Technology to Enhance Planning for Transportation Resilience to Flooding	UT SOA & TSU	Ming Zhang, Qisheng Pan	Year 3	In Progress
The Role of Transportation Networking Companies in Megaregion Mobility: Optimizing multi-modality through the optimal combination and utilization of different modes for intra-megaregion travel	UT SOA, Penn, TSU	Junfeng Jiao, Erick Guerra, Qisheng Pan	Year 3	In Progress
Key: UT SOA = University of Texas at Austin, School of Architecture; UT CTR = University of Texas at Austin, Center for Transportation Research; TSU = Texas Southern University; LSU = Louisiana State University; UPenn = University of Pennsylvania				

ii. Education Accomplishments

Ms. Paulina Urbanowicz, a Master's student in the Community and Regional Planning program at the University of Texas at Austin and a CM² GRA to Ms. Lisa Loftus-Otway, was selected as an Eno Fellow for the 2018 Transportation Leadership Development Conference (LDC) program. Paulina traveled to Washington D.C. where the fellows meet federal officials, business leaders, and non-profit organizations to better understand how national transportation policies are developed. Paulina notes that, "it felt surreal to walk the halls where policy decisions are made, and to talk to people who implement those policy decisions at every level of government and sector of the industry."



iii. Outreach/Engagement Accomplishments

Ms. Sandra Rosenbloom participated in the Texas State Traffic Safety Conference, in August. Dr. Danelle Briscoe presented at the 6th International Transportation and Economic Development

Conference held in Washington, D.C., in June. Dr. Briscoe also presented at the Association of Collegiate Schools of Architecture (ACSA) 2018 International Conference, held in Madrid, Spain, in June.

Dr. Jiao gave a talk at the School of Public Affairs & Administration at the University of Kansas, in September, at the Center for Advanced Spatial Analysis at University of College London, UK in August, and at the Department of Architecture at the University of Cambridge, UK in August. He was also an invited Panelist for a session on Big Health Data and Geo-visualization at the 2018 Health and GIS Conference put on by Texas State University in Round Rock, TX in May.

Dr. Brian Wolshon was an invited Expert Panelist for the Science & Entertainment Exchange in July 2018. The Science & Entertainment Exchange (The Exchange) is a program of the National Academy of Sciences (NAS) and their goal is to use the vehicle of popular entertainment media to deliver sometimes subtle, but nevertheless powerful, messages about science. The output title was "One Night to Save the World: Overpopulation".

Dr. Wolshon has also become the Section editor for the **new section** of Transportation Research D focusing on Disasters and Resilience. "This section of Transportation Research D will build on the special capabilities and interests of transportation researchers, coming from multiple disciplines, worldwide, to address the critical ways in which transportation science and the supporting theories, methods, and tools can be applied to increase societal resilience against all hazards, both natural and man-made." Dr. Wolshon is also the Area editor of "Highway Transportation System Security & Emergency Response" for the Journal of Transportation Safety System Security.

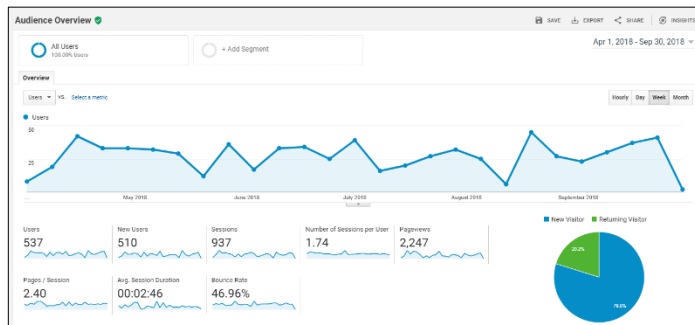
Mr. Harrison worked with a large Texas truck fleet operator that supplies corridor and urban deliveries to discuss fleet technologies and fuel performance, to determine impacts on gas tax revenues. This was used to develop recommendations for policy strategies for developing future transportation funding options.

Dr. Ming Zhang and Dr. Junfeng Jiao met with a representative from Austin Transportation Department to share about the work of our center, and to explore opportunities for future collaboration.

iv. Administrative Accomplishments

The CM² administrative team developed and submitted the newly required Technology Transfer Plan, which was approved for use. In addition, the center finalized the selection of Year 3 projects (15 projects in total, including 2 multi-institutional projects and 2 that are continuations of Year 2 projects). The projects are outlined in Tables 2 and 3 under Section 1.B.ii.

During this reporting period, the center's Support Partner Program was launched, and first supporter's check was cashed in September. The CM² administration and research team will continue expanding our base of Support Partners throughout the life of the grant.



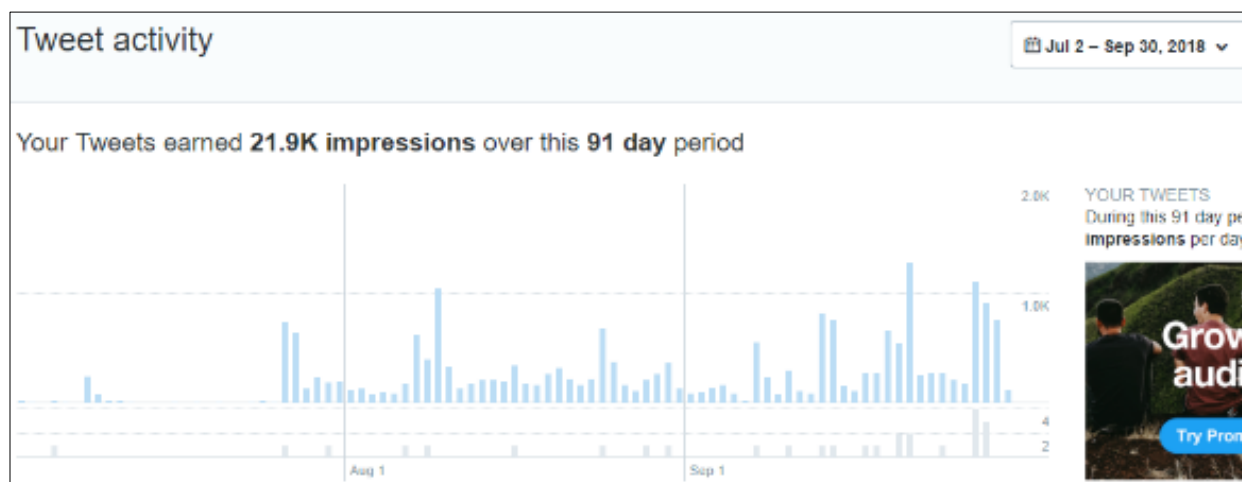
The [CM² website](#) data analytics has shown growth in website activity over the past six months. Audience page views showed 537 users with 510 new users, and 2247 page views. While the majority of views came from the United States (83.58%), our users are located in 43 countries (The image below depicts only top 10 countries total).

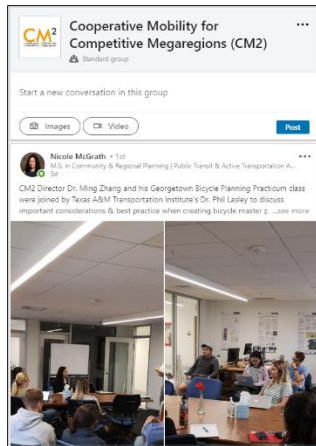
The CM² administration and research team will continue to ensure that all activities, reports,

Country	Users	% Users
1. United States	453	83.58%
2. China	14	2.58%
3. Bangladesh	10	1.85%
4. India	7	1.29%
5. Canada	6	1.11%
6. United Kingdom	3	0.55%
7. Italy	3	0.55%
8. Mexico	3	0.55%
9. Australia	2	0.37%
10. Germany	2	0.37%

news feeds, and articles are promptly posted to the website. They will also actively stride to bring traffic to the website to highlight center activities and engender public and private sector participation and discussion.

The CM² administration and research team has also focused activities on developing their Twitter and LinkedIn page. Since the CM² [Twitter account](#) opened in June 2018, our account earned nearly 22,000 impressions, which are defined as a number of times users saw our tweets on Twitter. Our account shared 63 tweets, has 52 followers and 106 Likes, and is following 212 users.





The [CM² LinkedIn company page](#) and [CM² LinkedIn Group](#) serve as a space where CM² researchers, GRAs (past and present), and partners can connect with each other, share exciting developments in research, professional accomplishments, awards, etc. At submission of this report, the LinkedIn Group has 59 members, and continues to grow. For any item that is tweeted or placed on LinkedIn, it is cross linked to the other platform. This maximizes social media data sharing. The CM² administration and research team will focus on growing our Twitter following and our LinkedIn group membership by regularly posting current and interesting content that crosses disciplines and reflects the mission of CM².

Additionally, the administration published 2 newsletters during this reporting period – Spring and Summer 2018. Our newsletter email list currently has 84 subscribers.



C. Dissemination of Results

The results of work completed to date has included 8 final project reports disseminated on the CM² website. CM² researchers presented their work at 7 different conferences as well as 11 invited talks both in the US and abroad. 6 refereed journal papers have been published and 6 are forthcoming or under consideration as is 1 book chapter. 6 papers have been submitted to TRB for presentation. Peer reviewed articles from our researchers have been cited approximately 115 times in the reporting period according to Google Scholar. Research has also been disseminated through templates for use by the primary software distributors in the field as well as different models (travel demand and investment; regional freight transportation) available for us by MPOs and transportation planners. All of these items are explored in more detail under Section 2.

D. Plans for Next Reporting Period

The next reporting period, the CM² consortium expects to see 13 completed projects with final reports. It is anticipated at writing of this update that 2 more Support Partners will be announced in the next reporting period. The administrative team will continue to conduct outreach to grow this program of matching funds.

On November 9th, Penn's CM² Northeast Megaregion Travel Demand and Investment Modeling (NEMRTD&IM) group will be conducting a one-day workshop with transportation planners from approximately 15 agencies throughout the Northeast Megaregion (including MPOs, state DOTs, and transit operators) to discuss three items: (i) additional modeling/planning capabilities to be developed; (ii) real world projects and scenarios to be tested; and (iii) transferring megaregional scale modeling capabilities and data from Penn to local MPOs and transportation agencies. Subsequent meetings will be held semi-annually or annually. Making Penn's CM² group available to regional transportation planners as a sort of R&D skunkworks for advanced modeling, analysis,

and regional planning efforts represents a long-established and still effective model of technology and capacity transfer.

On December 7th, UT Austin partners will host their Fall Exhibition 2018 to present ongoing research projects and share the center's updates. CM² researchers, GRAs, Support Partners, and Advisory committee members will attend the event. The center will continue hosting monthly Brown Bag Lunch Discussions that are described in more detail in Section E.

The University of Pennsylvania (Penn) and the University of Texas at Austin (UT Austin) are engaged in a joint project to investigate the potential for strategic investments in transportation infrastructure that would transform the economy of cities and regions that have fallen behind larger, more successful metropolitan places in two of America's largest megaregions: the Northeast and the Texas Triangle. As part of this Year 2 multi-Institutional project, "Mega-Travel in Megaregions: An Update on Growth Trends and Research Needs", teams of Master's degree and PhD candidates from both universities will participate in a week-long Charrette in Manchester, England from February 9-17, 2019. The UT Austin team will be led by Dr. Ming Zhang and Ms. Lisa Loftus-Otway, and the Penn team will be led by Dr. Bob Yaro and Dr. Fritz Steiner. The Charrette is being hosted by the UK 2070 Commission, an independent commission being led by Lord Kerslake, which is investigating similar trends in the United Kingdom. Commission members and researchers from the Universities of Manchester and Sheffield who are staffing the Commission will engage with Penn and UT Austin team members to share insights on strategies being considered by the commission to revitalize underperforming and bypassed cities and regions in the United Kingdom. While in Manchester, Penn and UT Austin team members will also engage with leaders of the Northern Powerhouse initiative, the UK's \$100 billion initiative to build two new high-speed rail lines and upgrade motorways as part of a broader endeavor to revitalize the economy of several disadvantaged mid-size cities across the North of England. This charrette provides a unique opportunity for CM² researchers and students from multiple institutions to learn from international initiatives that address megaregional mobility as well as conduct technology transfer of current CM² research at a global scale.

Ms. Loftus-Otway and Drs. Brian Wolshon, Carol Lewis, and Gwen Goodwin will be on a webinar panel for the WTS South West Region's Fall Conference on November 2, 2018. The WTS SW Region falls over 2 megaregions (the Texas Triangle and the Gulf Coast) and is comprised of 5 states (New Mexico, Oklahoma, Texas, Louisiana and Alabama).

Ms. Loftus-Otway will work with Girlstart and WTS Heart of Texas (HOT) chapter to prepare megaregion-related activities and career panels for the "Girls in STEM" Conference in March 2018 and the Girlstart 2019 summer camp.

Ms. Loftus-Otway, Ms. Inessa Ach, and GRA Ms. Nicole McGrath are developing a week long camp focused on megaregions to be held at UT Austin for summer 2019. The camp will have multiple activities including seminars, hands-on activities, field trips, and guest speakers. They will work with WTS as well as public and private sector groups to coordinate technical support for field trips and transportation as well as financial support to cover the cost of food and materials so that camps can be offered free of charge.

The CM² administration will continue to share the center’s activities on all social media platforms and grow our follower base, thereby continuing the dialogue around megaregion and multi-jurisdictions issues. The CM² administration will continue to follow and track all analytical data related to our online presence.

2. PRODUCTS

A. Publications

i. Journal Publications

- Liu, L. and Zhang, M. (*corresponding author*) 2018. High-speed rail impacts on travel times, accessibility, and economic productivity: A benchmarking analysis in city-cluster regions of China. *Journal of Transport Geography*, 73:25-40.
- Griffin, G., & Jiao, J. (2018). Crowdsourcing Bike Share Station Locations: Evaluating Participation and Placement. *Journal of the American Planning Association*. 84(3).
- Yu, H., Jiao, J., Houston, E., & Peng, Z. (2018). Evaluating the Relationship Between Rail Transit and Industrial Agglomeration: An Observation From the Dallas-Fort Worth Region, TX. *Journal of Transport Geography*. 67. 33-52.
- Jiao, J. (2018). Investigating Uber Price Surges During a Special Event in Austin, TX. *Research in Transportation and Business Management*. <https://doi.org/10.1016/j.rtbm.2018.02.008>
- Klein, Nicholas J., Erick Guerra, and Michael J. Smart. (2018). “The Philadelphia Story: Age, Race, Gender and Changing Travel Trends.” *Journal of Transport Geography* 69 (May): 19–25. <https://doi.org/10.1016/j.jtrangeo.2018.04.009>.
- Yahia, C. N., Pandey, V., & Boyles, S. D. (2018). Network Partitioning Algorithms for Solving the Traffic Assignment Problem Using a Decomposition Approach (No. 18-06570).

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>. This book chapter was published online at <https://www.sciencedirect.com/science/article/pii/B9780124095489100284?via%3Dihub>
- Landis, John. 2016 Metropolitan Equity Report Card: A Report from the Penn Planning Equity Initiative (Draft)
- Lindell, M., Murray-Tuite, P., Wolshon, B., and Baker, E. Large-Scale Evacuation: The Analysis, Modeling, and Management of Emergency Relocation from Hazardous Areas. 1st Edition, 2018, Publisher: CRP Press. In Print.

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

- Michael Oden. Whither Regionalism: The Salience of Megaregional Geographies for Inter-Metropolitan Planning and Policy Making. Presented at Urban Affairs Association Annual Conference, Toronto, Canada, April 6, 2018.
- Stephanie Levine, Paulina Urbanowicz, Lisa Loftus-Otway, Identifying Organizational Changes to Facilitate MPO Megaregion Planning; TRB, August 2018. Accepted for presentation at TRB 2019 annual meeting.
- Stephanie Levine, Paulina Urbanowicz, Lisa Loftus-Otway. Defining the Role of Performance Measurement in MPO Megaregion Planning. TRB, August, 2018.
- Jafari, E., Pandey, V., & Boyles, S. D. (2017). A decomposition approach to the static traffic assignment problem. *Transportation Research Part B: Methodological*, 105, 270-296.
- Pan, Q. (2018) "Megaregion Truck Flow Estimation Model," the 12th IACP Conference, June 30-July 1, Xi'an, China.
- Pan, Q. The Research and Applications of Regional and Urban Smart Models, Wuhan University, August 10, 2018, Wuhan, China.
- Pan, Q. The Development and Applications of Regional Planning Models, Department of Architecture, Cambridge University, July 27, 2018, Cambridge, UK.
- Pan, Q. Problems and Opportunities for Urban Growth and Transportation Development, Southwest Jiaotong University, July 11, 2018, Chengdu, China.
- Pan, Q. The Driving Forces Explaining Change of Employment Centers in Large US Metropolitan Areas: A Comparison Study of Houston and Dallas, International Planning PhD Forum, Tongji University, July 10, 2018, Shanghai, China.
- Dr. Pan, was also the Co-organizer, The 2018 world transportation convention, June 18-21, Beijing, China. A presenter at a Research seminar, Department of Architecture, Cambridge University, July 27, 2018, Cambridge, UK; a presenter at a Research seminar, Southwest Jiaotong University, July 11, 2018, Chengdu, China, and a presenter, International Planning PhD Forum, Tongji University, July 10, 2018, Shanghai, China.

E. Websites

The CM² website URL is <https://sites.utexas.edu/cm2/>. This website is used to disseminate any information related to the program. In addition, CM² has a Twitter account (<https://twitter.com/CM2.UTC>), LinkedIn group (<https://www.linkedin.com/groups/12134034/>) and LinkedIn company page (<https://www.linkedin.com/company/cooperative-mobility-for-competitive-megaregions-cm2/>).

All final project reports are also disseminated through the [TxDOT Research Library](#) website operated by the Center for Transportation Research Library at the University of Texas at Austin (UT Austin). The TxDOT Research Library serves as the official depository of the [Texas](#)

[Department of Transportation \(TxDOT\) Cooperative Research Program](#) and supports the information needs of the Research and Technology Implementation Division of TxDOT. The collection contains over 27,000 print and electronic transportation-related reports from different agencies (FHWA, AASHTO, TRB, state-level transportation agencies, City of Austin, SWUTC, and more), specializing in Texas transportation. Free full-text links are provided for over 60% of the collection, including most TxDOT research publications. Services and resources are available to students, researchers, agencies, and the public.

UT Austin's School of Architecture helps disseminate research results and the work of our center through the school's website (<https://soa.utexas.edu/headlines/what-megaregion>) and via eNews (<https://mailchi.mp/utexas/february-2018-enews-1975165?e=48aa70e157>). All LSU program activities are disseminated through <http://www.evaccenter.lsu.edu>.

Dr. Junfeng Jiao website www.transitdeserts.org demonstrates the findings of Dr. Jiao's research project on transit deserts. In addition, Dr. Jiao was interviewed by Community Impact Newspapers on Food deserts problem in East Austin:

<https://communityimpact.com/austin/central-austin/development-construction/2018/08/29/east-austin-commercial-development-boom-leaves-business-owners-conflicted/>. Dr. Jiao was also interviewed by the news website Vox on the presence of E-scooters and transit deserts in US. The story was published by Vox and The University of California Press: <https://www.universityofcalifornia.edu/news/the-battle-over-scooters> Dr. Jiao was also invited to give a talk on the Problem of Transit Deserts in the US at the Center for Advanced Spatial Analysis at the University of College London. The link is attached: <https://www.ucl.ac.uk/bartlett/casa/news/2018/sep/dr-junfeng-jiao-presents-casa-seminar-transit-desert-usa-lessons-52-cities>

Mr. Rob Harrison's poster presentation at CTR Annual Symposium on April 12, 2018 was published on the CTR website: <https://ctr.utexas.edu/ctr-symp/2018-poster-session/>.

Dr. Kara Kockelman's work is featured on an NCTCOG website on Connected & Automated Driving Systems: smarttransport.solutions

Erick Guerra's research was highlighted on the following websites:

- Island Press (a nonprofit, environmental publisher based in Washington, D.C., that specializes in natural history, ecology, conservation, and the built environment): <https://islandpress.org/blog/podcast-beyond-mobility>
- Nexos (a cultural and political magazine in based in Mexico City, Mexico): <https://labrujula.nexos.com.mx/?p=2075>
- Milenio (a major national newspaper in Mexico): http://www.milenio.com/df/invertir-transporte-publico-experto-foros-movilidad-milenio_0_1104489566.html
- Milenio (a major national newspaper in Mexico): http://www.milenio.com/region/cdmx-gastar-tecnologia-erick_guerra-urbanismo-movilidad-calidad_del_aire-milenio_0_1110488969.html

F. Technologies or Techniques

Dr. Briscoe developed the BIM (Building Information Modeling) Revit template and User Based Scenarios. Revit is building information modeling software for architects, landscape architects, structural engineers, MEP engineers, designers and contractors developed by Autodesk.

G. Inventions, patent applications, and/or licenses

Nothing to report.

H. Outreach activities

UT Austin CM² researchers take part in the City Forum Speaker Series at the School of Architecture to highlight their CM² research results. 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. Detailed information is available at <http://soa.utexas.edu/crp/city-forum>.



In June 2018 Ms. Loftus-Otway facilitated a partnership with the WTS HOT chapter to provide two career panels for Girlstart Austin's week long summer camps titled "Take it to the Streets". Dr. Sciara and CM² GRA Olivia Posner joined the career panels to provide an academic and graduate perspective for the 4th and 5th graders. The panels spoke about degree choices, fields of study, and gave short vignettes of the daily activities of project planning, project management, highway design, environmental review, marketing, working for a local government, leadership, and other topics.

In September 2018 Ms. Loftus-Otway continued the facilitation of CM² partnerships with WTS Houston's Chapter to provide activities to Girlstart's "[Girls in STEM](#)" conference held at Taylor High School in Alief, TX. Dr. Goodwin joined WTS Houston chapter participants for this all day event that gave 4th grade girls awareness of STEM career fields in all things transportation. One of the major activities undertaken was building a bridge out of toothpicks and



marshmallows. Through this activity the girls learn about structures, design elements, planning and aesthetics, and bridge construction.



Dr. Brian Wolshon and Ms. Herrera held a [Transportation Engineering Summer Camp](#) in July. Ms. Herrera organized a session of hands-on activities for the Recruiting into Engineering High-Ability Multicultural Students (REHAMS) summer

camp. This summer camp is offered every year to rising 11th and 12th grade students and provides an opportunity to explore, create, and compete in a variety of engineering and college preparatory activities to encourage interest in STEM. Gabrielle Taylor, an LSU undergraduate student worker supported by CM², assisted Ms. Herrera during the activity.

The activity began with a short presentation and Q&A session about planning and design. The 33 students that attended the session were then divided into six groups. Each group built a city on a piece of white cardboard representing their “city limit”. The students were provided toothpicks and gummies that served as building blocks for houses, schools, grocery stores, hospitals, warehouses, etc. They were also provided paper roads, traffic signs and traffic signals to build a transportation system that would provide accessibility and connectivity.

I. Courses and Workshops

TSU’s Drs. Lewis and Goodwin hosted a [workshop](#) in Round Top, TX on September 7th with participants from MPOs/COGs, Rural Planning Organizations, and Rural Transit Providers to look at serving vulnerable communities within the US290 corridor between Houston and Austin. Ms. Loftus-Otway presented her work on the project Issues in Setting a MPO Process for Megaregion and Multi-Jurisdiction Planning in the Texas Triangle.



LSU conducted two short-courses: “Overview of Geometric Design of Roadways and Highway Safety in the United States” at the School of Transportation Science and Engineering, Beihang University, Beijing, China, June 2018 and “Overview of Traffic Control and Operations on Highways in the United States” at the School of Transportation Science and Engineering, Beihang University, Beijing, China, June 2018.

The University of Pennsylvania hosted two classes. In the spring of 2018 Drs. Yaro and Taylor conducted a Graduate design and planning studio with 15 students enrolled, resulting in a series of recommendations for a national infrastructure investment strategy, incorporating case studies in Denver and Los Angeles. In the fall of 2018 Dr. Yaro conducted a Graduate seminar dealing with uneven development and social and spatial equity issues associated with mega-regional infrastructure investments. 15 were involved in the seminar.

UT Austin’s Dr. Junfeng Jiao was one of the leading Principle Investigators (PI) for a university-wide Campus Engagement Workshop under the Bridging Barriers initiative that took place on September 14th. Bridging Barriers brings together experts from across the 40 acres to address pressing problems facing Texas, the nation, and beyond. CM² Director, Dr. Ming Zhang also participated in the workshop. The workshop focused on connecting researchers from different disciplines to investigate how modern society’s complex web of technological systems can be made good for the wellbeing of individuals. Dr. Jiao discussed different ways to utilize crowdsourced data to address planning and health issues as well as how to use research findings to develop future university courses.

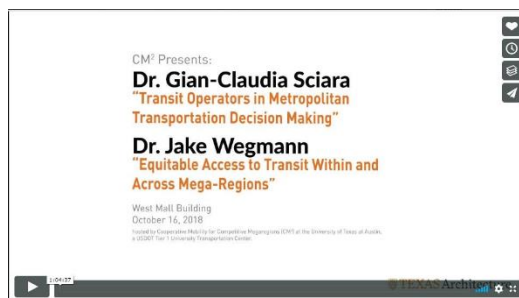


CM² also gathered for its first [Annual Summer Forum](#) at the University of Pennsylvania in June 2018. The CM² Summer Forum brought together the consortium of institutions that represent CM² and other invited guests. Researchers convened to host a discussion on megaregional trends and prospects, as well as an academic forum to introduce and share institutional research. The forum represents a unique

opportunity for the consortium to gather together, reflect on the research that has been done, and share research results with interested faculty and local professionals, and plan for future iterations of megaregional research. Future annual forums will be held in Houston in 2019, Louisiana in 2020, and Austin in 2021.

J. Other products

Each month, researchers at UT Austin gather for monthly Brown Bag Lunch Discussions to present their current projects and discuss their findings with their fellow researchers. The initiative was launched in Spring 2018 and there have already been 5 meetings featuring 7 presentations. Typically, there are 2 presentations per event (approximately 20 minutes each) with a discussion to follow. In addition to the center's researchers and GRAs, a broader audience is invited to attend these meetings (students, faculty members, center partners, etc.). All presentation materials used for the Brown Bag Lunch Discussions are available on [the Brown Bag Lunch Discussion Page of our website](#). Additionally, due to a high number of attendees and an increasing interest, the Brown Bag Lunch Discussions will now be video recorded and available online.



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 4 presents a list of current CM² partners.

Table 4: Current CM² Partners

Organization Name	Location	Contribution
City of Austin (Austin Transportation Department)	Austin, TX	Data Support
City of Houston	Houston, 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
Texas Department of Transportation	Austin, TX	Data Support
Centro de Investigación en Ciencias de Información Geoespacial	Mexico City, Mexico	Data Support
Center for Transportation Research's Freight Modelling Lab; Urban Information Lab, University of Texas at Austin	Austin, TX	Facilities
Stephenson Disaster Management Institute at LSU	Baton Rouge, LA	Facilities, Technical Contributions
WTS (HOT and Houston chapters, South West Region)	TX, OK, NM, AL, AK	In-Kind Support
Girlstart	TX	In-Kind Support
Texas and Houston APA Chapters	TX	In-Kind Support
Harris County	TX	In-Kind Support
Harris County Rides	Houston, TX	In-Kind Support
Southeast Texas Regional Planning Commission	Beaumont, TX	In-Kind Support
Brazos Valley Council of Governments	Bryan, TX	In-Kind Support
Capital Area Rural Transit System (CARTS)	Austin, TX	In-Kind Support
Bryan/College Station MPO	Bryan, TX	In-Kind Support
WSP New York	New York City, NY	In-Kind Support
Eno Center for Transportation	Washington, DC	In-Kind Support
Empire State Development	New York City, NY	In-Kind Support
Original Equipment Manufacturers (truck manufacturers)	TX	Research
Connecticut Capitol Region Council of Governments	Hartford, CT	Research
Regional Plan Association	New York City, NY	Research
USC Sol Price School of Public Policy	Los Angeles, CA	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, Technical Contributions
Beihang University	Beijing, China	Technical Contributions

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 four multi-institutional projects currently in progress. Dr. Ming Zhang and Dr. Pan continue to collaborate on the CM² Summer Forum to be held at the Texas Southern University in June 2019.

4. IMPACT

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

Transportation Planning and Policy at the megaregion scale is sketchy and under-developed. Projects analyzing the jurisdictional structures, challenges, impediments and opportunities on regional collaborative activity, at the megaregional or other scales, will offer comprehensive and important findings on the degrees of cooperation between MPOs and the salience of the Megaregion as a scale of organization and collaborative work.

Understanding the opportunities, challenges, and barriers to efficient and effective MPO planning for megaregions and inter-jurisdictional planning will ensure that projects with megaregional impacts are included in short and longer range planning documents. This, in turn, will allow federal and local funding to be matched for the development, maintenance, and enhancement of infrastructure. For example, the project, *Creating a Framework to Determine Purpose and Need for Increased Travel Options in the Megaregion for Vulnerable (Environmental Justice) Communities*, explored increased access to opportunities that promote equity in connecting regions and communities, including urban and rural communities. The subsequent workshop (discussed in Section 2F) gathered transit agency providers, corridor MPOs and a private sector transportation company to view Year 1 results. As a result of the workshop, the team will draft a position paper for the upcoming Texas Legislative session about the importance of funding for planners in the interstices.

Other projects, such as the research into impediments and high costs for infrastructure projects in the Northeast Megaregion deal with opportunities for and barriers to transportation infrastructure investments that will reduce inter- and intra-metropolitan congestion while promoting economic competitiveness and social equity. The results will be of great interest to elected officials, state, regional, and city officials, and MPOs concerned with maximizing the impacts of shrinking infrastructure investment funds and to the transportation and financial industries looking for new investment and public-private partnership opportunities.

B. Impact on Other Disciplines

The inter-disciplinary nature of CM²'s research output ensures that planners, architects, lawyers, engineers, and policy makers are part of our projects, combining their perspectives to enhance megaregional research. This approach creates products that can work in many different types transportation and planning entities, and can be utilized by the many consultants who provide services to these entities. As an example, the University of Pennsylvania will be rolling out the preliminary version of the Northeast Megaregion Travel Demand and Investment Model at a

meeting of Northeastern MPOs (and selected consultants/industry leaders) in November 2018 and there are currently inviting comments on its design and use. Developing new tools that can be utilized by transportation planning agencies, along with their associated economic development organizations, will provide much needed technical assistance as they assess and develop infrastructure that connects megaregions. The BIM Revit template and User based Scenarios will be used by all users of the Autodesk Revit software, which include architects, landscape architects, structural engineers, MEP engineers, designers and contractors. Findings on the allocation of subsidies for affordable housing based on “location efficiency” could affect government policies on affordable housing siting.

C. Impact on the Development of Transportation Workforce Development

CM² partner universities are preparing our students to enter both the public and private sector with expertise in planning, design, project delivery, and financing strategies. Our classes engage extensively with noted experts who work daily on the implementation of transportation and infrastructure projects. Several CM² graduates have already gone on to work in transportation agencies and consulting firms across the country (including Metropolitan Transit Authority of Harris County, KLD Engineering, P.C., and the Chicago Metropolitan Agency for Planning), implementing the lessons learned through CM² in their work. In addition, the camps and other outreach activities we have conducted are introducing the next generation to the potential avenues of a career in transportation.

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

The research and technological outputs from our center will be made available to all partner institutions as well as other research centers for instructional and research use. For example, regional freight transportation model developed in Year 1 research has been extended to estimate megaregion truck flows in subsequent year research. The joint project between UT Austin and Penn on strategic investments in transportation infrastructure that would transform the economy of cities and regions that have fallen behind larger, more successful metropolitan places will be incorporated into graduate level class offerings at both institutions in spring 2019 that teach planning for megaregions.

E. Impact on Technology Transfer

Our work has advanced the understanding and applicability of innovative programs that have the authority to bring together funding and financing from many resources into a single project budget. This includes multiple governmental agencies as well as private sector enterprises. Of specific interest is California’s statewide Enhanced Infrastructure Investment District (EIFD) legislation which allows for a broad range of projects to take advantage of this funding mechanism. Additionally, our work with DSTAP algorithms and proposed heuristic have the potential to impact the status quo of traffic assignment problem algorithms and provide a quicker alternative to existing solution methods.

F. Impact on Society beyond Science and Technology

The interdisciplinary nature of CM²'s projects means that they have impacts on many other aspects of society beyond transportation alone. Natural disasters like hurricanes, floods, and wildfires have impacted many areas throughout the world. Megaregions can also be susceptible to a range of these natural and manmade hazards and because of their enormous populations and geographic extents there is a need for better emergency planning and protection action strategies considering the characteristics of megaregions. The contributions of our projects are anticipated to include not only a better understanding of evacuation process in megaregions but also a better understand of the tools available for emergency planning that can be used by the research community, public agencies, and private companies.

The addition of Autonomous Vehicles (AVs) into society will have major impacts not only on our transportation systems but on our daily lives. Our research into AVs in the Texas Triangle suggest that people will shift to more distant destinations, on average (evidenced by the increase in the megaregion's average travel distance: from 14 miles to 16 miles). Air travel will fall by more than 82%, with these long-distance travelers shifting to ground transport options. Without travel demand management congestion issues will grow, thanks to an average VMT increase of 47%. Not only will this affect the urban fabric of our communities but it will have major health implications as well. Predictions of much-lowered local air travel and rising demand for highway infrastructure should help state and city departments of transport, planning organizations, manufacturers, transit providers, and airport authorities think about the kinds of policies and practices they should be putting into law and their budgets now. Results also provide insights for the automakers and policy makers who aim to achieve a balance between sustainable transportation development and profit maximization of automobile industry.

Additionally, our research into locational efficiency and its role in the allocation of subsidies for affordable housing shows the complicated relationship between transportation costs and racial concentration. Specifically, it highlights how goals of reducing segregation have direct implications for transportation costs for low-income and minority households. In this paper we provide ways that transportation data can be used to guide the siting and development of new affordable housing to ensure transportation costs for low-income households are minimized, and these programs do not further racial and economic segregation.

G. Additional Information regarding Products and Impacts

Nothing to report.

5. CHANGES/PROBLEMS

Nothing to report.

6. SPECIAL REPORTING REQUIREMENTS

Nothing to report.