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TABLE OF CONTENTS

1. ACCOMPLISHMENTS 3

 A. Goals and Objectives..... 3

 B. Accomplishments under These Goals..... 3

i. Research Accomplishments 3

ii. Education Accomplishments 4

iii. Outreach/Engagement Accomplishments 5

iv. Administrative Accomplishments 8

 C. Dissemination of Results..... 8

 D. Plans for Next Reporting Period 9

2. PARTICIPANTS & COLLABORATING ORGANIZATIONS..... 9

 A. Organizations Involved as Partners 9

 B. Other Collaborators or Contacts..... 11

3. OUTPUTS..... 11

 A. Publications..... 12

i. Journal Publications 12

ii. Books or other non-periodical, one-time publications..... 14

iii. Other publications, conference papers, presentations, and working papers 14

 B. Websites..... 14

 C. Methodologies, Technologies or Techniques 15

 D. Inventions, Patent Applications, and/or Licenses..... 15

 E. Outreach Activities..... 15

 F. Courses and Workshops..... 15

 G. Other products..... 16

4. OUTCOMES 16

5. IMPACTS..... 18

 A. Impact on the effectiveness of the transportation system 19

 B. Impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company 19

 C. Impact on the body of scientific knowledge..... 19

 D. Impact on transportation workforce development..... 19

6. CHANGES/PROBLEMS 20

7. SPECIAL REPORTING REQUIREMENTS..... 20

1. ACCOMPLISHMENTS

A. Goals and Objectives

CM² is committed to advancing research, education, and technology transfer initiatives to improve mobility, promote equity, and enhance the 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 partnerships for freight mobility planning and operation efficiency.

B. Accomplishments Under These Goals

i. *Research Accomplishments*

Throughout this reporting period, the grant funded 16 researchers and 18 students. Research teams were involved in a series of projects analyzing data, laws, policies, and technologies as well as developing solutions through modeling and analysis for cooperative mobility in megaregions. Table 1 outlines the projects completed by the end of this reporting period below.

Table 1: Completed Projects by Partner Institutions and PIs

Project Title	Partner(s)	Principal Investigator	Funding Year	Project Status
An Operational Platform for Modeling Multi-Modal Transportation Investments in the Northeast Corridor Megaregion	UPenn	John Landis	Years 1-3	Complete
Megaprojects for Megaregions: Global Cases and Takeaways	UPenn	John Landis	Year 3	Complete
Airport-MPO Collaboration: Challenges and Opportunities for Cooperative Megaregional Transportation Planning	Multi: UT SOA & UPenn	Gian-Claudia Sciara, Megan Ryerson	Year 2	Complete
Who Drives, Where, and When? An Evaluation of Behavioral Responses to License-Plated Based Driving Restrictions	UPenn	Erick Guerra	Year 4	Complete
Effect of Disruptions on Megaregion Emergency Evacuations: A Pilot Study	LSU	Brian Wolshon	Year 2	Complete
The Evolving Texas Megaregion: Developing a Sustainable Megaregion Mobility Planning Blueprint	UT CTR	Lisa Loftus-Otway	Year 4	Complete

The COVID-19 pandemic altered the timing of the most recent project selection process for new and ongoing research proposals by the Consortium for Year 6 (FY2021). PIs were invited to submit proposals for new research projects on June 15, 2021 with a final submission deadline of August 16, 2021. This invitation was a tight turn-around from the Call for Proposal (CFP) and selection process from Year 5 (FY2020), which was finalized in March 2021.

Each institution completed an internal review process to select final proposals. All proposals received a mix of double-blind reviews and single-blind reviews. The CM² Director also evaluated each submitting PI's previous record of completing CM² projects, including delivering planned outputs and spending project budgets in a timely fashion. Based on the institutional reviews of the submitted proposals, the CM² Director asked PIs to revise proposal submissions to respond to a synthesis of reviewer comments and evaluation scores. Once completed, the CM² Director approved the final selection of proposals and disseminated awards to member institutions.

ii. *Education Accomplishments*

On Saturday, May 22, 2021, the School of Architecture of the University of Texas at Austin recognized the award-winning students, faculty, and staff at the school's virtual commencement ceremony. CM² Administrative Graduate Research Assistant Tressa Olsen received the "Community and Regional Planning Engaged Practice Award 2021" for the practicum class thesis project *Drowning in Disinvestment: Addressing historic inequities in stormwater infrastructure in disaster recovery planning in Houston, Texas*.



1Dr. Bumseok Chun, Associate Professor, Urban Planning & Environmental Policy, Texas Southern University

Recent Texas Southern University (TSU) graduate Brandon Rogers, who was a GRA under Drs. Carol Lewis and Gwen Goodwin in the 2019-2020 academic year, is now working in the transportation sector as a transportation planner/engineer for Hampton Roads MPO. This makes the overall total of 72 graduates in transportation jobs, which exceeds our goal of having 15 students graduate and enter transportation-related jobs during the overall grant period.

In addition to our students' achievements, CM² researchers also received recognition for their expertise and contributions to their fields of research. Dr. Gian-Claudia Sciara of UT Austin has been appointed as a Nonresident Fellow in the Metropolitan Policy Program of the Brookings Institution for the upcoming 2021-2022 academic year. Dr. Bumseok Chun received two academic/faculty awards in May of this year: the Faculty Excellence Award in Scholarly Research and Creative

Activities, and the Outstanding Faculty Research Award from the TSU School of Public Affairs.

iii. *Outreach/Engagement Accomplishments*

The COVID-19 pandemic altered the ways in which CM² has been able to complete outreach/engagement activities. The majority of in-person events were shifted to online platforms such as Zoom and secondary event-specific websites. Research related travel, especially international travel for PIs and students, remains incredibly limited, but CM² researchers were able to participate in a variety of national and international conferences during this reporting period.

During this reporting period, CM² staff and researchers attended a variety of regional and national-level conferences. Assistant Director of Administration Sandra Ciarletta attended the 3rd Annual Mobility Summit 2021 hosted by Mobility 21 on April 15, 2021, where she presented the Cooperative Mobility for Competitive Megaregions (CM²) Informational video during the UTC Poster Session of the virtual event. Dr. Erick Guerra from UPenn represented CM² at the Spring Conference of the American Council of Engineering Companies of Pennsylvania on May 12, 2021. Dr. Sandi Rosenbloom attended the 2021 Texas Pedestrian Safety Forum hosted by The Texas A&M Transportation Institute, Center for Transportation Safety, the Texas Pedestrian Safety Coalition and the Texas Department of Transportation in August 2021. In March 2021, Dr. Ming Zhang of UT Austin gave the invited talk, *Facilitate Smart Planning with Cloud-Computing and Crowdsourcing Technologies for Small City Town Regions* at the Urban Chain Collective 3rd Annual Conference hosted at the University of Pennsylvania. Finally, CM² researcher Dr. Carol Lewis (TSU) led the panel session: *Building Lasting Connections through Mentorship* at the NASEM-TRB Conference on Advancing Transportation Equity virtual event in September 2021.

Several CM² researchers were able to attend international conferences as well, either in person or through virtual opportunities. In June 2021, Dr. Brian Wolshon was invited to act as a guest lecturer in the School of Transportation Science and Engineering at Beihang University in Beijing, China, where he taught an eight-week graduate course on transportation resilience during the Spring academic semester. Associate Professor Danelle Briscoe virtually attended the 8th Annual S.Arch Conference on Architecture and Built Environment in Rome, Italy on September 2021, where she presented her CM²-related research on multi-modal modelling through BIM technology for megaregion mobility. Dr. Qisheng Pan virtually attended the 7th Annual International Conference on Integrated Land Use Transport Modeling (ILUTM-7) in June 2021 hosted in Xi'an, China where he presented his work *Regional Freight Transportation Modeling and Applications in the U.S. and China*. Finally, CM² Director Dr. Ming Zhang gave the talk, *Transit Oriented Development (TOD): Concept, Planning Principles, and Research Frontier* as an invited guest speaker with the School of Architecture at Tianjin University. Dr. Zhang also presented at the 15th annual International Association for China Planning Conference (IACP) held in Nanjing, China on September 11 – 13, 2021. Dr Zhang presented three of his currently active research projects during this conference:

- Li, Y. and Zhang, M. 2021. *Do Millennials Fly More/Drive Less Than Baby Boomers for Long-Distance Travel? Evidence from National Travel Surveys in the United States.* Presented at the 15th International Association for China Planning (IACP) Conference. Nanjing, China, September 11-13, 2021.
- Guo, J. and Zhang, M. 2021. *Do Megaregions Lead to Convergence of Economic Productivity?* Presented at the 15th International Association for China Planning (IACP) Conference. Nanjing, China, September 11-13, 2021.
- Liu, Z., Li, Y., and Zhang, M. 2021. *The Network Effects of Urban Metro System on Housing Prices and Implications for Transit Planning: A Case Study of Shanghai.* Presented at the 15th International Association for China Planning (IACP) Conference. Nanjing, China, September 11-13, 2021.



A still image from the 2021 Summer Forum featuring CM2 Director Dr. Ming Zhang and Louisiana State University Professor of Engineering, Dr. Brian Wolshon

The Cooperative Mobility for Competitive Megaregions (CM²) consortium held its annual Summer Forum in June 2021 virtually through Zoom. The forum was entitled *Resilient Transportation, Policy, Planning, and Management in Megaregions*, and was co-hosted by Dr. Brian Wolshon of the CM² partner institution Louisiana State University (LSU). The Summer Forum provides a unique opportunity for CM²-affiliated researchers and students to share ongoing research efforts and program updates with CM² partners and industry stakeholders, as

well as discuss the future of the US Department of Transportation (USDOT) funded Tier 1 University Transportation Center (UTC). Researchers and students from all CM² partner institutions – UT Austin, the University of Pennsylvania (UPenn), TSU, and LSU – attended. Additionally, CM² invited our members of the CM² Advisory Committee, [CM² Support Partner](#) representatives, and guests from the transportation industry.

The Forum was divided into three days. Day One was our Speaker Forum which began with opening remarks from CM² Director Dr. Ming Zhang and Louisiana State University Professor of Engineering, Dr. Brian Wolshon. The keynote and plenary addresses were delivered by Dr. Karl Kim and Dr. John Renne, respectively, followed by an author round table to discuss the topic, *Creating Resilient Transportation, Policy, Planning, and Management in Megaregions*. Day 1 guest speaker presentations included:

- “COVID-19 and Transportation: Advancing Multi-scalar, Multi-disciplinary Understanding and Resilience” by [Dr. Karl Kim](#) (Executive Director, National Disaster Preparedness Training Center & Professor, of Urban and Regional Planning, University of Hawaii)
- “Virtual Reality as a Tool for Transportation Planners to Engage the Public on Sea Level

Rise” by [Dr. John Renne](#) (Director, Center for Urban and Environmental Solutions & Professor, Department of Urban and Regional Planning, Florida Atlantic University)

- “Traveler Behavior Changes During Transportation Disruptions” by [Dr. Pamela Murray-Tuite](#) (Vice Chair, Transportation Research Board’s Committee on Disaster Response, Emergency Evacuations, and Business Continuity, Clemson University)
- “Resilience, Automation, and Connected and Automated Vehicles” by [Dr. Anurag Pande](#) (Professor, Civil Engineering & Faculty Director for Community-based Learning at California Polytechnic State University, San Luis Obispo)
- “Resilience of National Highway Transportation System and Control Policy under the Outbreak of COVID-19 in China” by [Dr. Zhao Zhang](#) (Assistant Professor, School of Transportation Science and Engineering, Beihang University)



A still image of Dr. Zhao Zhang's guest speaker presentation: "Resilience of National Highway Transportation System and Control Policy under the Outbreak of COVID-19 in China" during the 2021 Summer Forum

After the presentations from our guest speakers, the second half of the day featured an open-ended all-member discussion moderated by Dr. John Renne.

Day Two was the Academic Forum portion of the Summer Forum event, which began with a Consortium overview presentation during which each partner institution provided brief overviews of their current CM²-related research projects, workshops, and teaching efforts. After the Consortium overview presentation, we then heard from individual Principal Investigators (PIs) and research teams on current research projects being conducted across the Consortium. The quality of research conducted across the consortium was widely lauded by the forum guests.

The Academic Forum ended with an award ceremony in which attendees voted on projects which best represented the following four research categories: Best Equity Project, Best Inter-Disciplinary Project, Best Tech Transfer Project, and Best Teaching Project. Poster award recipients received certificates and \$1,000 towards a travel stipend to assist graduate students in attending a research conference or meeting of their choice during the upcoming 2021-2022 academic year.

- Best Equity Project: Dr. Carol Lewis, Dr. Gwen Goodwin & graduate research assistant Lydia Ndagire: "[Examining Medical, Health and Transportation Equity in Rural Areas of the Texas Megaregion](#)" of Texas Southern University
- Best Inter-Disciplinary Project: Dr. Brian Wolshon, PhD candidate Mohammad Shapouri, and graduate research assistant James D. Fuller: "[Disruptive Events in Megaregion Emergency Evacuation](#)" of Louisiana State University

- Best Tech Transfer Project: Dr. Carol Lewis, Dr. Gwen Goodwin & Lydia Ndagire: [“Workshop: Stakeholder Response Reviewing Equity Rubric Showing Purpose and Need For Rural and Low-density Communities Near Megaregions”](#) of TSU
- Best Teaching Project: Dr. Ming Zhang and graduate research assistant PhD candidate Yang Li: [“Vehicle Usage Across Generations at Megaregion Level”](#) of the University of Texas at Austin.

Finally, Day Three of the 2021 Summer Forum event was a business meeting with members of the CM² Executive Committee and invited members of the Advisory Committee. Advisory Committee members in attendance included Allan Rutter from the Texas A&M Transportation Institute (TTI), and Michael Morris from the North Central Texas Council of Governments (NCTCOG).

iv. Administrative Accomplishments

Data analytics have shown steady activity in the [CM² website](#) over the past six months. Audience page views showed 2,292 total users with 2,257 new users visiting the website, and 4,870 page-views. Approximately half of the CM² website audience are users from the United States (49.41%), with the second largest user audience coming from China (17.01%). The remaining country demographics include audience users from Canada, Australia, and Peru.

We have utilized our [Twitter account](#) to increase social media engagement with CM² audience throughout the current reporting period. The account earned over 20,122 new impressions since the previous reporting period, which is defined as the number of times users saw our tweets on Twitter. Our account has a total of 207 followers and has received 6,891 profile visits during this most recent reporting period. We will continue to utilize and expand upon this platform.

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 recent developments in research, mention professional accomplishments, and list awards. At submission of this report, the LinkedIn Group has 103 members, and the company page has 182 members, which is a 19% increase in membership from the last reporting period.

Additionally, the CM² administration team published the Spring and Summer 2021 newsletters during this reporting period. Our current newsletter email list has 205 subscribers, which is a 15% increase in subscriptions from the last reporting period. The CM² administration and research team will continue to focus on growing our social media base by regularly posting current and interesting content that crosses disciplines and reflects the mission of CM².

C. Dissemination of Results

The results of work completed to date includes six (6) final project reports disseminated on the CM² website. During this reporting period, CM² researchers gave nine (9) presentations at conferences and lectures. Twenty (20) refereed journal papers have been published and six (6) are under consideration. According to Google Scholar, peer-reviewed articles from our

researchers have been cited approximately 1215 times in the reporting period. All items are explored in greater detail under Section 3.

D. Plans for Next Reporting Period

During the next reporting period the CM² consortium expects to see seven (7) completed projects with final reports. Consortium researchers will continue to share the findings of their research through conference presentations, workshops, and journal publications. Additionally, researchers already have plans to attend several virtual conferences including ACSP, WSTLUR, TRB, WRSA, and others during the next reporting period. Drs. Gian-Claudia Sciara and Megan Ryerson, along with PhD candidate Mashrur Rahman, have already been confirmed to present their work *Airport Competition and Megaregional Impacts: Challenges and Opportunities* for Planning Institutions for the Association of Collegiate Schools of Planning (ACSP) annual conference in October 2021.

Four (4) manuscripts are currently under revision and/or being developed during the next reporting period. Dr. John Landis's book *Megaprojects for Megacities* will be published by Edward Elgar next year (2022). Lisa Loftus-Otway will be submitting the draft of her co-authored book with Dr. Catherine Ross of Georgia Institute of Technology (Georgia Tech) tentatively entitled, *Megaregion Law and Policy* to Edward Elgar with an anticipated publishing date of March 2022. Dr. Qisheng Pan and Dr. Bumseok Chun will be developing a book proposal and a Special Issue Journal article titled *Megaregion Truck Flow Estimation and Planning*.

The CM² partners at the University of Texas at Austin will also hold its annual 2021 Fall Exhibition during the next reporting period. The exhibition represents a unique opportunity for researchers to come together, reflect on the research that has been done, and share findings with interested faculty, local professionals, and students in order to plan for future iterations of megaregional research.



Announcement Flyer for the 2021 Fall Exhibition Event scheduled for November 2021

We are excited to see how our researchers will find creative ways to adapt and stay connected to their research with these new circumstances that have been developed in response to the ongoing COVID-19 pandemic.

2. 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. Additionally, Table 2 presents a list of current CM² partners.

Table 2: Current CM² Partners

Organization Name	Location	Contribution
Texas Department of Transportation (TXDOT)	Austin, TX	Data, In-kind Support
City of Arlington	Arlington, Texas	Data Support
City of Austin (Austin Transportation Department)	Austin, TX	Data Support, Research
City of Houston (City Planning Department)	Houston, TX	Data Support
City of Dallas	Dallas, TX	Data Support
City of Austin Senior Centers	Austin, TX	Facilities, In-kind Support
Austin Asian- American Resource Center	Austin, TX	Facilities, In-kind Support
San Antonio Senior Sections	San Antonio, TX	Facilities, In-kind Support
City of Georgetown	Georgetown, TX	Data, In-kind Support
Houston Metro	Houston, TX	Data Support
City of Philadelphia: Office of Transportation, Infrastructure, and Sustainability	Philadelphia, PA	Data Support
Southern Pennsylvania Transportation Authority (SEPTA)	Philadelphia, PA	Data Support, Teaching support
Delaware Valley Regional Planning Commission	Philadelphia, PA	Data, In-kind 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, In-kind Support
Capital Area Metropolitan Planning Organization (CAMPO)	Austin, TX	Data Support
Capital Metro- Austin Public Transit	Austin, TX	Data Support, Research
Houston APA Chapter	Houston, TX	Data, In-kind Support
Texas APA Chapter	TX	Student, In-kind Support
University of Southern California	Los Angeles, CA	Research
Florida Department of Transportation	Tallahassee, FL	Data support
Center for Transportation; Smart City Lab, University of Texas at Austin	Austin, TX	Research
Stephenson Disaster Management Institute at Louisiana Emerging Technology Center	Baton Rouge, LA	Facilities, Technical Contributions
Clemson University	Clemson, SC	Research
Embry-Riddle Aeronautical University	Randolph AFB, TX	Research, Technical Contributions
WTS (HoT Chapters, South West Region)	TX, OK, NM, AL, AK	In-Kind Support
Girlstart	TX	In-Kind Support
Georgia Institute of Technology	Atlanta, GA	Research
Jewish Community Center	Austin, TX	Facilities, In-kind Support
Tokyo Government	Tokyo, Japan	Student Support, Research
Tokyo Olympic Game Committee	Tokyo, Japan	Student Support, Research

Tokyo Metropolitan University	Tokyo, Japan	Student Support, Research
City of Austin Traffic Management Center	Austin, TX	Student Support
Austin Bergstrom International Airport	Austin, TX	Student support
Central Texas Regional Mobility Authority	Austin, TX	Student Support
Amazon SAT-2 Distribution Center	San Marcos, TX	Student Support
University of Texas at Arlington	Arlington, TX	Research
Johns Hopkins University	Baltimore, MD	Research

B. Other Collaborators or Contacts

The CM² research team has consistently promoted multi-jurisdictional collaboration between consortium members by setting aside funds specifically for multi-institutional proposals. There are currently two (2) multi-institutional research projects currently in progress.

3. OUTPUTS

Table 3 summarizes output performance metrics for the reporting period, as identified in the CM² Technology Transfer Plan. Subsections A-G provide a specific list of outputs.

Table 3: Output Performance Metrics

Performance Metrics: Output	Annual Target	Actual for 10/1/20-3/31/21	Actual for 4/1/21-9/30/21	Actual Annual Total
1. Publications, conference papers, presentations, or final project reports	10	41 (20 journal publications, 4 final reports, 17 presentations)	35 (20 journal publications, 6 final reports, 9 presentations)	76
<i>1.1 Publications: diversity of fields/journals submitted to (e.g. engineering, modelling, law, policy, geography, economics, infrastructure, etc.)</i>	3	4 (Transportation, Planning, Land-Use, Travel Behavior)	5 (Transportation, Engineering, geo-information, Planning, Environmental, Health)	9
<i>1.2 Conferences: by entity (e.g. TRB, APA, ASCE, WTS, SXSU, etc.)</i>	2	6 (ACSP, CSET, IACP, PacTrans, TRB, YPT)	3 (IACP, Texas Pedestrian Safety Conference, S.Arch,	9
2. Workshops, seminars in collaboration with or participation of MPOs and transportation agencies	2	1	1	2
<i>2.1 Type of activity</i>	2	1	1	2
<i>2.2 Type of professional organizations involved</i>	2	2	1	3

2.3 Event scales/number of attendees (small (up to 10), medium (11-29), large (30 and up))	2	2	1	3
3. Web Presence	n/a	n/a	n/a	n/a
3.1 Website visits/page views	3,000	5,348	4,870	10,218
3.2 Number of impressions on Twitter	30,000	22,289	20,122	42,411
3.3 Number of additional members in LinkedIn Group	20	1	3	4

A. Publications

i. Journal Publications

- Bai, S., Jiao, J., Chen, Y., Guo, J., (2021). The Relationship Between E-scooter Travels and Daily Leisure Activities in Austin, Texas. Transportation Research Part D.
- Bai, S., & Jiao, J. (2021). Mining Heterogeneous Impact of Destination Attributes in Travel Demand Forecast for Different Urban Districts: A Deep Learning Approach. Transportation Research Record: Journal of Transportation Research Board.
- Chun, B., Hur, M., and Won, J. (2021). Impacts of Thermal Environments on Health Risk: A Case Study of Harris County, Texas. Vol 18, 5531.
- Jiao, J., Bai, S, Choi, S. (2021). Understanding E-scooter Incidents Patterns in Street Network 2 Perspective: A Case Study of Travis County, Texas. Sustainability.
- Jiao, J., Bhat, M., Azimian, A., (2021). The Impact of COVID-19 on Home Value in Major Texas Cities. International Journal of Housing Markets and Analysis.
- Jiao, J., Hansen, K., Azimian, A., (2021). Land Value Impacts of Airbnb Listings on Single-Family Homes in Austin, Texas, USA. International Journal of Housing Markets and Analysis.
- Jiao, J., Azimian, A., (2021). Measuring Accessibility to Grocery Stores Using Radiation Model and Survival Analysis. Journal of Transport Geography.
- Jiao, J., Azimian, A., (2021). Who Are Teleworking During the COVID-19 Pandemic. Transport Findings.
- Jiao, J., Conrad, J., Azimian, A., (2021). Measuring Social Vulnerability in Transit Deserts of United States Metro Areas. International Journal of Geospatial and Environmental Research, 8(1).
- Jiao, J., Azimian, A., (2021). Exploring the Factors Affecting Travel Behaviors During the Second Phase of the COVID-19 Pandemic in the United States. Transportation Letters: the International Journal of Transportation Research.

- Jiao, J., Bhat, M., Azimian, A., (2021). Measuring Travel Behavior in Houston, Texas with Mobility Data During the 2020 COVID-19 Outbreak. *Transportation Letters: the International Journal of Transportation Research*.
- Jin, Zhonghua and Q. Pan (2021) “Impacts of Air Pollution on Housing Prices and Related Policy Discussions: A Case Study of Houston, Texas” *Journal of Human Settlements in West China*, 36(4): 1-8. (Chinese)
- Lee, H, Jiao, J., Choi, S., (2021). Identifying Spatiotemporal Transit Deserts in Seoul, South Korea. *Journal of Transport Geography*.
- Liu, Z., Zhang, M. (corresponding author), and Liu, L. 2021. Benchmark of the Trends of Spatial Inequality in World Megaregions. *Sustainability*. 13, 6456. <https://doi.org/10.3390/su13086456>
- Liu, L. and Zhang, M. (corresponding author) 2021. The Impacts of High-Speed Rail on Regional Accessibility and Spatial Development Updated Evidence from China’s Mid-Yangtze River City-Cluster Region. *Sustainability*. 13, 4277. <https://doi.org/10.3390/su13084227>.
- Pan, Q., Z. Jin, and X. Liu (2021) “Measuring the effects of job competition and matching on employment accessibility” *Transportation Research Part D*, forthcoming.
- Pan, Q., Hongzhan Jiao, Xuejun Liu, Zhenhua Zheng, and Shuang Zhao (2021) “The Feature Extraction for Attractiveness and the Optimization of Planning in a Suburban District: A Case Study of the Dongxihu District in Wuhan” *Shanghai Urban Planning Review*, Vol. 3, pp. 65-73. (Chinese)
- Pan Q., Jin Z., Tao T. (2021) Improving Public Transportation Safety in COVID-19 Era Through Crowdsourcing Technique. In: Shaw SL., Sui D. (eds) *Mapping COVID-19 in Space and Time. Human Dynamics in Smart Cities*. Springer, Cham. https://doi.org/10.1007/978-3-030-72808-3_17.
- Parr, S., L. Acevedo, P. Murray-Tuite, and B. Wolshon, Methodology to Quantify Statewide Evacuations, accepted and in press in *Transportation Research Record: Journal of the Transportation Research Board*
- Parr, S., B. Wolshon, P. Murray-Tuite, and T. Lomax, Multi-State Assessment of Roadway Travel, Social Separation, and COVID-19 Cases, *Journal of Transportation Engineering*, Part A: Systems, Vol. 147, No. 5, May 2021.
- Rahman, M. & Sciara, G.C. “Travel Attitudes, The Built Environment and Travel Behavior Relationships: Causal Insights from Social Psychology Theories”. *Transportation Policy* [Submission Oct. 2020; Revision requested Mar. 2021; Resubmitting Sept. 2021]
- Sciara, G.C., Rahman, M., & Walthall, R. (2021). A Seat at the Table? Transit Representation in U.S. Metropolitan Planning. *Transport Policy*, 2021(114): 165-173. <https://doi.org/10.1016/j.tranpol.2021.09.011>

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

In April 2021, Dr. Junfeng Jiao was interviewed by Chicago NPR (WBEZ) on the topic of transit deserts for a featured interview entitled “Closing the Gap on Transportation: Solving ‘Transit Deserts’”. The audio recording and transcript can be found here:

<https://www.wbez.org/stories/closing-the-gap-on-transportation-solving-transit-deserts/70a805d1-d514-4be6-94a3-7ffc493070f2>.

Additionally, Dr. Junfeng Jiao and PhD Greg Griffin co-authored the published article, “Chicago, New York discounted most public input in expanding bike systems,” for The Conversation online (<https://theconversation.com/chicago-new-york-discounted-most-public-input-in-expanding-bike-systems-107426>). Finally, Dr. Junfeng Jiao’s first book, *Shared Mobility* was published by Elsevier in July 2021.

Dr. Brian Wolshon was interviewed and quoted as expert in evacuation in the article “Is Ida A Taste of Future? Rapidly intensifying hurricanes will play havoc with evacuation plans,” The Times-Picayune, New Orleans, LA on September 2, 2021, which is available online at:

https://www.nola.com/news/hurricane/article_cbddfaf2-0b74-11ec-90b1-ff976f9c5629.html.

Dr. Wolshon was also interviewed and quoted as expert in evacuation in “How New Orleans handled Hurricane Ida after post-Katrina changes,” for ABC News, New York, NY, September 2, 2021. Available online at: <https://abcnews.go.com/US/orleans-handled-hurricane-ida-post-katrina/story?id=79743061>.

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

The Planning Forum is an annual publication produced by graduate and doctoral students in the Department of Community and Regional Planning at The University of Texas at Austin. The journal publishes peer-reviewed scholarly articles as well as critical explorations in less-conventional formats. Planning Forum serves as a platform for emerging voices and new perspectives on the most pressing issues in the field. Dr. Sandi Rosenbloom acted as one of the faculty advisors to the student-led editorial board, of which several UT Austin graduate research students/PhD candidates participated on, including Mashrur Rahman, Yang Li, Jiani Guo, and Yefu Chen.

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 very active social media presence on our Twitter account (<https://twitter.com/CM2 UTC>), both the LinkedIn group (<https://www.linkedin.com/groups/12134034/>) LinkedIn company page (<https://www.linkedin.com/company/cooperative-mobility-for-competitive-megaregions-cm2/>) for CM² researchers and interested transportation stakeholders, as well as a company Facebook page (<https://www.facebook.com/CM2page/>).

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.

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>), eNews (<https://mailchi.mp/utexas/february-2018-eneews-1975165?e=48aa70e157>), YouTube channel (https://www.youtube.com/channel/UCJS9a_AUbsZfhRYBXojeu-Q), and the Texas Architecture Facebook page (<https://www.facebook.com/UTSOA/>).

B. Methodologies, Technologies or Techniques

Dr. Bumseok Chun's recently published work, "Impacts of Thermal Environments on Health Risk: A Case Study of Harris County, Texas" applied the use of machine learning algorithms to estimate air pollution levels along major traffic corridors. In the co-authored research on GIS-based Megaregion Transportation Planning Model, Drs. Pan and Chun will be applying modeling algorithms to include the impacts of autonomous vehicles (AV).

C. Inventions, patent applications, and/or licenses

Nothing to report.

D. Outreach activities

CM² hosted a guest lecture series in conjunction with Dr. Ming Zhang's Spring 2021 Planning for Megaregions academic course. In the previous reporting period we discussed the first hosted guest lecturer, Dr. Zhenhua Chen of Ohio State University, who presented his work "Regional Impact of the High-Speed Rail System: Lessons for the U.S." This guest lecture series continued through April 2021 and featured the following guest lecturers:

- Dr. Ethan Seltzer, Professor Emeritus in the Toulan School of Urban Studies and Planning at Portland State University (PSU) discussed the topic of the "Cascadia Ecopolis"
- Johnathan Barnett, Professor Emeritus of Practice in the City and Regional Planning program of University of Pennsylvania presented his work, "Housing Opportunity and Development in Megaregions,"
- Dr. Gian-Claudia Sciara (UT Austin) presented, "Megaregions for inter-metropolitan transportation planning"

E. Courses and Workshops

The limitations imposed by the COVID-19 pandemic has had a marked impact on the outreach and engagement activities CM² researchers were able to accomplish during this reporting period. Many workshops and courses planned to take place during the Spring/Summer 2021 academic semester were postponed or even canceled by institutions during this reporting period due to restrictions for in-person contact. Some institutions had "hybrid" or "dual-modality" courses that allowed for students to attend classes either in-person or online.

Several UT Austin CM² researchers taught research courses focused on megaregions and transportation:

- Dr. Sandra Rosenbloom taught the graduate level course *Women’s Transportation Issues* (CRP 383 – 01590), which focused both on identifying comparative patterns of travel over the life course, as well as addressing the causes, and where possible, the solutions to unfair disparities between women and men’s travel patterns, needs, and preferences.
- Dr. Ming Zhang taught two graduate level courses during the Spring 2021 semester, *Metropolitan Transportation Studies: Applications with TransCAD GIS* (01335), and the *Planning for Megaregions* (CRP 384 - 01600) seminar course focused on U.S. megaregions.
- Dr. Gian-Claudi Sciara taught the hybrid/dual-modality course *Land Use and Transportation Plan* (CRP 384 – 01605) which examined the relationship about transportation-land use in the development of urban regions.

F. Other products

During the Spring and Fall 2020 academic terms researchers at UT Austin gather for monthly Brown Bag Lunch Discussions to present their current projects and discuss their findings with fellow researchers and students. During these events, students and faculty researchers have an opportunity to share their progress on current CM² research and receive feedback on research methods and design. All materials and video recordings are available on the [Texas Architecture YouTube channel](#) and [the Brown Bag Lunch Discussion Page of our website](#).



A still image of the CM2 September Brown Bag 2021 event featuring guest speakers Danelle Briscoe and Junfeng Jiao

During the current reporting period, CM2 hosted our Brown Bag Lunch Discussion events virtually via Zoom. In April 2021, CM2 hosted two of our graduate research students to share their current research activities. James David Fuller is a Master’s student under the direction of Dr. Brian Wolshon at LSU who presented the research project, *Disruptive Events in Megaregion Emergency Evacuations*, which assessed the effect of various disruptive events on megaregion emergency evacuations through traffic simulation and performance indices to

gauge link criticality while reducing prohibitive computation times. Ziqi Liu is earning both a Master’s degree in Statistics and a PhD in Community and Regional Planning at UT Austin, and shared her research conducted under Dr. Ming Zhang entitled *Spatial and Sectoral Economic Impacts of HSR Construction with Private Investments*, which focused on the study of the Dallas-Houston high-speed rail (HSR) line by applying multi-regional input-output (MRIO) modeling estimates to measure the distributions of impacts from the HSR line. For the first Brown Bag Lunch Discussion hosted for the Fall semester in September 2021, we hosted Associate Professors

Danelle Briscoe and Dr. Junfeng Jiao of UT Austin to discuss recently completed works. Professor Briscoe was the overseeing curator of the architectural exhibition *OTHER NATURE* which explored the ideas of integrating natural systems into the built environment, which was on display from May through September 2021 on the UT Austin campus. Dr. Junfeng Jiao discussed the details of his recently published book *Shared Mobility*, which highlights his research on urban informatics, smart city, and shared mobility focused on the city of Austin, Texas.

OUTCOMES

Table 4 summarizes output performance metrics for the reporting period, as identified in the CM² Technology Transfer Plan.

Table 4: Outcome Performance Metrics

Performance Metrics: Outcome	Annual Target	Actual for 10/1/20-3/31/21	Actual for 4/1/21-9/30/21	Actual Annual Total
1. Enlarged pool of trained transportation professionals	n/a	n/a	n/a	n/a
1.1 Number of students hired by CM², broken down by degree types and levels, diversity metrics, and other social-economic measures	25	9	18	27
Degree type (Undergrad, Master, PhD)	n/a	67% undergraduate, 22% master, 11% PhD	0% undergraduate, 69% master, 31% PhD	n/a
Gender (male, female)	n/a	67% male, 33% female	54% male, 46% female	n/a
Race (Asian, Black, White, other)	n/a	33% Asian, 56% White, 0% Black, 11% Other	54% Asian, 46% White, 0% Black, 0% Other	n/a
First generation student (undergrad. or grad.)	n/a	0	0	0
1.2 Number of papers developed by students for publication	2	5	1	6
1.3 Number of graduates in transportation jobs	15*** for overall grant period	1	1	2
2. Increased cooperation by local governments and transportation agencies regarding regional and inter-regional issues	n/a	n/a	n/a	n/a

2.1 Number of regional or inter-regional planning activities detailed in long, medium, and short-range transportation plans	1	1	1	2
2.2 Development and utilization of consistent and usable planning datasets	1	2	1	3
2.3 Creation of megaregional forums, committees, and communications by megaregional transportation planning entities	1	3	0	3

Despite the pressure the COVID-19 pandemic has put on the transportation industry, we are proud to have a total of two (2) students enter the workforce in the past twelve months and start their careers in the field of transportation. This makes the overall total of 72 graduates in transportation jobs, which exceeds our goal of having 15 students graduate and enter transportation-related jobs during the overall grant period. Moreover, 1 student researcher had a paper developed for publication during the reporting period, making the annual amount of published student papers six (6), which exceeds our annual target of two (2) for the FY20-21 period. The journal article “Benchmark of the Trends of Spatial Inequality in World Megaregions” authored by Dr. Ming Zhang and PhD candidate Ziqi Liu was published in the Sustainability Open Access Journal in June 2021.

In addition to our students’ achievements, CM² faculty researchers across all of our institutions have increased their collaboration efforts with local governments and transportation agencies regarding regional and inter-regional issues. Lisa Loftus-Otway is a member of the Border Trade Advisory Committee (BTAC) of the Texas Department of Transportation (TxDOT), which recently published the [Texas-Mexico Border Transportation Master Plan 2021 report](#) in March 2021. This is a long-range plan for the entirety of the Texas-Mexico border.

4. IMPACTS

Table 5 below summarizes the impact performance metrics for the reporting period, as identified in the CM² Technology Transfer Plan.

Table 5: Impact Performance Metrics

Performance Metrics: Impact	Annual Target	Actual for 10/1/20-3/31/21	Actual for 4/1/21-9/30/21	Actual Annual Total
1. Enhanced knowledge base	n/a	n/a	n/a	n/a
<i>1.1 Development of books/handbooks</i>	3*** for overall	4	1	5

	grant period			
<i>1.2 Journal publications in academic or professional journals</i>	5	20	20	40
<i>1.3 Special issues of academic or professional journals</i>	1	2	1	3
2. Increased societal awareness beyond transportation sector of megaregional passenger and freight transportation challenges facing megaregion constituents today and in the future	n/a	n/a		n/a
<i>2.1 Number and extensiveness of social media coverage of CM² research, education, and outreach activities</i>	1	5	5	10
3. Informed decision making on public policy and transportation infrastructure investments	n/a	n/a	n/a	n/a
<i>3.1 Number of contracted plans and projects conducted for and adapted by local and regional agencies in megaregions</i>	1	1	0	1

A. Impact on the effectiveness of the transportation system

Nothing to report.

B. Impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company

Nothing to report.

C. Impact on the body of scientific knowledge

The research projects and findings from the consortium are shared at academic forums, conferences, and in journal publications, as well as through social media. This has contributed to the overall awareness of the importance of megaregional study. Our principal investigators will continue producing research that shows the importance of planning from the megaregional scale to help create stronger transportation systems across the country.

D. Impact on transportation workforce development

CM² partner universities are preparing students to enter both the public and private sectors with expertise in planning, design, project delivery, and financing strategies. Our classes engage students with experts who work on the implementation of the transportation and infrastructure projects they study. Several CM² graduates have already started working in transportation-related positions across the country. They will be able to bring their knowledge from CM² and implement it in their work. Additionally, the educational camps and outreach activities we have conducted, and continue to plan for the next reporting period, are introducing the next generation to the transportation field.

6. CHANGES/PROBLEMS

As mentioned throughout this report, the impact of the COVID-19 pandemic affected university operations for all Consortium institutions, interrupted national and international travel for our researchers, and reduced the number of in-person outreach activities such as conferences, workshops, and symposiums. While the impact of COVID-19 did slow down certain activities during this reporting period, all Consortium member institutions were able to adapt to changes, and pivot to virtual platforms such as YouTube and Zoom to reschedule the activities that were canceled or disrupted due to uncertainties around in-person events. As the COVID-19 pandemic continues, the way we conduct outreach and research dissemination will continue to evolve, and we anticipate the continued utilization for virtual communication platforms such as Zoom, YouTube, and more.

7. SPECIAL REPORTING REQUIREMENTS

In an email message to UTC administrative leaders, Amy Stearns requested feedback on how the extension of the grant period and additional year of funding into 2023 will impact UTCs. The CM² consortium is excited to use this opportunity to conduct five (5) additional research projects and extend one (1) research project into a two-year project for the final year of the grant period:

- *Potential Description of Services: Using the Composite Vulnerability Index to Identify Needed Transportation Connections* by TSU researchers Dr. Carol Lewis and Dr. Gwendolyn Goodwin
- *Pedestrians' and Cyclists' Perceptions of and Behavioral Responses to Driverless Cars* by UPenn researchers Dr. Erick Guerra and PhD candidate Xiaoxia Dong
- *Assessment of Driver Route Decision-Making During a Range of Incident-Induced Traffic Flow Disruptions* by LSU researcher Dr. Brian Wolshon
- *The Extensions and Application of Megaregional Transportation Planning Model* by TSU researcher Dr. Bumseok Chun and Co-PI Dr. Qisheng Pan from UT Arlington
- *Spatial Travel Mode Choice Model for Megaregions in an Autonomous Driving World* by UT Austin researchers Dr. Ming Zhang and Co-PI Dr. Chandra Bhat
- *Advancing Equity and Justice in Megaregions: A case law analysis on the challenges in developing disproportionality metrics for successful suits* (multi-year research) by UT Austin researchers Lisa Loftus-Otway and Co-PI Dr. Alex Karner.

Additionally, the grant period extension allows CM² to catch up on project deliverables that were delayed due to the ongoing COVID-19 pandemic and personnel changes such as the departure of Dr. Qisheng Pan as the lead PI to TSU in 2020.

Finally, in looking back through the life of the grant period to date, the CM² consortium has established a lasting academic relationship between the partner organizations, and the consortium is eager to continue collaborating on research related to megaregional transportation as we look to future grant opportunities with the UTC Program.