USDOT Tier-1 University Transportation Center

CM2

Cooperative Mobility for Competitive Megaregions

RESEARCH PROJECT
EXECUTIVE SUMMARIES

http://sites.utexas.edu/cm2/ | (512) 471-1291 | iach@austin.utexas.edu | @CM2_UTC

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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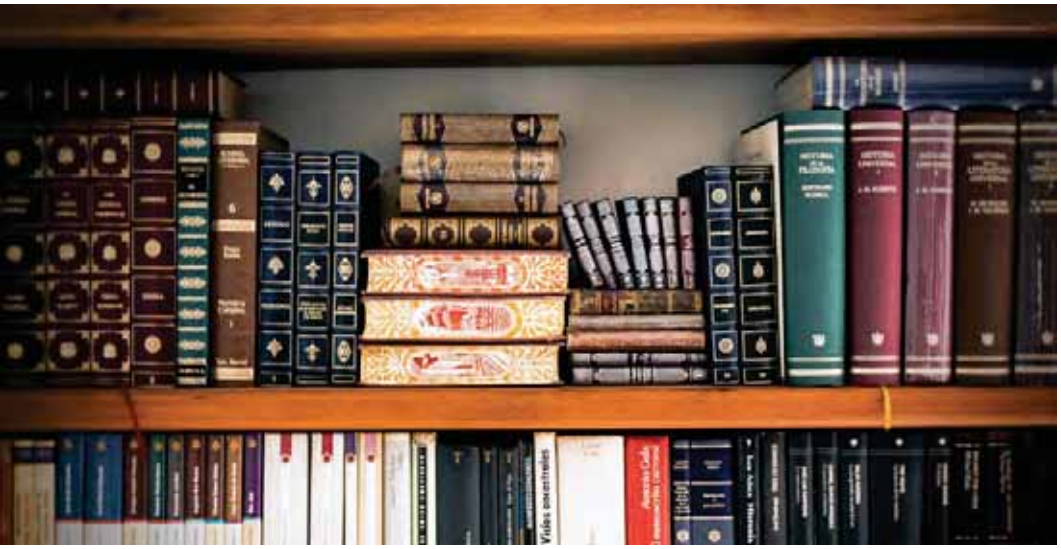

CHANGES TO FEDERAL / STATE LAW & MEGAREGION PLANNING

Assessing Changes to Federal and State Law for Megaregion Planning (#CM2-1)

Lisa Loftus-Otway,
University of Texas at Austin

06/01/2017 - 03/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1Lisa-Loftus-Otway-Assessing-Changes-to-Federal-and-State-Law.pdf

Final Project Report:
http://sites.utexas.edu/cm2/files/2018/03/Year1-HunnLoftus-Assessing-ChangesPart12.pdf

TEXAS
The University of Texas at Austin

Federal and state transportation laws form the foundation of domestic transportation policies. However, as currently drafted federal laws are not sufficiently developed to support a megaregion transportation regime and will require a formalized approach to be created so that MPOs and DOTs can scale efforts beyond traditional boundaries. This project forms part of a series of analysis of how megaregional planning can be achieved. It analyzed the United States Constitutional powers of spending, regulating commerce and preemption and provided recommendations for how federal law could be used to conduct megaregional planning at a federal level with recommendations for developing transportation policy.

This project provides a groundwork compendium focuses on federal constitutional powers and how they can provide a rationale for federal megaregion planning. The current federal transportation structure represents the individual interests of states, cities, and counties. However, it currently lacks the ability to address the nation's increasingly interconnected megaregions. To better address megaregions planning, the government must define the boundaries of existing megaregions, craft guidelines for how to connect them, and provide funding streams for megaregion planning and improvements.

Going forward, the Spending Power will continue to be the strongest tool the federal government can use to affirmatively shape American transportation planning and investment. Within the scope of its enumerated powers, the federal government can create the framework for 21st century megaregion development to occur at all levels of American governmentoccur at all levels of American government.

Project Report Completed in March 2018.

Preemption can be a powerful tool for allowing federal oversight of megaregions to prevail over insular local interests, supporting focused top-down planning.
Preemption, based on the supremacy clause of the U.S. Constitution, allows federal law to displace state law in any field in which it can constitutionally operate.

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

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CROWDSOURCING SUPPORT FOR CO-PRODUCTIVE PLANNING

Can Crowdsourcing Support Co-productive Transportation Planning in Megaregion? Evidence from Local Practice (#CM2-2)

Dr. Junfeng Jiao,
University of Texas at Austin

09/01/2017 - 05/31/2018

Project Information Form:
hhttp://sites.utexas.edu/cm2/files/2018/02/UTC-Project-Information_JJF.pdf

Final Project Report:
http://sites.utexas.edu/cm2/files/2018/06/Year-1-JiaoGriffin_MegaRegionCrowdsourcing.pdf

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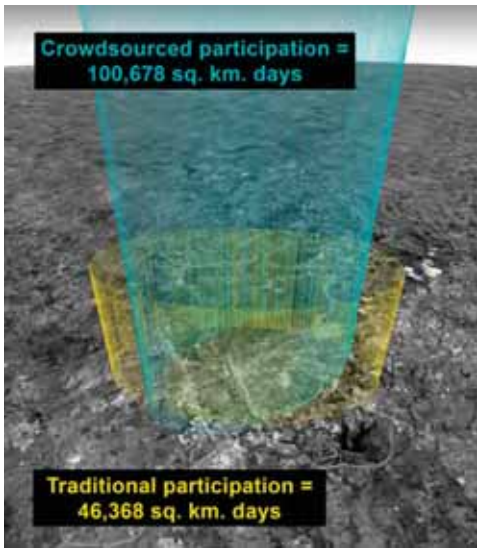
The University of Texas at Austin

Public participation is a well-acknowledged requirement of transportation planning in most democratic societies, and is generally required at all levels: local, regional, state, and national (McAndrews and Marcus 2015). No evidence suggests that megaregional planning should be different—in fact, we can expect citizens to demand involvement in any public planning process that involves significant resources or impacts (Alexander 2001). Megaregions, could be a particularly challenging context for participatory planning.

Generally, crowdsourcing is on online, participatory approach that distributes a problem to communities for bottom-up input. Megaregional scale presents three challenges for planners: larger areas are more likely to have information gaps across the geography; information is more likely to be formatted and quality-controlled differently in different jurisdictions, and traditional face-to-face meetings are difficult to apply evenly across such a large area. This study evaluates crowdsourcing as one potential perspective to support transportation planning at widely varying scales

To evaluate crowdsourcing as a method for public participation in transportation planning to scale from local and regional to megaregional contexts, researchers explored case studies of bike-sharing planning in NYC, Chicago, Austin, San Antonio and Houston. Crowdsourcing methods may be useful for gathering structured public input over large areas, which are likely to be particularly helpful for megaregion-scale planning. These examples of planning from local and regional transportation planning suggest potential along these lines, but more research is needed to evaluate real impacts over the medium and long term.

Project Report Completed in June 2018.



Crowdsourced participation vs traditional

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MPOs MEGAREGIONAL PLANNING IN THE TEXAS TRIANGLE & BEYOND

In the Texas Triangle, MPOs are actively exploring integrated transportation-land use strategies to tackle the problems associated with conventional car-oriented sprawl. Unfortunately, transit-oriented developments (TODs) have only been practiced locally by a limited number of communities and transit agencies, and where it is practiced there is often little development, regardless of TOD-friendly regulations. This study aims to take a regional approach to assess opportunities and challenges facing large and small communities in the Texas Triangle in developing TOD.

An integral component to understanding the state of TOD in the Texas Triangle was understanding the types of TOD being developed and planned. A survey was disseminated throughout the Texas Triangle in the fall of 2017 and spring of 2018. Following the surveys, interviews were conducted around the Austin metropolitan region to ground survey results and allow for an examination of Austin's TOD progress at a site-specific level.

Most Texas Triangle planning agencies agree that TOD would benefit their communities, but less that ¼ report having even adopted a definition for TOD. As a result, most of the region's 181 TOD-ready sites remain underdeveloped. Most pressingly, agencies need direction on new and useful Texas value capture mechanisms which could fund needed capital projects for station areas and for transit lines. Additionally, planning agencies need access to best practices for TOD-specific land development codes. With an increase in quality partnerships and improvements in demonstrated public investment and TOD-specific development codes, the case of TOD in the Texas Triangle is a case of tremendous yet-unrealized potential.

Project Report Completed in August 2018.

Regional Opportunities and Challenges for Transit Oriented Development: The Case of Texas Triangle (#CM2-3)

Dr. Ming Zhang,
University of Texas at Austin

10/01/2017 - 09/30/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Ming-Zhang-Regional-Opportunities.pdf

Final Project Report:
http://sites.utexas.edu/cm2/files/2018/08/Year-1-ZhangGoodrich_RegionalTOD.pdf

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The University of Texas at Austin

TOD Sites in the Texas Triangle

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

US DOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

LOCATION AFFORDABILITY & FAIR HOUSING

The average household in the US spends more on transportation than any budget item other than housing. How much its members spend depends on where they live. In 2014 HUD released the Location Affordability Index (LAI), a publicly-available online tool that allows users to compare the location affordability of neighborhoods throughout the nation. Calls are beginning to mount for the LAI or similar indices to be taken into account for decisions related to siting of subsidized low-income housing.

There is concern, however, that such efforts, though well-intentioned, could place affordable housing sponsors in legal jeopardy related to Fair Housing law. Is incorporating location affordability into the siting of new subsidized housing projects tantamount to steering such developments into predominantly African American and Latino neighborhoods? Further, does the answer vary across megaegions, perhaps conditioned by differing spatial patterns of racial and ethnic segregation, housing costs, and transportation infrastructure?

This project analyzed three megaregions: Northeast (Boston-Washington); the Texas Triangle (Dallas-Houston-San Antonio); and Cascadia (Seattle-Portland). The Northeast represents a series of high cost cities where market pressures and gentrification are pushing low-income households further from city centers. The Texas Triangle contains Dallas, home to a significant recent US Supreme Court Fair Housing decision. Finally, Cascadia is an area with declining poverty rates but increasing housing and transportation costs. The project finds that from a Fair Housing standpoint, transportation costs may not be an ideal factor to consider when siting affordable housing. At the very least, they should be used with caution to avoid inadvertently intensifying the segregated locational patterns that subsidized rental housing has long exhibited.

Location Affordability and Fair Housing on a Collision Course? (#CM2-4 & 5)

Dr. Vincent Reina
Dr. Erick Guerra
University of Pennsylvania
Dr. Jake Wegmann
University of Texas at Austin

09/01/2017 - 08/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Jake-Wegmann-Erick-Guerra-Vincent-Reina-Equitable-access.pdf

Final Report:
http://sites.utexas.edu/cm2/files/2019/01/Reina-et-al-Year-1-Final-Report-Accessible.pdf

Penn
University of Pennsylvania

TEXAS
The University of Texas at Austin

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

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MEGAREGION TRUCK FLOW ESTIMATION MODEL

Megaregion Truck Flow Estimation Model (#CM2-6)

Dr. Qisheng Pan,
Texas Southern University

05/01/2017 - 08/31/2018

Final Research Report:
http://sites.utexas.edu/cm2/files/2018/10/PanChun-Megaregion-TruckFlow-Estimation-Model-FinalReport_Accessible.pdf

TSU
TEXAS SOUTHERN UNIVERSITY

Freight transportation has played a critical role in the development of megaregion economies. Trucks are the dominant mode of freight transportation and also one of the major contributors to roadway congestion and emissions.

To facilitate efficient freight transport, improve the competence of megaregions, and ensure the general success of the megaregional economy, it is necessary to gain a better understanding of the spatial and temporal patterns of megaregion truck movement. However, this important issue has not been thoroughly examined due to the lack of sufficient data and appropriate methods. Most studies of megaregions are still limited to academic interest; applied research on megaregional freight movement is still at an early stage.

The objectives of this research is to develop an analytical model for estimating megaregion truck flows, which helps to evaluate and improve freight mobility in megaregions. It reviews existing studies on this issue, identifies available and ready-to-use freight datasets, and develops the state-of-practice methods for truck flow estimation.

Based on the available freight data, this research intends to develop a replicable method to explore the spatial and temporal patterns of commodities moved by truck in megaregions. It develops an analytical framework to load the commodities carried by truck onto a road network, which is a spatial integration of the Federal Highway Administration (FHWA)'s Freight Analysis Framework (FAF) and the megaregion freight transportation facilities. It also estimates the amount of off-peak (night time) truck traffic within the Texas Triangle. It selects Texas Triangle as an empirical case to demonstrate the implementation of the megaregion truck flow model.

Hourly Truck Volume in Houston

Hourly Truck Volume in Austin

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

NEED FOR INCREASED TRAVEL OPTIONS
VULNERABLE COMMUNITIES

Megaregional travel crosses boundaries of political jurisdictions and typical planning boundaries. Detailed work is often done on specific projects (like high speed rail) with little or no attention to the needs of vulnerable populations. State DOTs consider environmental justice in project planning, but in a localized manner, not focusing on interregional travel needs.

It is important as megaregion planning matures that access to opportunities promoting equity across rural communities improves. There should be better connections and access to employment, health care and other trip purposes from rural to urban communities within the megaregions, especially for high need populations.

The objective of this research is to formulate a rubric styled framework for planners to craft purpose and need statements that will support development of transportation projects for vulnerable populations in megaregions. The framework will be designed to assist decision making by providing an assessment tool to identify the location of vulnerable populations and determine the travel needs that can be met in the megaregion beyond traditional jurisdictional boundaries.

The study is designed to identify vulnerable populations in the Texas Triangle corridors coupled with an investigation of their mobility needs. The purpose is to link these communities with improved mobility to meet essential and desired lifestyle improvements.

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Creating a Framework to Determine Purpose and Need for Increased Travel Options in the Megaregion for Vulnerable Communities (#CM2-7)

Dr. Carol Lewis,
Texas Southern University

05/01/2017 - 08/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-Carol-Lewis-Creating-a-Framework-to-Determine-Purpose.pdf

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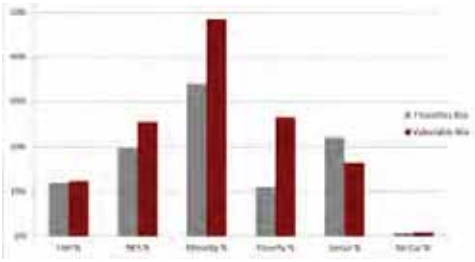
Variables	Definition
Minority Population	African Americans, American Indians, Asians, Native Hawaiians , and Hispanics or Latinos
Low-Income Population	Total income in the past 12 months below poverty level
Senior Population	Persons 65 years and older.
Zero Automobile Ownership	Households with zero automobiles available.
Female Headed Households	Households with more than one person, in which no male head of household is present
Language Proficiency	Households that speak English less than very well

Vulnerable Block Group Variables



Comparison: Counties to Vulnerable Block Groups

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POST-DISASTER RE-ENTRY in MEGAREGIONS ASSESSMENT

Assessment of Post-disaster Re-Entry in Megaregions: A Pilot Study (#CM2-8)

Dr. Brian Wolshon,
Louisiana State University

01/01/2018 - 12/31/2018

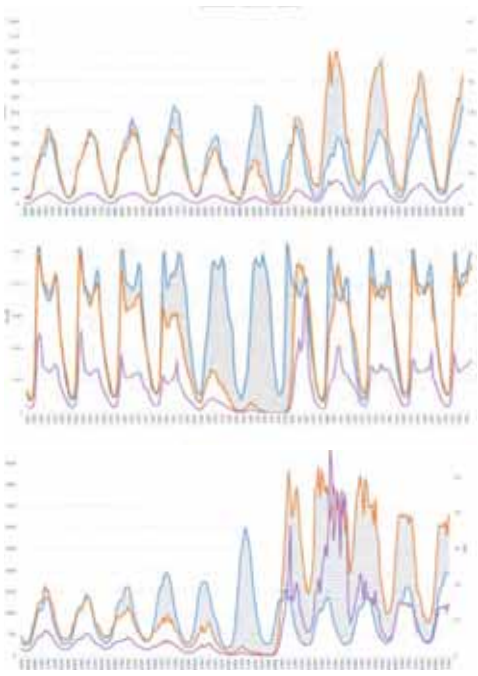
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Brian-Wolshon-Project-1-Assessment-of.pdf

Post-disaster reentry plans are essential to ensure the safety of returning evacuees and the effectiveness of recovery/restoration processes (Wolshon, 2009, Texas Division of Emergency Management, 2013). After an evacuation, potential hazardous conditions may pose a risk to evacuees returning to their homes, businesses, or properties. For example, downed electrical lines, gas line leaks, collapsed bridges, flooded roads, landslides, washed-out roads, etc. may create hazardous environments for returning evacuees (Wolshon, 2009). These conditions may also challenge the recovery/restoration processes as additional personnel, special machinery, etc. may be required.

Post-disaster reentry, in some cases, may be challenged with a large number of evacuees that may be returning from distant communities across multiple regions or states (Lin et al., 2013). As such, the transportation system could be significantly congested due to high demands in transportation network that may not be fully functional. Although post-disaster reentry could be more challenging and complex than evacuations (Lin et al., 2013), it was evidenced in the literature that re-entry research is limited and there is, in most cases, a lack of formal planning (Wolshon, 2009).

This project seeks to assess various post-disaster reentry scenarios that could be used to support transportation agencies as they assist emergency management and law enforcement agencies in post-disaster re-entry efforts. The scenarios to be assessed in this project could include various re-entry procedures, demand/response rates, network accessibility conditions, road blockages, etc. which could be used to support traffic management plans for reentry. This research will employ traffic simulation modeling techniques to assess various conditions associated with post-disaster re-entries in megaregions.

LSU
LOUISIANA STATE UNIVERSITY



Sample of Re-Entry Data from Hurracane Irma to derive re-entry curves

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SENIOR MOBILITY & ACCESSIBILITY THROUGH TECH INNOVATION

Using Technological Innovations Across the Megaregion to Enhance the Mobility and Access of Seniors (#CM2-9)

Dr. Sandra Rosenbloom, University of Texas at Austin

05/01/2017 - 12/31/2018

Project Information Form: http://sites.utexas.edu/cm2/files/2018/03/Year-1-Sandra-Rosenbloom-Using-Technological-Innovations-Across-the-Megaregion.pdf

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America is aging rapidly; by 2025 almost 80 million Americans will be over 65. Seniors will constitute more than 20% of the population, outnumbering children for the first time in history. Many will remain in the paid labor force long after the traditional age of retirement; 40% will likely work full time until the age of 75. Seniors will also account for almost one out of four drivers on US highways because most will live in inherently low density places with few alternatives to the car. Yet many seniors will want or need to curtail or cease driving with few practical alternatives, forcing many into driving when they should not or doing without crucial human, social, and medical services.

The rapid aging of a population living at low density who have built a life around the mobility offered by the private car is a policy and planning challenge which may be addressed by two additional societal trends: the growth of e-commerce and local delivery of a variety of goods and services, and, the rapid rise in the shared economy, particularly in the transportation sector. Do societal trends offer a way to address some of the needs of the silver tsunami, a wave of aging seniors living in suburbs and even rural areas who may face terrible problems meeting their needs when they need to reduce or cease driving? Will new technology and key aspects of the shared economy meet some senior mobility needs across a megaregion?

This is a qualitative research effort, assessing how much seniors from diverse backgrounds know about, use, or would consider using a range of technological innovations and various services offered by the private firms, and the extent to which they knew about such services, used them, or would consider using them in the future if they had mobility needs.

Do you now, or have you ever used...	Yes	% of respondents who answered yes (79 total)
Local home grocery delivery	4	5.1%
Local delivery of other products	2	2.5%
Meal kit services	2	2.5%
Local restaurant delivery services	2	2.5%
Local Transportation Network Services	3	3.8%
On-line purchase of groceries and supplies	6	7.6%
On-line purchase of clothing	4	5.1%
Local chore/task services	0	0.0%

Senior Mobility Survey Responses

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EXECUTIVE SUMMARY - *updated JANUARY 2019*

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Cooperative Mobility for Competitive Megaregions

INFRASTRUCTURE INVESTMENTS
A MEGAREGION PERSPECTIVE ON FREIGHT

Megaregions demonstrate strong economic linkages and support extensive internal freight movements amongst their constituent metropolitan areas. As megaregions continue to grow, the number of freight movements is likely to increase, and new infrastructure or policies will become necessary to accommodate that growth. Texas was the origin of nearly $1.9 trillion in freight shipments in 2012, more than any other state. Those shipments accounted for 244 billion ton-miles, and the vast majority of this freight originated in the Texas Triangle.

How can innovative freight strategies be incorporated at the megaregion level technically, economically, and politically? This research examines the applications of both underutilized and emerging freight technologies for the Texas Triangle.

Freight movements at the megaregion level broadly have a choice between two modes: highways or trucking. Because freight mode choice has large external costs, this research looks at the network effects of different strategies, and potential policy levers available at the megaregion level to effect socially desirable outcomes.

Strategies to be tested include truck-only lanes, freight rail electrification, and truck platooning, including autonomous truck platooning. Each of these strategies has the potential to bring about large changes in freight mode utilization, and efficiency. Consistent policies throughout a megaregion will be necessary for smooth policy implementation and maximum social benefits, but this will require coordination amongst the megaregion's municipal, regional, and state authorities.

The Effects of Transportation Infrastructure Investments on Freight Mobility: a Megaregion Perspective (#CM2-10)

Dr. C. Michael Walton,
University of Texas at Austin

09/01/2017 - 12/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-Michael-Walton-The-Effects-of-Transportation-Infrastructure-Investments.pdf

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Map and rendering of Truck-Only Lanes Simulation

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

BEYOND POLITICAL BOUNDARIES
MEGAREGION NETWORK MODELS

The scale of urban planning is now focusing on megaregions in addition to metropolitan areas and states. The traffic assignment problem (TAP), used to study traffic flow patterns on networks, is a crucial step in urban planning. Megaregional networks transcend planning agency jurisdictions, challenging current network models and computational resources. This study aims to solve TAP on a megaregional scale by applying an algorithm based on the decomposition approach for the static TAP (DSTAP) that uses network decompositions based on network geography.

In the first part of this research, we compare two partitioning algorithms for finding network partitions for megaregions by minimizing the number of subnetwork boundary nodes and the time required to solve DSTAP. The flow-based spectral partitioning generates flow balanced subnetworks which reduce the per iteration computation time and lead to faster convergence compared to the agglomerative partitioning algorithm. In the second part of this research, we propose a decomposition heuristic for large scale networks, allowing parallelization of TAP.

The heuristic reduces the computational time for DSTAP by simplifying interactions within the subnetwork. For the uncongested Texas network, the proposed heuristic led to marginal 5% savings in computational time than state-of-the-art TAP methods, while for the congested scenario, the heuristic observed about 70% savings in computation time for the same convergence level. However, the heuristic leads to a lower bound on the relative gap value at termination (called heuristic gap) which ranges between 9E-3 and 5E-4 for the experiments conducted on the Texas statewide network.

Project Report Completed in December 2018.

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

Beyond Political Boundaries: Constructing Network Models for Megaregion Planning (#CM2-11)

Dr. Stephen Boyles,
University of Texas at Austin

11/01/2017 - 10/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Stephen-Boyles-Beyond-Political-Boundaries.pdf

Final Project Report:
http://sites.utexas.edu/cm2/files/2019/01/Boyles-et-al-Year-2-CM2-Research-Report-Constructing-Network-Models.pdf

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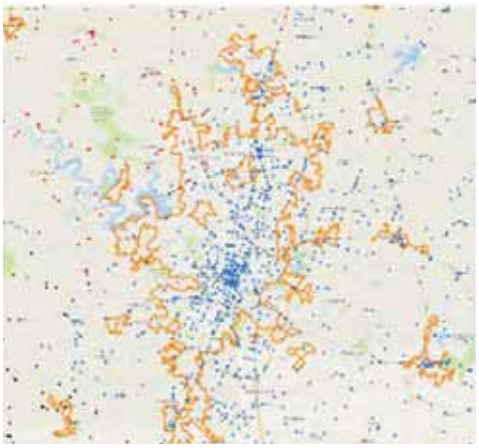

Five-partition case for SDDA, with a focus on the Austin area

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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CM² Cooperative Mobility for Competitive Megaregions

FUNDING MULTIMODAL TRANSPORTATION
PLANNING FOR MEGAREGIONS

Most models suggest that American megaregions occupy less than a quarter of its land area, but account for over two thirds of the population and seventy-five percent of the national gross domestic product. In addition, projections show that future population increases and economic growth will be focused within these regions. Current transportation policy remains focused on road building, which harkens back to a decentralized rural America and no longer reflects developing transportation realities. To account for increasingly dense population within urbanized areas, more frequent intercity travel along megaregion corridors, and disparities in transportation access, state and federal transportation policy and funding criteria should be adapted to encourage innovative, multimodal solutions.

This project conducts a multidisciplinary analysis of transportation policies in the United States and in China and Germany. The project combines economic, historical, and legal analysis to generate a model of transportation policy which allows different modes of transportation to compete for passengers on an even playing field. In doing so, the project seeks to reduce inefficiencies created by policies which favor one mode of transportation over another through an imbalance of subsidies, taxation, or regulation and instead promote flexibility in addressing megaregion transportation issues.

This project analyzed current federal and state transportation funding policy and will provide recommendations for how to amend these funding streams and transportation policy criteria to more effectively allocate limited resources between different modes of transportation for maximum efficiency. It will apply research to generate a set of example amendments to state and federal transportation and taxation codes.

The Right Structure for the Right Incentives: Multimodal Transportation in America's Growing Megaregions (#CM2-12)

Lisa Loftus-Otway,
University of Texas at Austin

09/01/2017 - 12/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Lisa-Loftus-Otway-The-Right-Structure.pdf

TEXAS
The University of Texas at Austin

Federal Spending on Transportation

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated JANUARY 2019*

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CM² Cooperative Mobility for Competitive Megaregions

MEGAREGION FREIGHT MOBILITY
THE IMPACT OF NEW TECHNOLOGIES

Efficient, competitive, transportation modes and systems underpin vibrant, growing economic regions and their impacts apply to increases in state, multi-state and national gross domestic product. U.S. freight volume is expected to increase forty-five percent by 2045. Much of this freight traffic will be concentrated in megaregions. Developing methods and strategies for the efficient flow of freight is vital to ensuring future economic competitiveness. The goal of this project is to create a framework for planners to estimate the economic impacts of new truck technologies designed to improve both operating efficiencies and safety.

The project will identify a range of technologies being tested for fuel and safety efficiencies. It will first identify supported research by U.S. truck, engine, transmission, tire and brake manufacturers and group them into immediate, intermediate and long term adoptions, the latter defined as over 5 years. The impetus created by autonomous vehicles in the auto sector is being replicated in the trucking sector and while a driverless truck is not an immediate prospect in this work, the ability of trucks systems to monitor the highway around the truck and recognize safety signals—speed limits, bridge height, weather conditions, accidents and the position of all users relative to the truck—will bring a range of social benefits that can be incorporated into highway planning.

The final report extends the U.S. Department of Energy SuperTruck Program findings and provides estimated Class 8 tractor and trailer impacts for model years 2018, 2021, and 2025 as they relate to fuel consumption, safety, and exhaust emissions. The inadequacy of current U.S Federal and State fuel taxes to meet future metropolitan, regional, and national highway system maintenance, expansion, and reconstruction is noted.

The final report was completed in October 2018.

Megaregion (MR) Freight Mobility: Impact of Truck Technologies (#CM2-13)

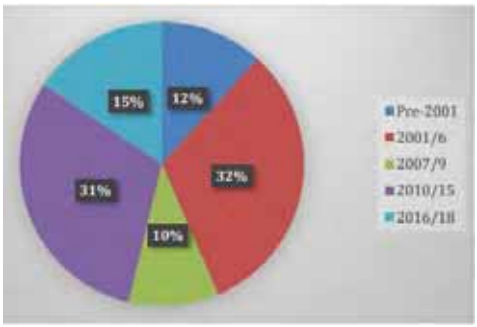
Robert Harrison
University of Texas at Austin

05/01/2017 - 11/30/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-Robert-Harrison-Improving-Megaregion-MR-Freight-Mobility.pdf

Final Report:
http://sites.utexas.edu/cm2/files/2018/11/Year1_Harrison_Megaregion-Freight-Mobility-Impact-Truck-Technologies.pdf

TEXAS
The University of Texas at Austin



2018 U.S. Class 8 Ages

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated JANUARY 2019*

US DOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

WHITER REGIONALISM:
THE EVOLVING ROLE OF MPOs

Analysis of larger clusters or agglomerations of metro regions has a long history, beginning in the 1920s under RPAA and Mumford in the US. However, as urban populations continue to grow and cities continue to spread outwards, the megaregion has become a major point of discussion amongst academic researchers. However is the megaregion a legible and compelling scale to address pressing environmental, social and infrastructural challenges now or in the future? Does the megaregional scale have meaning and salience for existing government and governance institutions addressing planning and policy problems spanning multiple metropolitan areas (U.S. MSAs)? How does one even begin to delineate the borders of an identified megaregion?

This research project provides a literature review and evaluation of cases of multi-metro, multi-jurisdictional planning and implementation in the U.S. In addition, the researchers have conducted a survey of directors and/or senior planners at 372 Metropolitan Planning Organizations (MPOs). The survey asks respondents questions dealing with the following themes: 1). Do MPO directors view collaboration and planning at the megaregional level as a meaningful framework and an important means to address interregional transportation and land use challenges? 2). In what ways do MPOs actively collaborate and/or cooperate with other MPOS across their state or at larger regional scales? 3). What are the legal, regulatory or institutional barriers to greater collaboration or joint project planning and implementation between MPOs at the state or megaregional scale?

Preliminary analysis of survey results show modest evidence that megaregional scales have significant resonance or salience with government or governance institutions or actors.

The Evolving Role of MPOs on Intra and Inter-Regional Transportation, Land Use and Access Policies and Outcomes (#CM2-15)

Dr. Michael Oden,
University of Texas at Austin

09/01/2017 - 01/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-Michael-Oden-The-Evolving-Role-of-Metropolitan-Planning-Organizations.pdf

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Preliminary MPO Survey results

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated MARCH 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

OVERCOMING IMPEDIMENTS NORTHEAST MEGAREGION

Overcoming Impediments and High Costs for Infrastructure Projects in the Northeast Megaregion (#CM2-16)

Dr. Marilyn Taylor, Dr. Bob Yaro
University of Pennsylvania

10/01/2016 - 05/31/2019
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1Marilyn-Taylor-Robert-Yaro-Overcoming-Impediments-and-High-Costs.pdf

Penn
University of Pennsylvania

The Northeast has the most extensive regional rail network in the country. However much of this system is the legacy of investments made by private rail operators in the first half of the 20th century, and today is overcrowded and outmoded. It also leaves many older mid-sized cities with inadequate service, or no service at all. Many of these places are former manufacturing centers that have lost their employment base and today have high concentrations of unemployed and under-employed residents.

This project will build on previous work by Professors Taylor and Yaro that explored the potential to expand and modernize these systems. It will identify new roles for Metropolitan Planning Organizations, state Departments of Transportation and metropolitan transportation authorities in planning, priority setting and promoting greater economic and social accessibility for megaregion-scale transportation investments in the Northeast Megaregion.

A major focus of the project will be on the Northeast's extensive regional rail network and opportunities to modernize and expand this network. Addinitionally, a special focus of this research will be on the impacts that innovations in transportation technology and commuting patterns could have on the utility of regional rail systems. For example, will the growth of shared mobility and automated vehicles reduce or eliminate the "first and last mile" challenge for regional rail riders? Will the increase in telecommuting make it possible for riders to commute one or two days a week?

This project will also examine strategies to improve project finance and delivery for major investment proposals for this system.

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

The Philadelphia Story: Urban Renaissance and Shifting Travel Behavior in a Northeast Region (#CM2-17)

Dr. Erick Guerra,
University of Pennsylvania

10/01/2016 - 09/30/2018

Final Research Report:
http://sites.utexas.edu/cm2/files/2018/10/Guerra-etal_PhiladelphiaStory_FinalReport.pdf

SHIFTING TRAVEL BEHAVIOR NORTHEAST REGION

Penn
University of Pennsylvania

The objective of this project is to analyze how shifting residential location, demographics, economic activity, and preferences have contributed to changes in travel behavior in the Philadelphia Region over the past decade and a half. Cities and regions like Philadelphia have been at the heart of national increases in the use of transit, bicycles, and walking at the regional, megaregional, and national level. The metropolitan area has experienced enough demographic and spatial change in a short period of time and has enough demographic and travel variation to begin to unpack questions about the relative importance of economic conditions, demographic change, and people's preferences in shifting travel patterns.

In this project, we examine changes in travel behavior in the Philadelphia region between 2000 and 2012. We use two household regional travel surveys over a decade apart, the 2000 and 2012 surveys, from the Delaware Valley Regional Planning Commission (DVRPC). Previous research, at the national scale, has highlighted changes among the Millennial cohort. We use these two regional datasets to examine the changing travel behavior among Millennials and to put these changes in context by comparing them with changes among other social groups of interest: women and minorities.

We find that the travel behavior of young people did not change substantially between 2000 and 2012. Where there are changes, these pale in comparison to the changes among women and black residents. And finally, we find that the built environment factors appear to influence travel more in 2012 than in 2000. Taken together, our findings fit an overarching narrative about urban gentrification and the suburbanization of poverty, rather than a story of Millennials' changing travel behavior.

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated JANUARY 2019*

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CM² Cooperative Mobility for Competitive Megaregions

TRANSIT DESERTS USA
GAPS IN TRANSIT SUPPLY & DEMAND

Transit Deserts in the Texas Triangle: Measuring Transit Demand and Supply at the Megaregional Scale (#CM2-18)

Dr. Junfeng Jiao,
University of Texas at Austin

09/01/2017 - 12/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Junfeng-Jiao-Transit-Deserts.pdf

America's cities are growing faster than ever before. As of 2016 the Census Bureau estimates that over 60% of all Americans live in urban areas. Increasing urbanization present numerous problems, chief among them is the issue of transportation access. This research aims to identify areas where transit dependent populations are being underserved by existing transit networks. Transit deserts are areas in cities where transportation demand outstrips transportation supply. This concept was first developed by Dr. Jiao at Ball State University. The research team's previous work has looked at transit deserts in several US cities. This year they extend this research concept to more cities, conducted additional baseline analysis, and have been working to develop a software product based on this concept.

This research aims to identify areas where demand for transit exceeds the supply of transit. The primary research question is what areas of cities are being underserved by transportation. This research also hopes to answer the following questions: What methods should be used to measure transit supply and transit demand at the megaregional scale and how does this differ from measurement methods used at the city-scale?

Having developed methods to identify transit deserts, the research team wanted to understand if transit deserts were significantly different than non-transit deserts. To do this, they identified key infrastructure variables and transportation time variables. They use ACS data and various GIS data to calculate these metrics. In terms of the software product, they used Python and QGIS to develop an open source software product that can detect transit deserts given user specified data. A baseline analysis was conducted of transit desert areas vs. non-transit desert areas in 52 major cities.

TEXAS
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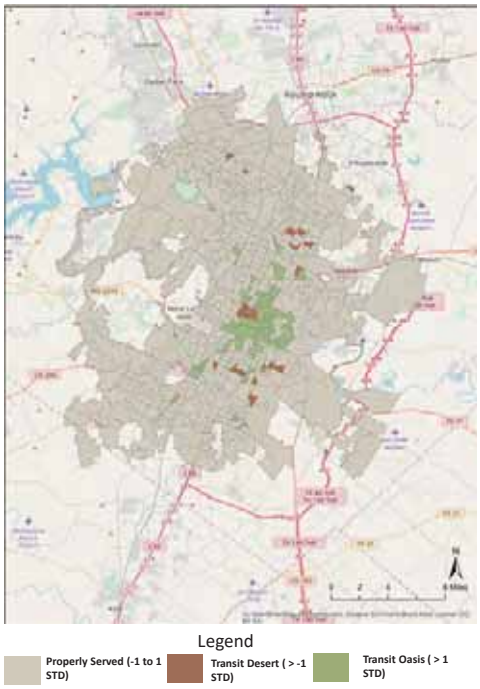

Austin Transit Desert Map

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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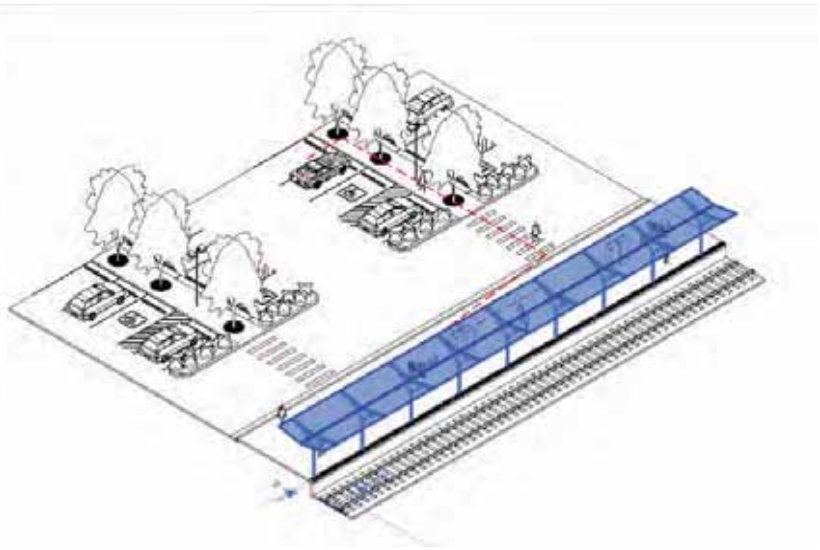

MULTI-MODAL MODELLING
SUSTAINABLE BIM TEMPLATES

Optimizing a multi-modal transit hub can accomplish a dual mission: make a journey more enjoyable and bring immense benefits to accessibility and performance. Stops and stations are often where existing and potential riders first interact with a transit service, can provide essential information and more generally frame the level of comfort and satisfaction riders have with transit service. Framing the necessary logistics to create simple, legible, and pleasant experiences at transit hubs grows the capacity and sustainability of the whole system.

A Building Information Model software program supports the ability to coordinate, update, and share design data with team members throughout the design construction and management phases of a building's life. A key component in managing the BIM process is to establish a foundation for different types of projects by creating standard templates and custom 3D modelled elements. Having this in place makes the process of any new (or renovated) project potentially smoother and with guided efficiency.

This project aims to further previous specialized research into the application of Building Information Modeling (BIM) technology for megaregion mobility, offering recommendations on strategic transportation design and planning methodology for smart infrastructure and multimodal transit hub design. These objectives will be accomplished through the development of a standard, proprietary BIM architectural template would be further carried out. The base template would allow for the development of advanced custom 3D parametric objects, archive the collection and most likely promote expansion of customized component design by future users.

Multi-Modal Modelling: BIM Templates for Hub Design and Networks (#CM2-19, 40)

Danelle Briscoe,
University of Texas at Austin

09/01/2017 - 12/31/2018

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-Danelle-Briscoe-Multi-Modal-Modelling_-BIM-Templates.pdf

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Sample BIM Inventory

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM2

Cooperative Mobility for Competitive Megaregions

The Effect of Shadow Evacuation in Megaregion Disasters: A Pilot Study (#CM2-20)

Dr. Brian Wolshon,
Louisiana State University

06/01/2017 - 09/30/2018

Final Research Report:
http://sites.utexas.edu/cm2/files/2018/09/Year-1-WolshonEtAL_The-Effect-of-Shadow-Evacuation-in-Megaregion-Disasters-A-Pilot-Study.pdf

MEGAREGION DISASTERS
THE EFFECT OF SHADOW EVACUATION

Natural disasters like hurricanes, floods, and wildfires occur throughout the world. And while they can occur anywhere, coastal areas tend to be the most vulnerable and tend to receive the most attention. Over the last decade or so, another set of areas, referred to as megaregions, have also received growing interest. Megaregions are broadly defined as continuously populated regions of once-separate metropolitan areas that have grown together. They often cover hundreds of milesand can even cross national boundaries.

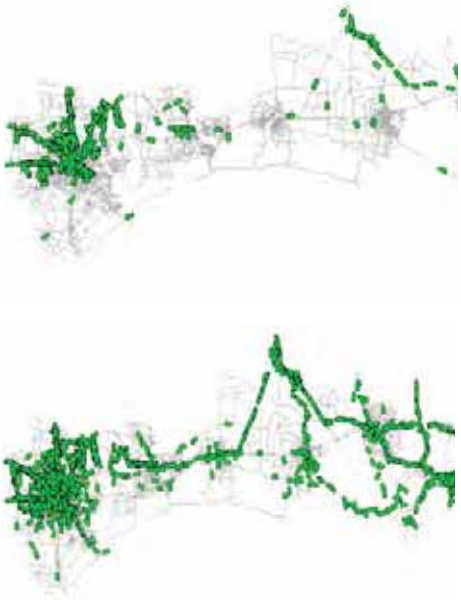
Megaregions can also be susceptible to a range of naturaland manmade hazards. However, unlike coastal areas that are considered to be vulnerable basedon their geography, megaregions are vulnerable because of their enormous populations andgeographic extents. One example of this vulnerability is in evacuation.

Strategic emergency plans are essential to protect the health and safety of the public under disaster threats. The time to evacuate officially declared evacuation zones may be affected by the demand not only within these zones but also in lower-risk areas. This is because based on the perceived threat, some proportion of the population in proximity to the official evacuation zones are also likely to evacuate. The evacuation of areas not under mandatory evacuation are referred to as shadow evacuation.

This research assesses the effect of shadow evacuation in megaregion disasters. Shadow evacuation could increase the overall clearance times of declared evacuation zones (Weinisch and Brueckner, 2015) which is important to be considered during the emergency planning process.

LSU

LOUISIANA STATE UNIVERSITY



Shadow Evacuation Scenarios

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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CM² Cooperative Mobility for Competitive Megaregions

MEGAREGION EMERGENCY EVACUATION
EFFECT OF DISRUPTIONS

Effect of Disruptions on Megaregion Emergency Evacuations: A Pilot Study (#CM2-21)

Dr. Brian Wolshon,
Louisiana State University

01/01/2018 - 12/31/2018

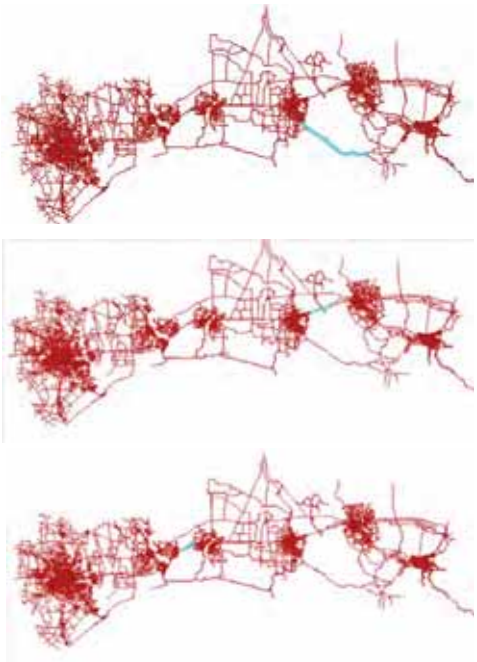
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Brian-Wolshon-Project-2-Effect-of-Disruptions.pdf

LSU
LOUISIANA STATE UNIVERSITY

Emergency planning is essential to protect the health and safety of the public under disaster threats. Traffic simulation has been widely used to support the development of these plans as it captures spatial-temporal conditions during an evacuation and provides insights about the overall clearance process. For example, traffic simulation may support the decision to shelter in-place or evacuate in the event of a nuclear power plant emergency (NUREG/CR 7002); identify resources needed in the event of an evacuation (Murray-Tuite & Wolshon, 2013), etc. Considerations of possible network disruptions are also of particular importance to assist decision makers (Wolshon, 2009). This is because, network disruptions could affect the overall evacuation clearance process.

Few, if any, studies have assessed the effect of network disruptions on emergency evacuations at the megaregional scale. The research proposed here, therefore, seeks to fill this information gap by assessing the effect of various disruptive events on megaregion emergency evacuations. The network disruption events to be assessed in this project could include access restrictions to neighbor cities or states, traffic incidents (e.g. abandoned or disabled vehicles, crashes, etc.), work zones, flooded roads, adverse weather, traffic signal failure, etc.

This research will deepen understanding of the effects of disruptions on megaregion emergency evacuations which state and local officials could use in emergency planning and decisions making activities related to the transportation network robustness and redundancy, incident management strategies, etc. This contribution is expected to be significant to both research and practice as there is currently little information on this topic in practice and research.



Network Disruption Scenarios

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

THE RISE OF LONG DISTANCE TRIPS
AUTONOMOUS VEHICLES IN TEXAS

The Rise of Long-Distance Trips in a World of Self-Driving Cars: Anticipating Trip Counts and Evolving Travel Patterns Across the Texas Triangle Megaregion (#CM2-22)

Dr. Kara Kockelman
University of Texas at Austin

01/01/2018 - 01/31/2019

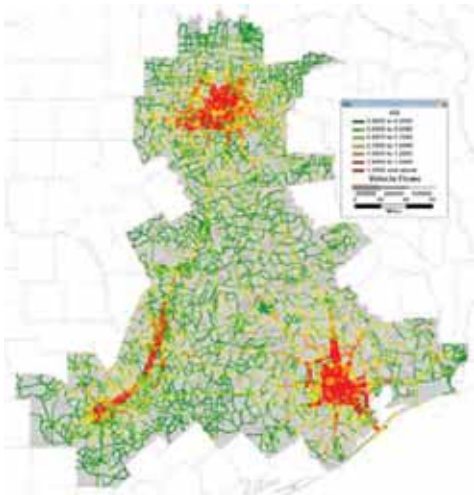
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Kara-Kockelman-The-Rise-of.pdf

TEXAS
The University of Texas at Austin

More automated vehicles means easier travel and thus more long distance driving (≥ 50 miles one-way). Thanks to automated vehicles, vehicle-miles traveled (VMT) is predicted to rise in the coming decades well beyond what trends in population and economic activity would predict (Lee & Kockelman 2018). The Texas Triangle Megaregion has 6% of U.S. population, 7% of U.S. GDP, and 7% of U.S. VMT. 43.2% of person-miles traveled in the U.S. consists of long distance travel, with 28% of it being leisure trips, 25% visiting friends and relatives, 18% business, 15% personal business and 12% of commute.

Connected & (fully) automated vehicles (CAVs) may change long-distance travel by shifting travel towards CAVs (therefore away from conventional vehicles and air travel), along with a large trend of longer and more frequent trip-making by travelers of all types (including those currently unable to drive). A key reason for preferring an AV comes from lower "driving" burden, so there is a lower perceived value of travel time en route (for those who used to drive). How much more VMT will the Texas Triangle experience, both by passenger vehicles and heavy trucks moving freight?

This project calibrated models of destination, mode and route choice for passengers & freight, and simulated those behaviors across Texas, with AV and ATruck options. Results were pulled out for the Texas Triangle specifically. This work is the first of its kind to assess what types of policies, strategies and models may be necessary to facilitate the efficient introduction of CAVs, shared automated vehicles (SAVs) and Automated Trucks (Atrucks) across the U.S. and its megaregions, without compromising congestion & mobility. Policy recommendations are now being developed to reduce any negative effects caused by AV implementation and to invest scarce resources into optimal locations & practices.



Congestion Levels after introduction of Autonomous Vehicles

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

POST-DISASTER RE-ENTRY in MEGAREGIONS
EVALUATION AND ANALYSIS

Evacuation procedures are the primary focus of emergency managers (and researchers) when planning for disaster in at-risk areas. However, re-entry could be more difficult than evacuation when evacuees are scattered across multiple regions or states (Lin et al, 2013). Furthermore, properly timed and organized re-entry is essential for the safety of returning residents while also helping the recovery process begin as soon as possible (Texas Division of Emergency Management, 2013).

A systematic reentry plan also helps to support the recovery process by allowing it to be managed and begins as soon as possible (Texas Division of Emergency Management, 2013). The limited amount of research into re-entry processes and management has lead to a limited knowledge of the practical and theoretical aspects of the re-entry process and its smaller components (Siebeneck et al, 2013).

The research proposed in this project will explore key concept related to the processes and procedures associated with post-event re-entries. The general idea is to assess current practices and condense it for a general understanding of current guidelines and procedures for return-entry process and procedures. This may also allow disaster management agencies to demonstrate a broader benefit to the community resulting in increased level of support from many area transportation agencies (DOTs, counties, cities, MPOs, etc.) and the public.

The research output will come not only from development of new guidance but also from the standpoint of creating and disseminating knowledge that may exist in practice but has never been systematically quantified or assessed from a research perspective.

Evaluation and Analysis of Post-Disaster Re-Entry in Megaregions: A Pilot Study (#CM2-23)

Dr. Brian Wolshon,
Louisiana State University

07/01/2017 - 01/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-Brian-Wolshon-with-Nelida-Herrera-Evaluation-and-Analysis-of-Post-Disaster-Re-Entry.pdf

LSU
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Hurracane Harvery
Communications Situation Report

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

TEXAS MEGAREGION CORRIDOR EQUITY RUBRIC

State transportation agencies and Metropolitan Planning Organizations (MPOs) across the country apply variables seeking equity in transportation projects. The goal is to improve access to employment, health care and other essential services for vulnerable or at-risk populations. Previous research in Cooperative Mobility for Competitive Megaregions (CM2) identified variables that are appropriate for developing Purpose and Need statements for transportation projects and created an Equity Purpose and Need Rubric for use by transportation planners in megaregion settings. The next step proposed will apply the rubric to a specific Texas Megaregion corridor enabling assessment and determination of the robustness of the tool.

The gap between those who have financial resources and those without is a commonly discussed phenomenon in US dialog. The Center for American Progress (2013) reports that more than 4 million Texans are in poverty, typically concentrated in the state's largest cities and along the Texas/Mexico border. Increasingly, these low income, ethnic and senior residents might be left on the fringes of society if attention is not focused on their travel requirements (US DOT, 2016). Crossing jurisdictional boundaries for these communities to reach services that have moved further from historical locations will create additional future challenges.

Identification of transportation need by planners and engineers is generally preceded by development of a statement of Purpose and Need. Previous research developed a template of variables and a rubric to apply when agencies are determining purpose and need for vulnerable populations. This research will apply the rubric to the US 290 Texas Megaregion corridor that connects Houston and Austin. The focus will be on whether equity considerations are merited in this corridor per the rubric tool.

USDOT Tier-1 University Transportation Center

CM2

Cooperative Mobility for Competitive Megaregions

Application of the Equity Rubric for Purpose and Need to a Demonstration Corridor in the Texas Megaregion (#CM2-24)

Dr. Carol Lewis,
Texas Southern University

01/01/2018 - 02/28/2019

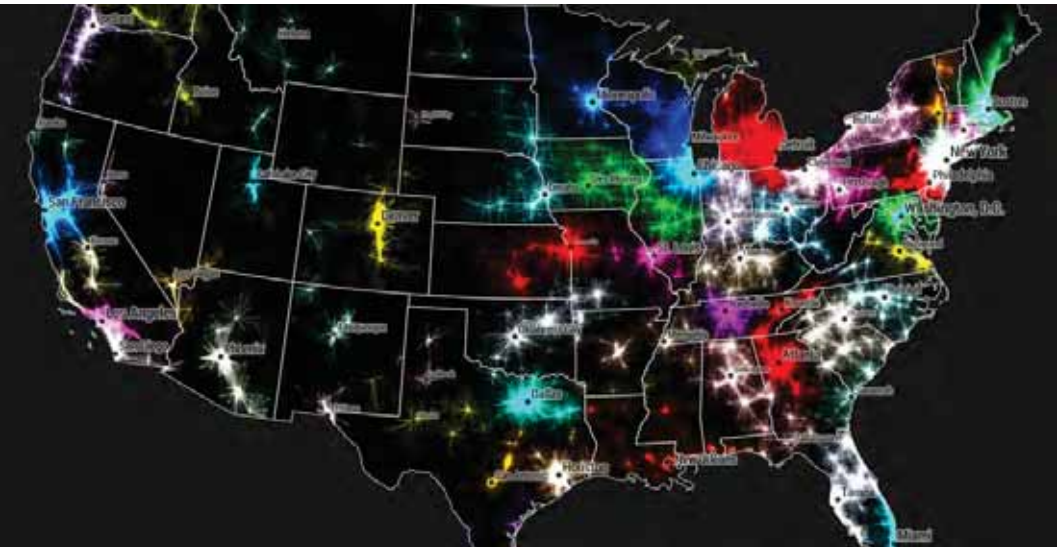
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Carol-Lewis-Gwendolyn-Goodwin-Application-of-the.pdf

TSU
TEXAS SOUTHERN UNIVERSITY

US 290 Corridor

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*



USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

GIS-based MEGAREGION TRANSPORTATION PLANNING MODEL

Develop a GIS-based Megaregion Transportation Planning Model (#CM2-25 and #CM2-49)

Dr. Qisheng Pan,
Texas Southern University

05/01/2018 - 04/30/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Qisheng-Pan-GIS-based-Planning-Model.pdf

There are few academic studies or professional programs focusing on the development and implementation of megaregional transportation models. It is also a big challenge to build such kind of models because they need to ensure theoretical soundness and methodological validity in academic and professional studies while at the same time to meet the expectation of public agency on the models for reliability, efficiency, and user friendliness. This study intends to fill the gaps to develop a GIS-based model for megaregion transportation planning. It aims to balance the priorities in both the academic research setting and operational planning setting.

The leader of this research team has developed and maintained the Southern California Planning (SCPM), which is a Lowry-type spatial planning model combining the functions for economic impact analysis, spatial allocation, and transportation modeling. This research will extend the spatial scale of the SCPM from region to megaregion, which will accommodate larger areas, more passenger and freight trips, and more complex transportation networks. It will put together transportation models with economic input-output models and spatial allocation models to trace spatial socio-economic impacts and support policy analysis in megaregions.

This research is a two-year project. On the base of the analytical framework and GIS functions developed for the Megaregion Transportation Planning Model (MTPM) in the first year, the research in the second year focuses on the implementation of the analytical framework to build a GIS-based Megaregion Transportation Planning Model (MTPM). It adopts Texas Triangle as an empirical case to demonstrate the procedure of data inventory and model applications.

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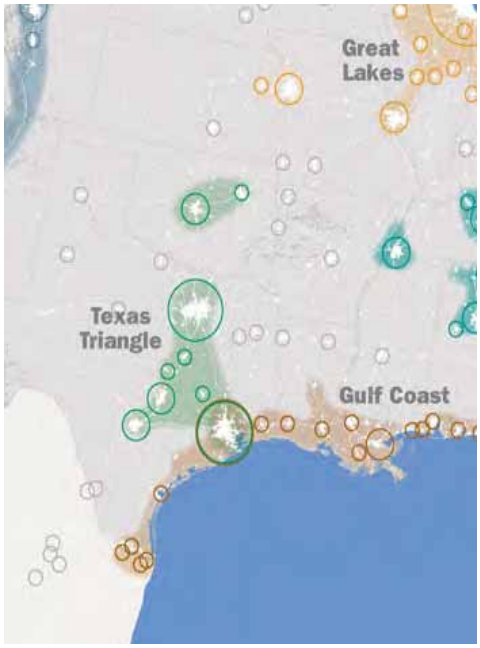

Source: America 2050 Map

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

WALKABILITY METRICS FOR OLDER PEOPLE

Creating Neighborhood Walkability Metrics that Represent the Needs of Older People; Developing Appropriate Infrastructure and Policy Interventions (#CM2-26)

Dr. Sandra Rosenbloom, University of Texas at Austin

06/01/2018 - 05/31/2019

Project Information Form: http://sites.utexas.edu/cm2/files/2018/03/Year-2-Sandra-Rosenbloom-Creating-Neighborhood.pdf

TEXAS The University of Texas at Austin

Over 75% of US seniors live in low density neighborhoods with few places to which they can safely walk yet seniors walk for an increasing share of all trips as they age. There are multiple guides and metrics to measure and promote neighborhood walkability but many either miss issues important to seniors OR emphasize elements that might serve younger people but are actually viewed by seniors as barriers to walking. Most existing walkability guidelines and indices also do not link directly to specific infrastructure improvements and supportive programs; they merely measure deficiencies.

Many walkability metrics focus on the needs of younger travellers walking for transportation, that is to specific destinations. Seniors tend to walk for recreation, to socialize, for physical activity, and to maintain a connection to their neighborhood; they may have no set destination or the destinations are incidental. Walkability metrics should acknowledge senior walkability needs and perceptions by identifying: 1) those needs and desires they share equally with others; 2) those that they value very differently, and 3) those factors and situations sought by other travellers that seniors find difficult or frightening.

This research project will review, evaluate, and synthesize the body of interdisciplinary literature on how seniors view the walkability of their neighborhoods, the reasons why they walk, and the improvements they seek to facilitate additional walking. Based on focus groups with diverse seniors in the mega-region that assess perceptions of neighborhood walkability, researchers will develop a concise set of powerful metrics capturing the most relevant and important features of the built environment supporting walkability for diverse seniors.

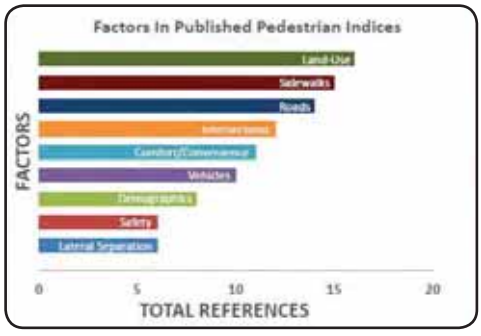

Chart synthesizing the major elements stressed by twenty-five (25) walkability studies. The least stressed elements, Safety and Lateral Separation, are ones often most important to seniors.

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EXECUTIVE SUMMARY - *updated JANUARY 2019*

US DOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

TRANSIT OPERATORS IN MPO TRANSPORTATION DECISION-MAKING

Transit Operators in Metropolitan Transportation Decision Making (#CM2-27)

Dr. Gian-Claudia Sciara, University of Texas at Austin

06/01/2018 - 05/31/2019

Project Information Form: http://sites.utexas.edu/cm2/files/2018/03/Year-1-Gian-Claudia-Sciara-Transit-Operators-in-Metropolitan.pdf

Regional and megaregional transport systems enable the economic and social interactions that make metro regions significant engines of growth and innovation. One persistent research challenge is the lack of readily available data about the organizations responsible for regional transportation governance. Federal transportation law requires that urban areas have a state-designated metropolitan planning organization (MPO) to coordinate transport planning and spending for the region. The MPO is usually governed by an appointed board, most members of which hold local elected offices in the region.

This research sets the stage for a series of explorations into the influence of regional (and megaregional) transportation governance and capacity on transportation investments and outcomes. The project develops a database capturing key MPO governance variables. For instance, it asks whether transit agencies and airport interests are represented on the board, what MPO committees exist for non-auto modes, and what its travel model capabilities are. The database includes information that indicates transit agency and airport representation in comparison to total board composition; whether or not MPOs have standing committees or advisory groups for active transportation, airport or transit; and the type of travel demand models currently used by MPOs. Other information includes if board representation in MPO areas is weighted and modes currently modeled by travel demand models used.

Initial stages of this research project include determining the most informative and objective variables accessible through MPO websites and travel demand model documentation. After establishing variables, the database can be used to investigate indicators of board composition, transit representation, airport representation, and advancement of travel demand modelling.

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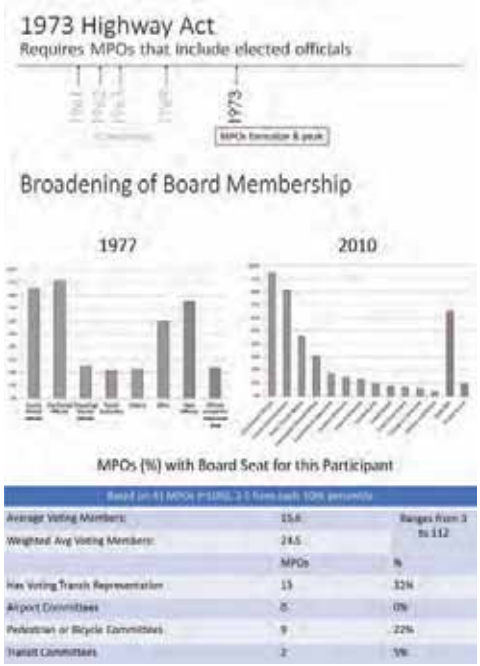

MPO Board Membership History & Data

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

US DOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

MPOs MEGAREGIONAL PLANNING IN THE TEXAS TRIANGLE & BEYOND

Issues in Setting a MPO Process for Megaregion and Inter-regional Planning in the Texas Triangle (#CM2-14, 28)

Lisa Loftus-Otway,
University of Texas at Austin

01/06/2017 - 05/31/2019

Project Information Form: http://sites.utexas.edu/cm2/files/2018/09/Year-1-2-Lisa-Loftus-Otway-Robert-Harrison-Issues-in-Setting-a-MPO-Process.pdf

TEXAS The University of Texas at Austin

MPOs were first mandated for urbanized areas with 50,000 or more people in the Highway Act of 1973 and have increasingly become more central in the regional transportation planning process. Our research evaluates the evolving role of MPOs in megaregional planning within existing legal frameworks and the related policy and planning implications for smart growth in the Texas Triangle.

How aligned are MPO planning and operational procedures within the Texas Triangle? Do current legal and MPO operating structures allow for megaregion planning at the MPO level? This research maps out MPO planning processes and operating procedures to see where discrepancies may lie within the Texas Triangle megaregion. Given any discrepancies, the research will assess what, if any, measures need to be taken to move forward to allow MPOs to plan on a megaregion scale. Analysis includes evaluating success in other MPO-driven approaches to megaregional planning in order to calibrate practical recommendations for implementation.

This project will involve a review of the requirements of the three main planning documents produced by MPOs: the Metropolitan Transportation Plan, the Transportation Improvement Plan, and the Unified Transportation Work Program. Following this, researchers will provide a delineation of federal, state and local funding streams that support the operating budgets of MPOs. After a case study of the bylaws of Texas Triangle anchor city MPOs, researchers anticipate the draft of an MOU that could be used between MPOs to encourage megaregion planning. The work will also integrate findings from a companion piece "Creating a framework to determine purpose and need for increased travel options in the megaregion for vulnerable (environmental justice) communities."

The scale of planning in the Texas Triangle is very different from other areas. For example, the population living within NCTCOG boundaries exceeds that of 38 states.

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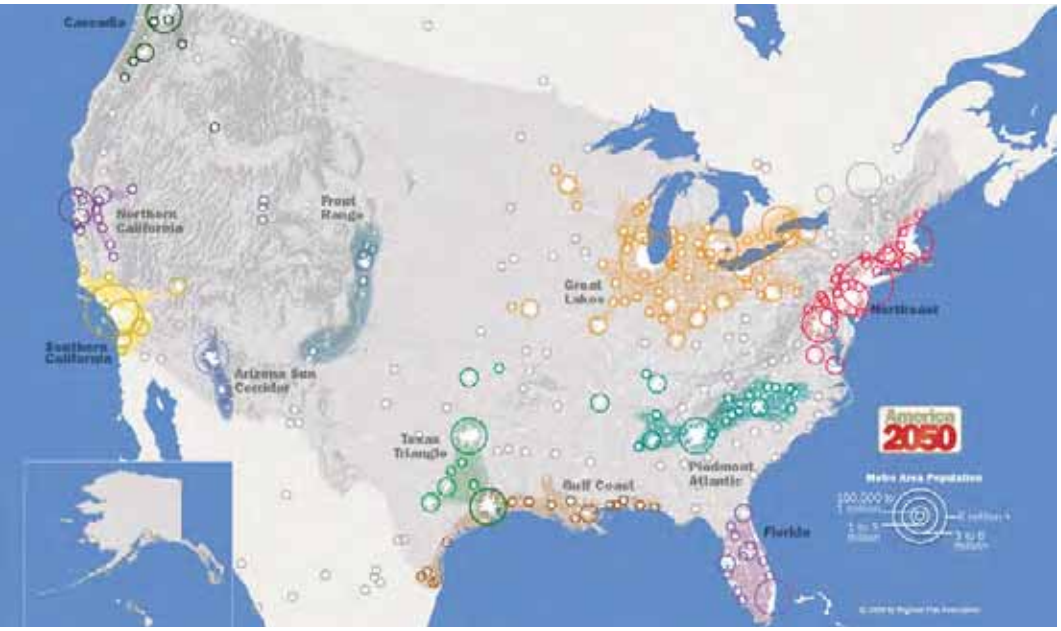
EXECUTIVE SUMMARY - *updated FEBRUARY 2019*



MEGAREGIONS TRENDS AND RESEARCH
AN UPDATE

Over a decade ago a team of faculty and students from University of Pennsylvania—along with their collaborators from the Lincoln Institute of Land Policy—studied spatial trends of demographic and economic growth in the US and identified eleven emerging megaregions in the US continent (RPA 2006). Since the publication of the Penn study (Carbonell and Yaro 2005, RPA 2006), the megaregion phenomenon has gained ever-increasing attention from academia, public agencies, and NGOs.

Over the past twelve years however there have been important changes in the economic and political environment, both globally and in the US domestically. Information technologies have also advanced quickly, affecting every aspect of transportation. Given these new trends of the past twelve years, it is necessary to update the information and knowledge base for megaregions, re-assess research needs, and contemplate needed institutional and technical innovations to meet the new challenges.

This project updates the knowledge base on megaregions. Building on prior research, the project plans to carry out seven tasks. Task 1 aims at refining the conceptual definition of megaregions and developing a framework for mega-regional coordination, planning, and policy making, with a focus on transportation. Task 2 and 3 examine the demographic and economic trends, respectively, and study the travel demand implications of these trends. Task 4 focuses on technological innovations and applications. Task 5 investigates the spatial dimension of the socioeconomic and demographic trends in megaregions. Task 6 conducts a survey of MPOs and state DOTs in the US megaregions, asking for their concerns and input on cross-jurisdictional transportation issues. Task 7 proposes a research agenda for megaregions based on the analyses completed in previous tasks and the survey results.

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

Mega-Travel in Megaregions: An Update on Growth Trends and Research Needs (#CM2-29)

Dr. Frederick Steiner,
Dr. Robert Yaro,
University of Pennsylvania
Dr. Ming Zhang,
University of Texas at Austin

10/01/2017 - 05/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Dean-Frederick-Steiner-Robert-Yaro-and-Ming-Zhang-Mega-Travel.pdf

Penn University of Pennsylvania

TEXAS The University of Texas at Austin

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EXECUTIVE SUMMARY - *updated MARCH 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

TRANSPORTAION & LAND USE
US & MEXICAN CITIES AND MEGAREGIONS

Transportation and land use across US and Mexican cities and megaregions (#CM2-30 & 43)

Dr. Erick Guerra,
University of Pennsylvania

09/01/2017 - 08/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/09/Year-2-3-Erick-Guerra-Transportation-and-land-use.pdf

Penn
University of Pennsylvania

Megaregions inherently cross borders, often national ones. Of the eleven emerging US megaregions identified by the Regional Plan Association in its seminal work, three include Mexican cities (Figure 1). Moreover, cross-border commutes, tourism, and economic flows are important components of local and metropolitan economies and cultures in places like San Diego, Tijuana, El Paso, and Juarez. According to the 2015 Intercensus (INEGI 2015), around 5-10% of Mexican commuters from border cities and municipalities work in the United States (Figure 2). Even in many central parts of Mexico, a sizable fraction of the workforce commutes to the United States.

Studying the relationship between land use, socioeconomic, and commute behavior across multiple regions in multiple countries can help shed light on not just on the strength and relative importance of different relationships, but also their consistency and the role of regional and social context. Of particular interest will be questions about the relative importance of transportation supply, household income, and the built environment in determining the radically different commute patterns seen on each side of the border.

For example, Mexican cities are highly multimodal with substantial and continuous variation in modal importance. Even in the most car-reliant city, La Paz, 40% of commuters walk, bike, or take transit. In the US, by contrast, nearly everyone drives to work, with just a few individual cities that have less than 90% of commutes by car. Income almost certainly plays a role. Mexican commuters have average household incomes that are around 8 times lower than American commuters. So does the built environment. Average metropolitan population densities are an order of magnitude higher in Mexico than in the US.

Figure 1. Regional Plan Associations map of emerging megaregions

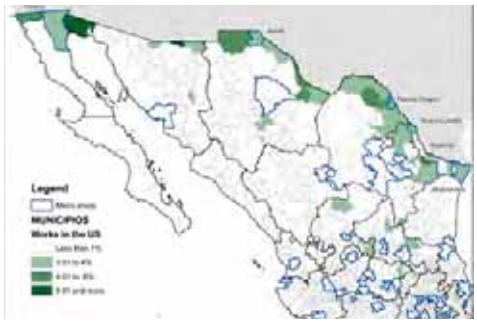

Figure 2. Percent of commutes to the United States by Municipality

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

FIRST & LAST MILE CONNECTIONS
ACTIVE TRANSPORT & REGIONAL PLANNING

Incorporating active transport into the regional planning process to support first and last mile travel (#CM2-31)

Dr. C. Michael Walton,
University of Texas at Austin

09/01/2018 - 08/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Michael-Walton-Incorporating-active.pdf

There is a gap between research on long-distance transit services, such as high speed rail, and research on bikeability and walkability at the final destination. High-quality bicycle and pedestrian facilities have the potential to support the first and last mile movements in long-distance trips, but most active transport research focuses on attracting riders for short-distance trips. Meanwhile, ensuring adequate connectivity for high speed rail and other intercity transit modes remains a key issue in megaregion mobility. Including active transport in multimodal planning has becomean issue of national interest. In a 2010 policy statement, the United States Department of Transportation encouraged transportation agencies to "implement improvements to their walking and bicycling networks, including linkages to transit." (USDOT 2017)

This project will examine current efforts to incorporate active transport in planning decisions, and it will attempt to quantify some of the impacts that active transport infrastructure can have on long-distance travel behavior. This will be useful to expand the scope of bicycle and pedestrian transportation planning from considering only short-distance trips to being an essential part of a larger multimodal framework. Key themes are interoperability, traveler comfort, and the role of new technologiesand operational strategies.

This project will combine publicly available data from multiple MPO's located in megaregions, as well as information on active transport infrastructure and bike share programs. The project will build a logistic regression to test the significance of bicycle infrastructure in causing non-local users to bike rather than drive (either by taking their car on a long-distance trip, renting at the destination city, or using taxis or TNC's).

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New technologies such as e-scooters can help make first & last mile connections

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

INTER-REGIONAL RESILIENCY
MPOs IN NATURAL DISASTER PLANNING

Inter-regional Resiliency: The Role of MPOs in Natural Disaster Planning and Response Preparation (#CM2-32)

Lisa Loftus-Otway,
University of Texas at Austin

09/01/2018 - 05/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Lisa-Loftus-Otway-Inter-regional-Resiliency.pdf

TEXAS
The University of Texas at Austin

Natural disasters are occurring with increasing frequency and increased impacts to communities across the U.S and the world. Cities and regions can plan for disaster resiliency in numerous ways: carefully planned evacuation system plans, construction of barriers along seawalls, and changes in materials used to ensure lasting construction. Megaregion resilience planning is yet to be determined or outlined.

Primary questions include: should resilience planning be done at the megaregion level, or should this effort be led by the state? Do connected MPOs have a vested interest in the recovery or success of MPOs in typically geographically vulnerable locations? This study will include an evaluation of how MPOs have been affected by natural disasters to-date, and will identify opportunities to integrate resiliency planning into the MPO planning cycle.

This project will evaluate the economic impact of four natural disasters that occurredin different megaregions in the U.S within the last decade. It will assess economic and demographic impacts of regions connected to the region of greatest impact. When a severe natural disaster event displaces residents, this can cause unexpected high spikes in population growth in adjacent metropolitan areas and increasedstrain on the regional transport systems of receiving regions. The deterioration of existing infrastructure can set a region behind in achieving strategic objectives in the case of needing to rehabilitate existing infrastructure quicker than planned for. The project will develop a proof of concept for an economic analysis to be conducted at a megaregional scale. It will also synthesize best practices in transportation resilience planning and develop recommendations for the Texas Triangle megaregion.

Hurricane Ike Observations

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

STATE GOVERNMENT and MULTIJURISDICTIONAL PLANNING

Most states are prevented from enacting local and specific legislation that applies selectively to specific jurisdictions. For example, Article III, Section 56 of the Texas Constitution prohibits the legislature from enacting local and special legislation; that is, it cannot explicitly make legislation that applies selectively in specific jurisdictions. However, the state of the practice has shown that legislators have historically circumvented these provisions using a technique called "bracketing," in which they set ostensibly germane requirements such as population and date of creation, with the effect of creating laws that apply only to specific jurisdictions.

Use of bracketing over long periods has resulted in a patchwork of policies varying by jurisdiction, reducing consistency and making cross-jurisdictional cooperation more difficult. In transportation, this has been used to restrict the activities that transit agencies can conduct, and some would argue stymie efficient multimodal transportation options.

This project will review provisions within selected megaregion states constitutions and legislationand regulations, and litigation surrounding bracketing to map its breadth and effectiveness in restricting efficient multi modal mobility options. The project will review the Texas constitutional prohibition against special legislation, and will also survey similar provisions in other states and select several states with different special legislation jurisprudence to conduct a comparative review of the effects of different levels of restriction. The project will generate a set of judicial recommendations for how these provisions should be interpreted to facilitate good transportation policy, as well as some suggestions for how these issues might be reconciled legislatively.

Using State Government to Mitigate the Effects of Bracketing on Multijurisdictional Transportation Planning (#CM2-33)

Lisa Loftus-Otway,
University of Texas at Austin

09/01/2018 - 05/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Lisa-Loftus-Otway-Effects-of-Bracketing-on-Multijurisdictional-Transportation-Planning.pdf

TEXAS
The University of Texas at Austin

Texas has a long history of bracketing in legislation ... Jurisdictional complexity and legal inconsistency between jurisdictions burden transportation planners ability to effectively plan for mobility and impact commuters who rely on them to provide network efficiencies.

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EXECUTIVE SUMMARY - *updated MARCH 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

ADVANCING INFRASTRUCTURE ACROSS POLITICAL BOUNDARIES

Advancing Transformational Infrastructure Projects across Political Boundaries in the Northeast (#CM2-34)

Dr. Marilyn Taylor, Dr. Bob Yaro
University of Pennsylvania

01/01/2018 - 08/31/2019

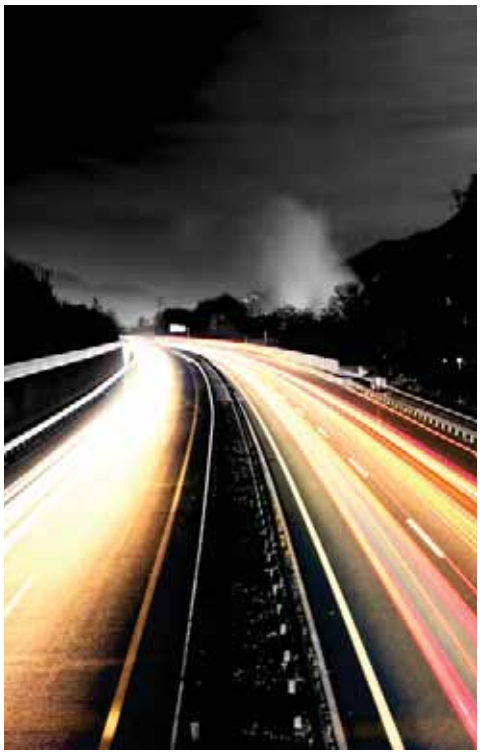
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-2-Marilyn-Taylor-Advancing-Transformational.pdf

Penn
University of Pennsylvania

The Northeast Megaregion is choking on congestion, with gridlocked interstate highways, congested inter-city passenger rail and urban rail networks, airports and goods movement systems. The Megaregion's continued economic success will hinge on its ability to expand capacity and better utilize existing capacity on all of these systems. In addition, the advent of autonomous vehicles and the even-greater potential of increased ride-sharing and vehicle-sharing innovations can open the door to new solutions, particularly about "the last mile challenge."

In response to these challenges, proposals are being advanced to create expanded and modernized regional and urban rail systems and airports, and to reconstruct urban interstate highway links. These investments could also have a profound effect on social and economic equity across the Northeast, by providing improved transit accessibility to low and moderate income urban and inner-suburban communities. They could also reduce the damaging impacts that these systems have on disadvantaged urban communities, including increased air pollution, noise and other impacts that lead to increased rates of lung disease and other health effects.

The goal of our work over the decades has been, and remains, to advance transformational infrastructure projects that can be implemented across political boundaries to achieve greater equity, economic competitiveness, and respond to climate change. This project will examine the role that MPOs, state DOT's and metropolitan transportation authorities should play in planning for and prioritizing investments in these systems. Finally, it will explore strategies to improve project finance, permitting, procurement and project delivery for these projects, with the goal of expediting and reducing the cost of these investments.



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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

AIRPORT GOVERNANCE *and* MEGAREGIONAL PLANNING

Airport Governance in U.S. Metro Regions: Institutional Models and their Implications for Megaregional Transport (#CM2-35)

Dr. Gian-Claudia Sciara, University of Texas at Austin
Dr. Megan Ryerson, University of Pennsylvania

09/01/2018 - 08/31/2019

Project Information Form: http://sites.utexas.edu/cm2/files/2018/03/Year-2-Gian-Claudia-Sciara-Megan-Ryerson-Airport-Governance.pdf

Market dynamics of air transportation are rapidly changing, with big implications for surface transportation in U.S. regions and megaregions. Whereas proximity has traditionally driven air passengers' airport choice, allowing metro airports to attract the majority of passengers from the immediate region, today's airports compete fiercely with one another and draw passengers from far beyond their own regional borders, from wider megaregional geographies. The phenomenon, known as airport market leakage, means that planning for air service itself, for ground transport access to airports, and for economic development linked to airports must account for dynamics unfolding at the megaregional scale.

Limited examples of contemporary planning acknowledge both the growing megaregional dimensions of urban transportation and the changes to megaregional transportation brought by evolving airline industry dynamics and growing commuter sheds for airport access. Using case studies of one or two regions or megaregions, this project observes, in a single geographic context, how and to what extent airport sponsors engage in regional and megaregional transport planning. models.

Research Questions include (1) What governance models are present among airports? How do they work? (2) How do specific governance structures contribute to or hamper an airport's engagement in regional and megaregional transportation planning? (3) What formal and informal relationships exist between airports and metropolitan planning organizations (MPOs) responsible for surface transport? How do these parties share information or work together? (4) Among existing governance models for connecting airports and metropolitan planning organization members, which governance structures and arrangements are most effective?

Fuellhart et al (2016). Airport passengers increasingly may leak from smaller, less-served to larger, better served airports

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EXECUTIVE SUMMARY - *updated MARCH 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

TRANSPORTATION INVESTMENT MODEL NORTHEAST MEGAREGION

An Operational Platform for Modeling Multi-Modal Transportation Investments in the Northeast Corridor Megaregion (#CM2-36, 37, & 50)

Dr. John Landis,
University of Pennsylvania
10/01/2016 - 09/30/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/03/Year-1-2-John-Landis-An-Operational-Platform-for-Modeling-Multi-Modal.pdf

The thirteen-state Northeast Megaregion (NEMR) extends along the I-95 corridor from Portland, Maine to Richmond Virginia, and includes more than 15% of the country's residents and 14% of its jobs. This makes it America's largest and most productive megaregion by far. It also includes 38 Metropolitan Planning Organizations, or MPOs, each of which is responsible for coordinating transportation planning and investment activities in its metropolitan area.

This plethora of MPOs, and the resulting fragmentation of transportation investment decision-making has compromised the NEMR's ability to undertake needed transportation investments within and across modal categories, generating productivity and quality-of-life bottlenecks across the region. Where comparable regions in other advanced economies have undertaken major investments in state-of-the-art intra-regional and inter-city passenger and goods movement transport, the U.S. and NEMR are falling further and further behind.

The purpose of this three-year applied research project is to develop and test a robust travel demand and facility planning and evaluation model capable of simulating the costs and benefits of various multi-modal transportation investments as undertaken at the megaregional scale within the NEMR. Such investments might include high-speed, inter-city high-speed rail service, intra-regional bus rapid transit service, dedicated (and automated) freight movement facilities, new bridge and tunnel facilities, high-speed airport-city transit lines, and other projects to be determined. The proposed modeling procedures and datasets will be developed and implemented in TransCAD, a state-of-the-art modeling platform already in wide use across the United States.

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NEMR Transportation Investment Model Highway Network

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM2

Cooperative Mobility for Competitive Megaregions

TNCs AND MEGAREGIONAL MOBILITY

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 (#CM2-38)

Dr. Junfeng Jiao,
University of Texas at Austin
Dr. Erick Guerra,
University of Pennsylvania
Dr. Qisheng Pan,
Texas Southern University

09/01/2018 - 08/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Multi-Junfeng-Jiao-Erick-Guerra-Qisheng-Pan-Role-of-TNCs-in-Megaregion-Mobility.pdf

This study will investigatethe spatial and temporal pattern of TNCs usage, people's perception of TNC service, the broad impact of TNC with other transportation modes within the megaregional context, and the overall role TNC in megaregion mobility. This study will focus on three megaregions, The Texas Triangle, The Northeast Region and the Gulf Coast Region.

Due to the data limitations, multi-modal travel, particularly as it relates to TNCs, is significantly understudied. With the recent fast growth of TNCs, researchers and planners need a framework for effectively evaluating theirimpactsto existing multimodal system as well as their roles in the overall urban transportation system. This study will focus on TNC usage in four major American cities in three different megaregions. These cities are Austin and Houston in the Texas Triangle Megaregion, New Orleans in the Gulf Coast Megaregion, and Philadelphia in the Northeast Megaregion.

This study will investigate four specific research questions: 1) How do users and drivers utilize TNCsboth temporally and spatially 2) How do users and drivers perceive and value these services and 3) How do these services integrate with the broader multimodal transportation networks. 4) What roles do TNCs play in improving megaregion mobility? Results from this study will serve at least two purposes. First, the data collected about usage patterns will allow planners to better understand how TNCs are being used by users and drivers so that they can better integrate them into the overall network. Second, data collected about the public opinion of TNCs will help guide regulators in developing effective policies around TNCs at the city and megaregional level.

TEXAS
The University of Texas at Austin

Penn
University of Pennsylvania

TSU
Texas Southern University

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners 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.

EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM² Cooperative Mobility for Competitive Megaregions

CROWD-SOURCING & MACHINE LEARNING
PLANNING FOR FLOODING RESILIENCY

Utilize Crowd-Sourced Data and Machine Learning Technology to Enhance Planning for Transportation Resilience to Flooding (#CM2-39)

Dr. Ming Zhang,
University of Texas at Austin
Dr. Qisheng Pan,
Texas Southern University

09/01/2018 - 08/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Multi-Ming-Zhang-Qisheng-Pan-Crowd-Sourced-Data-and-Machine-Learning-Technology.pdf

Transportation plays a critical role in building community resilience to disasters. The latest federal transportation legislation requires transportation agencies to incorporate resiliency into their transportation planning process. However, agencies like MPOs and emergency management authorities are short ofeffective tools to assess real-time disaster conditions and affected areas in order to make quick responses.

This project aims at developing a decision support system (DSS) that combines non-traditional, crowd-sourced big-data with traditional data (e.g. remotely sensed data, GIS, andstatistical data) to improve flood risk assessment and enhance transportation readiness for quick response decisions on disaster management.The project focuses on urban flooding. While not all urban flooding is severe enough to threaten lives and property loss, it is the small scale flooding events that reveal the vulnerable sites, segments, and sectors where major damages likely occur when severe storms and hurricanes hit.

The pilot study of the project will select Harris County, TX as a study area. Considering the reality that flooding events often ignore jurisdictional boundaries, the DSS to be developed will alsooffer scalable flexibility so that it can be applied to different spatial scales of geography, for instance, cities, counties, metropolitan areas, megaregions of multiple regions andstates. Phase 2 of the project next year will develop mobile apps to enable individuals to share flood information with each other for flood monitoring,real time reporting, and evacuation.

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Hints for deriving flood information

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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DEMAND FOR HIGH SPEED RAIL IN THE TEXAS TRIANGLE & BEYOND

An Alternative Approach to Analyzing Demand Potential for Travel by High Speed Rail in the Texas Triangle (#CM2-41)

Dr. Ming Zhang,
University of Texas at Austin

09/01/2018 - 05/31/2019

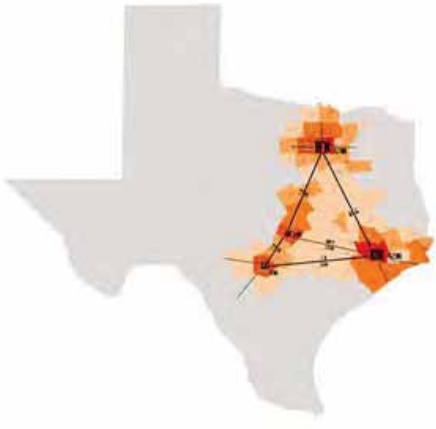
Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Ming-Zhang-Analyzing-Demand-Potential-for-Travel-by-High-Speed-Rail.pdf

TEXAS
The University of Texas at Austin

Existing studies on high-speed rail (HSR) demand analysis in the United States mostly relyon the conventional procedure of four-step travel demand modeling with data assembled from constituent MPOs along the proposed HSR routes. This approach likely produces forecasting outcomes favored towards business-as-usual, car-dominated trends given that HSR has never existed in modern times in US megaregions.

The proposed project explores an alternative approach to analyzing aggregate mobility demand for high-speed travel in the Texas Triangle megaregion, simulating shares of HSR modes under different transportation policy assumptions, and drawing implications for long term strategic infrastructure investments in the Texas Triangle.

The project plans to carry out five tasks. Task 1 reviews the literature related to HSR studies and travel demand analyses for non-existenttravel options. Literature on modal competition and complementarity among air, HSR, and telecommunications will also be reviewed. Task 2 assembles data on 1) inter-metropolitan travel by air and surface transportation from such sources as Bureau of Transportation Statistics and National Household Travel Surveys,and 2) projections of population growth and economy/income changes for up to the year of 2050 at the county-level in the Texas Triangle. Task 3 calibrates an aggregate model of mobility demand as a function of population, economy, income, and travel time-/travel-money budgets. Task 4 estimates future mobility demand in terms of total person-miles of travel (PMT) as well as HSR shares under different policy scenarios. Task 5 reports analysis results, compares outcomes of different scenarios, and draws implications for long-range infrastructure investments in the Texas Triangle.



The Texas Triangle (source: America 2050)

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EXECUTIVE SUMMARY *- updated MARCH 2019*

USDOT Tier-1 University Transportation Center

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METROPOLITAN CONGESTION FINDING SOLUTIONS

Researchers at the University of Pennsylvania's School of Design are initiating a major research effort to identify and demonstrate solutions to one of the major challenges facing America's metro-politan regions and megaregions today: managing extreme and growing levels of metropolitan traffic congestion.

The highways, city streets, and transit systems of America's metropolitan regions have congealed. Unless effective measures are taken to address traffic congestion, these places —which are home to the vast majority of US population, employment and GDP, and nearly all of the nation's innovation and tech economy— will experience declining productivity. They will also experience reduced quality of life and an increase in a range of other ills, including rising social inequity, carbon pro-duction and incidence of chronic diseases.

It's not an accident that all-news radio stations from Philadelphia to Los Angeles have traffic and weather reports every 10 minutes, 24 hours a day. This is because traffic and weather are the only two features of daily life that are vitally important to everyone living in these places, but are also seen as "acts of God", beyond the control of mere mortals.

Our goal of our work over the decades has been, and remains, to advance transformational infrastructure projects that can be implemented across political boundaries to achieve greater equity, economic competitiveness, and respond to climate change. This project will build our previous work, which has explored the potential to expand and modernize infrastructure systems and to introduce new systems as well.

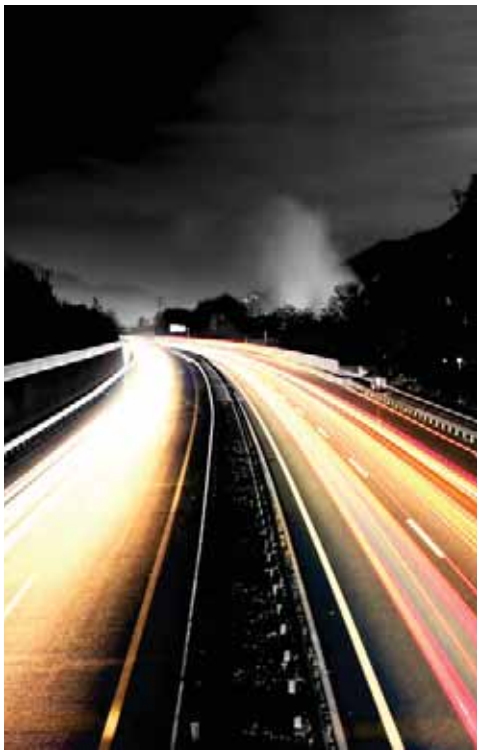
Decongesting America's Cities, Regions and Megaregions: Finding Solutions to Metropolitan Congestion (#CM2-42)

Dr. Marilyn Taylor, Dr. Bob Yaro
University of Pennsylvania

09/01/2018 - 08/31/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Robert-Yaro-Marilyn-Taylor-Metropolitan-Congestion.pdf

Penn
University of Pennsylvania



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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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RURAL AND LOW DENSITY COMMUNITIES EQUITY RUBRIC

Application of an Equity Rubric that Defines Purpose and Need for Rural and Low Density Communities In Megaregions (#CM2-44)

Dr. Carol Lewis,
Texas Southern University

10/01/2018 - 09/30/2019

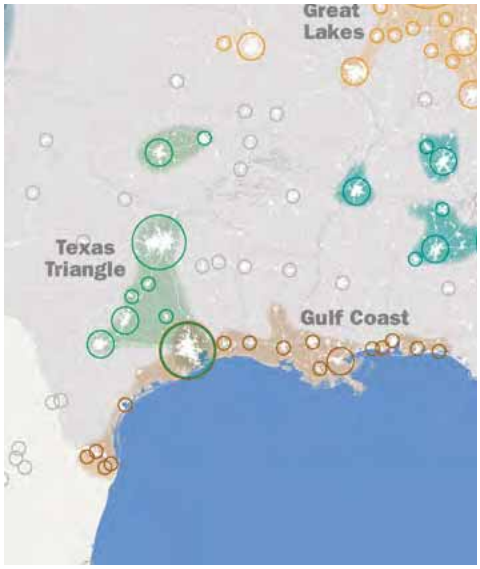
Project Information Form: http://sites.utexas.edu/cm2/files/2018/06/Year-3-Carol-Lewis-Equity-Rubric.pdf

TSU
TEXAS SOUTHERN UNIVERSITY

Most often transportation plans focus on reducing congestion or improving safety meeting needs that are obvious and causing repetitive problems. Less obvious are the travel needs of people in low density or rural communities. Whether needing to make a work trip, address medical needs or other purposes, infrequent service does not promote the healthiest environments resulting in transit deserts. Improved access to better health related locations would enhance the lives of people suffering chronic diseases. In some cases, public transportation is available, but in sparse coverage or lifeline response providing only minimal service. In these cases, the community is not totally disconnected as occasional transit service is available, but it does not actually meet the residents' travel needs.

Community advocates often express concern that rural low income, ethnic and senior residents are inadequately considered in transportation planning and decision making. Federal process requires a statement of need or purpose in order to address consideration of financing for transportation improvements. Showing need where congestion or safety are not problems is often based on sociodemographic variables and lacks a convincing, well established process.

When transportation needs require crossing jurisdictional boundaries, additional challenges are created. The Texas Megaregion is anchored by the core triangle of Houston, Dallas, Austin/San Antonio. The triangle is supported by an extension west along IH10 toward Louisiana, leading to the Gulf Coast megaregion. Traveling west from Houston on the way to Beaumont are the several rural areas between the small towns of Baytown, Port Arthur and Nederland. This work will apply a previously developed rubric to assessment of travel purpose and need for the residents in this IH10 corridor.



Source: America 2050 Map

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

MEGAREGION MASS EVACUATION
SPATIOTEMPORAL TRAFFIC CHARACHTERISTICS

The 2017 evacuation of Hurricane Irma has been referred to as the largest evacuation in the history of the nation with approximately 6.5 million Floridians under mandatory or voluntary evacuation orders (Marshall, 2017; Cook, 2017). The goal of this research is to build upon the prior knowledge and expand the scientific understanding of traffic flow principles governing large scale emergency evacuations. The Hurricane Irma evacuation data will be collected from 510 SunGuide locations, from across the state for the 34-day period encompassing the Hurricane Irma Evacuation.

The SunGuide program gathers roadway data from across the State of Florida. Traffic counts and average travel speeds are reported every hour and archived for analysis. The analysis of the temporal characteristics of the evacuation phenomenon in this research will determine when Floridians decided to evacuate and how the evacuation progressed over time.

The spatial analysis component will assess the evacuation origins and destinations, from across the state. In doing so, this research seeks to develop a better understanding of the travel flow patterns and traffic flow principles during the evacuation process.

In addition, the association between the evacuation and the path of the hurricane will be investigated as well as the association between the evacuation and the proximity to the coast.

Lastly, the relationship between detector volumes and evacuation a nnouncement/information timing will be investigated. This knowledge can be leveraged to better plan for and respond to other large scale evacuations as well as identify best practices moving forward.

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CM² Cooperative Mobility for Competitive Megaregions

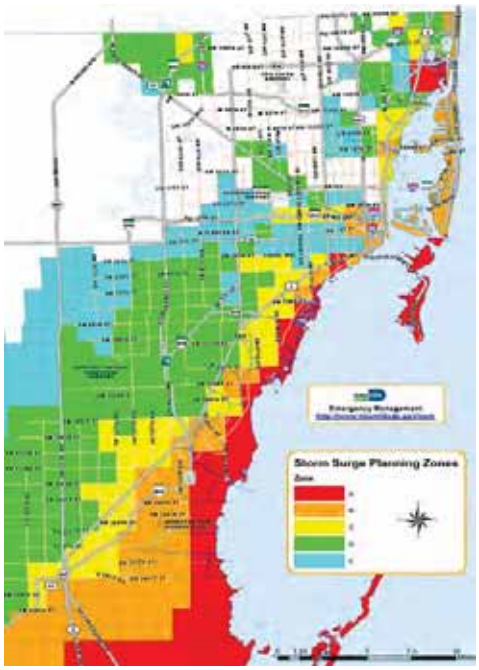
Spatiotemporal Traffic Characteristics of Megaregion Mass Evacuation (#CM2-45)

Dr. Brian Wolshon,
Louisiana State University

08/01/2018 - 09/30/2019

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Brian-Wolshon-Spatiotemporal-Traffic-Characteristics.pdf

LSU
LOUISIANA STATE UNIVERSITY



Hurricane Irma Evacuation

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MEGAREGION EVACUATION TRANSPORTATION NETWORKS

Robustness of Transportation Networks under Megaregion Evacuations (#CM2-46)

Dr. Brian Wolshon,
Louisiana State University

08/01/2018 - 09/30/2019

Project Information Form: http://sites.utexas.edu/cm2/files/2018/06/Year-3-Brian-Wolshon-Robustness-of-Transportation-Networks.pdf

Evacuations, the movement of people from locations of imminent or potential danger to locations of safety, are a key element to protect the health and safety of the public in the event of disasters. Different factors related to the evacuation process could affect how fast an at-risk area is evacuated. These include overall demand, departure time, driving behavior, weather conditions, etc.

However, the characteristics of the at-risk area (and the surrounding areas) could also have a significant impact. The most obvious of these is the available network capacity. Additional factors such as network topology and population density can also be associated to network performance. Therefore, this research will identify and investigate possible associations between network performance with the network characteristics (e.g. available capacity, network topology), and surges of demand such as that observed in an evacuation.

Traffic simulation will be used to assess different scenarios using a small network for proof-of-concept and later scaled to megaregions. Based on the analysis, a network robustness measure will be developed with consideration of all the above mentioned characteristics. In addition, this research will investigate applications of the robustness measure in CAV environments.

Anticipated contribution to practice include the development of a robustness measure that can be implemented by emergency managers and transportation planner in general. In addition, this measure could serve for planning and collaboration among different jurisdictions across a megaregion in the event of large scale-evacuations.

LSU Louisiana State University

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EXECUTIVE SUMMARY *- updated MARCH 2019*

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CM2

Cooperative Mobility for Competitive Megaregions

Global Transportation Megaregion/Megaproject Best Practices Manual (#CM2-47)

Dr. John Landis,
University of Pennsylvania

10/01/2018 - 01/31/2020

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-John-Landis-Global-Transportation-Megaregion.pdf

BEST PRACTICES MANUAL MEGAREGION TRANSPORTATION

As global metropolitan areas grow bigger and more interconnected, the importance of inter-metropolitan transportation infrastructure investments grows in tandem. These investments are becoming increasingly essential to connecting labor markets, moving goods, spurring innovation, and under some circumstances, reducing greenhouse gas emissions.

There is much to be learned about "best practice" megaproject development from history, but even more to be learned from current practice abroad. There have been a number of recent works on this subject, most notably books and articles by Bent Flyvbjerg et.al. (2003) and Harry Dimitriou et.al. (2005, 2011, 2013).

This research project will build on prior research in the U.S., the U.K., and Europe to produce a "transportation megaregion/mega-project best practices manual" aimed at regional and metropolitan transportation planners and decision-makers primarily in the U.S. The proposed manual will include a series of 10-12 recent roadway, rail, airport, and seaport megaproject case studies from around the world including, where relevant, the U.S. Rather than taking a critical or analytical perspective, the proposed volume will be oriented around identifying a series of robust case studies and best practices that can be applied in multiple contexts and situations.

Each case study will follow the same format, identifying: (i) how and why each project was initiated, and by whom; (ii) how each project's physical, environmental, market, and financial feasibility was assessed; (iii) how each project was financed; (iv) how the project construction process was managed; (v) issues that emerged once the project was completed and entered service; (vi) whether the project is on target to achieving its goals; and, (vii) critical takeaways for U.S. transportation planners and funders.

Penn
University of Pennsylvania

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EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

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CM2

Cooperative Mobility for Competitive Megaregions

MEGAREGIONAL FREIGHT FINANCIAL POLICY AND PLANNING

Freight Megaregional Planning and Financial Policy (#CM2-48)

Dr. C. Michael Walton,
University of Texas at Austin

09/01/2018 - 05/31/2020

Project Information Form:
http://sites.utexas.edu/cm2/files/2018/06/Year-3-Michael-Walton-Freight-Megaregional-Planning-and-Financial-Policy.pdf

TEXAS
The University of Texas at Austin

There are different transportation funding mechanisms available, such as freight corridor tolling, taxes on vehicle-miles travelled (VMT), and the motor fuel tax. The last of these is by far the most prevalent, but currentresearch within CM² (Harrison & Loftus-Otway, not yet published) is establishing that fuel-tax revenue per freight VMT is declining. Part of this decline is linked to inflation, and part is linked to improvements in truck fuel economy, similar to the improvements in passenger fuel economy.

This research project examines the role of freight planning at the megaregion level. It builds on prior research within the UTC, whiche stablished how important megaregions are in inducing freight trips (Steiner, Yaro, & Zhang, net yet published). This project will look at how that influence can be leveraged to ensure state transportation financing remains stable, and the opportunities that exist in state and regional freight planning. By examining freight infrastructure funding from the megaregion perspective, this project will contribute to the body of knowledge necessary to protect, preserve, and expand freight infrastructure within megaregions.

This project will adapt existing travel demand models to provide insights into the revenue generated from various transportation funding mechanisms. Adapting existing models will make the procedure more practical, and create a methodology that can be applied to megaregions that this project does not initially consider. Having a model capable of addressing questions related to transportation financing issues atthe megaregion scale will provide a valuable research tool for other projects. By using a megaregion perspective, this project will create a planning tool relevant for regional economic analysis.

Union Pacific Train Daily Volumes, 2003

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