Multi-Modal Modelling: BIM Templates for Sustainable Hub Design and Networks

1. BACKGROUND
Optimizing a multi-modal transit hub can accomplish a dual mission: making a journey more enjoyable, while bringing 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 generally frame the level of comfort and satisfaction riders have with transit service (Transit Design Guide, 2017). The integration of transit modes, seamless modal transfers, and operational ease contribute to the sustainability and efficiency in planning of a multimodal hub.

2. RESEARCH QUESTIONS
A Building Information Model (BIM) 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. The spatial structure and layout plan of a multimodal transit hub includes modes of transit organized across levels and surfaces, in order to optimize pick-up and drop-off points, transfer passengers across levels and surfaces, in order to optimize transit hub includes modes of transit organized (Transit Design Guide, 2017). The integration of transit modes, seamless modal transfers, and operational ease contribute to the sustainability and efficiency in planning of a multimodal hub.

2.1 User-based Scenarios (UBS)
The four spatial scenarios explored conditions for multimodal transit hub. These scenarios demonstrate the complex networks for transfer and relay of goods and people between points of source and destination.

2.2 UBS Component Assemblies in BIM
- 2.1 Airport to Core City
  Multimodal hub to connect flight passengers from the airport to core city areas via ground, air or subsurface modes.
- 2.2 Freight Hub Terminal
  Loading and unloading of goods from container ships at ports into boats on the inland waterway network, freight railway, or trucks.
- 2.3 Inter-City Junction
  Tunnelling and tubing connected towns between metropolitan cities.
- 2.4 Autonomous Hub
  Unmanned air taxis, drones, passenger vehicles and freight trucks create an autonomous network of conveying goods and people.

3. BIM Component Properties
New BIM families added to the archive were identified for multiple properties of autonomous vehicle, industrial equipment and service bots, such as, sensor detection, autonomous vehicles, service bots and equipment.

3.1 Autonomous vehicle
- Autonomous vehicles
- Service bots
- Equipment

3.2 Autonomous Vehicle
- Autonomous vehicles

3.3 Container Ship
- Container ship

4. RESEARCH CONTENTS
The proposal aimed to further previous specialized research into the application of Building Information Modeling (BIM) technology for megaregion mobility. The planning methodology for smart infrastructure and multimodal transit hub design was explored through case studies of multimodal transportation hubs in various locations to determine performance metrics and how they could be incorporated into the BIM model.

4.1 Research Framework
This research task explored the RDPT (Identification of Fixed Objects in Public Transport) model and characterized each condition based on topography, accessibility, stop places and points of interface. These characteristics were tabulated under a performance index, how they corresponded with transportation metrics, and what parameters would be particularly useful for multimodal hub design using BIM families.

4.2 A zone-based programmatic relationship was determined in the four conditions, termed as User-based Scenarios (UBS). These typical conditions include express transit between airports and city core, freight transfer from ships at port to freight boats, rail or trucks, inter-city rapid transit, and autonomous transportation via surface-level or elevated infrastructure, or via air.

5. ROADMAP
The BIM template was continuously reiterated through the design and curation of advanced custom 3D parametric components. These new additions to the template were categorized as vehicles, transportation infrastructure, landscape and recreational elements, points of interface and other entourage including people. 4D time based assemblies necessary for transfer nodes could start to include 5D cost implications and 6D schedule design of robust multimodal time-tables. Thus, specific BIM properties and information related to sensors, cameras, and material assembly was detailed for particular special families of autonomous vehicle and container ship. In this manner, the UBS performed as a supplement to the template database structure by visualizing the systems-diagram of each UBS through organization of the BIM families and their potential for better performance in multimodal transportation.

6. TIMELINE
Research for this proposal began in fall of 2016. Creation of the proposed multi-modal transit template began in fall of 2017. This along with user based scenarios and advanced parametric continuously developed through the summer of 2018, after which it immediately disseminated and then integrated with a spring of 2019 design studio.

ACHIEVEMENTS
1. User-based Scenarios (UBS)
The four spatial scenarios explored conditions for multimodal transit hub. These scenarios demonstrate the complex networks for transfer and relay of goods and people between points of source and destination.

2. UBS Component Assemblies in BIM
- 2.1 Airport to Core City
- 2.2 Freight Hub Terminal
- 2.3 Inter-City Junction
- 2.4 Autonomous Hub

3. BIM Component Properties
New BIM families added to the archive were identified for multiple properties of autonomous vehicle, industrial equipment and service bots, such as, sensor detection, autonomous vehicles, service bots and equipment.

4. RESEARCH FRAMEWORK
This research task explored the RDPT (Identification of Fixed Objects in Public Transport) model and characterized each condition based on topography, accessibility, stop places and points of interface. These characteristics were tabulated under a performance index, how they corresponded with transportation metrics, and what parameters would be particularly useful for multimodal hub design using BIM families.

4.1 Research Framework
This research task explored the RDPT (Identification of Fixed Objects in Public Transport) model and characterized each condition based on topography, accessibility, stop places and points of interface. These characteristics were tabulated under a performance index, how they corresponded with transportation metrics, and what parameters would be particularly useful for multimodal hub design using BIM families.

4.2 A zone-based programmatic relationship was determined in the four conditions, termed as User-based Scenarios (UBS). These typical conditions include express transit between airports and city core, freight transfer from ships at port to freight boats, rail or trucks, inter-city rapid transit, and autonomous transportation via surface-level or elevated infrastructure, or via air.

5. ROADMAP
The BIM template was continuously reiterated through the design and curation of advanced custom 3D parametric components. These new additions to the template were categorized as vehicles, transportation infrastructure, landscape and recreational elements, points of interface and other entourage including people. 4D time based assemblies necessary for transfer nodes could start to include 5D cost implications and 6D schedule design of robust multimodal time-tables. Thus, specific BIM properties and information related to sensors, cameras, and material assembly was detailed for particular special families of autonomous vehicle and container ship. In this manner, the UBS performed as a supplement to the template database structure by visualizing the systems-diagram of each UBS through organization of the BIM families and their potential for better performance in multimodal transportation.

6. TIMELINE
Research for this proposal began in fall of 2016. Creation of the proposed multi-modal transit template began in fall of 2017. This along with user based scenarios and advanced parametric continuously developed through the summer of 2018, after which it immediately disseminated and then integrated with a spring of 2019 design studio.
RESEARCH AGENDA

1. BACKGROUND

There are few academic studies or professional programs focusing on the development and implementation of megaregional models. It is also a big challenge in the process of building such kind of models. 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.

This research extends the spatial scale of a spatial planning model from region to megaregion, which accommodates 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.

2. RESEARCH OBJECTIVES

This research will develop an analysis framework for a GIS-based transportation planning model at megaregion level. It uses Texas Triangle as an empirical case to demonstrate the model development and implementation.

3. RESEARCH CONTENTS

This research extends the spatial scale of our regional planning model from a single metropolitan area to megaregion. It puts together economic input-output model, a spatial allocation model, and a travel demand model to trace spatial economic impacts in the megaregion.

This so-called Megaregion Transportation Planning Model (MTPM) will also endogenize traffic flows including both passenger flows and freight deliveries with an explicit representation of the transportation network. The capacity of the existing model will be significantly extended to handle the much larger and more complex passenger and freight flows in megaregions with a newly designed analysis zones. The functions of the regional model will also be redeveloped or updated to address more complex land use and transportation issues, like development pressures, peak load pricing or congestion tolls, and dynamic traffic patterns, etc.

4. RESEARCH FRAMEWORK

This MTPM model is an integration of the inter-metropolitan and intra-metropolitan planning model for passenger and freight movement. It is capable of estimating economic impacts of a policy, plan, or project in a megaregion.

5. ROADMAP

The research project reviews the state of practice of megaregion transportation studies on passenger and freight movement at various spatial levels. It also examines the existing transportation databases, including those publicly available and ready-to-use transportation datasets.

The research develops an analytical framework for a GIS-based megaregion transportation planning model (MTPM) that estimates the intra-regional and inter-regional passenger and commodity flows, and then loads the passenger cars and commodities carried by trucks to a megaregion roadway network together based on the identified existing transportation databases and sophisticated transportation analysis mechanisms.

It implements the analytical framework to estimate passenger and truck flows in Texas Triangle.

6. TIMETABLE

The research team has developed a work plan that consists of the eight tasks to be accomplished over a period of 24 months. Four tasks are supposed to be finished in the first year, including literature review, the development of an analytical framework, development of GIS functions, the documentation of findings.

ACHIEVEMENTS

- Literature Review and Synthesis of the State of Practice
  1) Review existing studies on regional passenger and freight movement;
  2) Identify available transportation datasets, including those publically available and ready-to-use datasets at different spatial levels;
  3) Examine existing analytical methods for estimating passenger and freight flows.

- Development of an Analytical Framework for Estimating Both Passenger and Truck Flows in a Megaregion
  1) Construct a passenger trip module for both intraregional and interregional passenger movement in megaregions.
  2) Construct a freight module for both intraregional and interregional freight movement in megaregions.
  3) Develop a user equilibrium transportation model to load interregional and interregional passenger and freight onto a roadway network.
  4) Extend the regional impact analysis model and incorporate policy analysis to the analytical framework.

- Development of GIS Functions to Support Transportation Modeling Practices and Facilitate Policy Analysis for Megaregions
  1) Develop GIS functions for transportation data processing.
  2) Construct GIS analytical functions for travel demand modeling in megaregions.
  3) Create impact analysis function and decision support functions for policy analysis.

- Documentation of Research Findings and Preparation of Research Report.
Inter-regional Resilience: The Role of MPOs in Natural Disaster Planning and Response Preparation

RESEARCH AGENDA

1. BACKGROUND & MOTIVATION

By 2050, two thirds of the nation’s population is projected to live in a megaregion. Much of the argument for beginning to develop policies at the megaregional scale is to increase economic competitiveness of connected metropolitan areas. Any positive or negative shock to an economic system will be felt by all connected pieces. Economic engines and large populations in metropolitan areas are vulnerable to increasing numbers of natural disasters. As people continue to be drawn to populous metropolitan regions for employment opportunities and quality of life, the nation is developing concentrations of potentially vulnerable populations to natural disasters. Transportation plays a critical role in increasing economic competitiveness of a region. The resilience of transport infrastructure impacts how quickly after a natural disaster people and goods can resume operations and how deeply economies are impacted. This research focuses on the role of MPOs in integrating adaptive and mitigative practices to enhance spatial resilience of regions, and subsequently megaregions. It also considers an introductory case study of megaregions surrounding the Gulf of Mexico to hurricane disaster events.

2. RESEARCH QUESTIONS

- How are different infrastructure types in a transport system impacted by natural disasters?
- What role can MPOs play in planning resilient transportation systems?
- How do disaster risks and threats vary across megaregions?
- What adaptive or mitigative resilience strategies are currently used by MPOs?
- How resilient are counties in the Gulf Coast megaregion in terms of population and total employment indicators?

3. RESEARCH CONTENTS

The report includes a two-page resilience profile for each megaregion and a case study. The two-pagers combine information from multiple sources to create a reference tool for future related research. The case study provides a look into measuring resilience at the megaregion level and explores different mechanisms for similar types of future analyses.

4. RESEARCH FRAMEWORK

Since 2010, FHWA and has partnered with state DOTs and MPOs to fund pilot programs related to integrating resiliency strategies into transport system asset management, project selection, and operations. Since the FAST Act, FHWA and FTA implemented regulations to reflect these priorities in long-range visioning as well as during project prioritization process. This research explores the role of transportation infrastructure during, before, and after natural disasters. It also delineates how different types of infrastructure are affected by natural disasters and explains how this issues threatens the economic competitiveness of a megaregion. As natural disaster events become more prevalent and increasingly severe, MPOs and state DOTs must work together to ensure that transport systems can recover and facilitate the necessary flow of goods and flow of people. As many megaregions are located along coastal cities, this will become increasingly important in the coming years.

5. TIMETABLES

Project duration: September 2018 – August 2019

Core Pieces of the Report

1. Transport System Risks and Vulnerabilities

The transportation system plays many roles before, during and after a natural disaster event. This report explores the important role of a functioning transportation system throughout a natural disaster event and delineates how different types of natural disasters impact transport infrastructure. The resilience of transport systems can facilitate the recovery of communities in regions suffering from disaster events.

2. Megaregional Resilience Profiles and the role of MPOs

The report includes a two-page megaregion profile that identifies population information, the number of transport agencies at various organizational levels in the megaregion, most common natural disasters. It also provides an overview of FHWA-pilot programs that MPOs or state DOTs within the megaregion have participated in, the outcome of these projects, and highlights the work of a specific MPO as a best practice example. It also provides a map of the megaregion as originally depicted by the Regional Plan Association and identifies the location of MPOs within the megaregion. The two-pagers are meant to serve as reference guides for future megaregional research on disaster resilience.

3. Spatial Resilience

The final chapter of our report conducts a case study of megaregions that border the Gulf of Mexico and the resilience of two indicators to hurricane disasters: population and total employment. The study evaluates the 2005 hurricane season for the Texas Triangle and Gulf Coast megaregions, and the 2004 hurricane season for the southern Florida megaregion. The study identifies counties that had not recovered pre-disaster levels of employment or population by 2017 and explores potential explanations for the phenomena identified.

MPO projects from FHWA Resilience Pilot Programs:

In the 2013 – 2015 cycle, CAMPO received a grant to participate in a pilot program for Vulnerability Assessments and Adaptation Options. In the 2018-2020 grant program, HPGC received a grant for a pilot program to Integrate Resilience and Durability to Extreme Weather into agency operations.
1. BACKGROUND & MOTIVATION

As the American population grows and becomes ever more interconnected across jurisdictional boundaries, public entities need a streamlined, predictable framework of laws to make effective policy.

The federal system of the United States emerged from a hotly contested debate about the appropriate degree of federal control over the states, a debate which continues into the government we have today. Notably absent in the federal constitution, however, is any enumerated protection for the powers of local governments. Due to this lack of constitutional safeguard, the delegation of power to these smaller governments are found only in state constitutions.

In addition to the delegation of powers, which varies by state, nearly every state constitution has provisions targeting “special” or “local” legislation (known as bracketing). That is, legislation targeted at one particular area or jurisdiction in the state, requiring state law to affect all members of a given class equally within the state. Provisions targeting multiple jurisdictions have variated, and states have managed to circumvent court rulings effectively.

Transportation law in many states has become highly inconsistent between jurisdictions, making cooperation more challenging. In transportation, bracketing has been used to restrict the activities that transit agencies can conduct, and some argue stifles efficient multimodal transportation options.

Combining maps of areas that we are traveling within and between megaregion areas. Providing options to facilitate a multi-modal commuting choices in planning and funding, by reducing bracketing could provide multiple transportation agencies opportunities to more easily collaborate.

2. RESEARCH QUESTIONS

This project will determine the extent to which these provisions impede their applicability to transportation planning, and explore legal arguments that could be made in the future to use these provisions to prevent governmental bodies from roads creation projects. The project will:

- Review provisions within the Texas Triangle, Cascadia and Mid-Atlantic megaregions' state constitutions, legislation and regulations, and litigation surrounding bracketing.
- Compare Texas laws to other states and regions to map breadth and effectiveness in restricting efficient multimodal mobility options.

Prepare a comprehensive review of the effects of different levels of restriction.

Conduct a critical legal analysis of case law on bracketing.

Developing recommendations for effective megaregional multijurisdictional planning.

Legal and policy recommendations

Juridical recommendations for interpreting provisions to facilitate smart transportation management

Develop suggestions for how issues could be reconciled legislatively.

3. TIMELINE

Project duration: September 2018 – August 2019

- Research

Findings from Cascadia

- Washington and Oregon have limited case law on bracketing.
- Article II, Section 28 of the Washington Constitution prohibits private or special laws.
- Only counties with >150,000 people has held a reasonable classification.
- The SCW has found population thresholds are rational, for example a statute prohibiting construction of baseball stadiums in counties over a million people was found to be permissible, despite only one county exceeding this threshold, King County.
- The SCW has found population thresholds are rational, for example a statute prohibiting construction of baseball stadiums in counties over a million people was found to be permissible, despite only one county exceeding this threshold, King County.
- The SCW has found population thresholds are rational, for example a statute prohibiting construction of baseball stadiums in counties over a million people was found to be permissible, despite only one county exceeding this threshold, King County.
- The SCW has found population thresholds are rational, for example a statute prohibiting construction of baseball stadiums in counties over a million people was found to be permissible, despite only one county exceeding this threshold, King County.
- The SCW has found population thresholds are rational, for example a statute prohibiting construction of baseball stadiums in counties over a million people was found to be permissible, despite only one county exceeding this threshold, King County.
An Anatomy of Megaregional Process
-- Case Study of the Texas Triangle

BACKGROUND
The Texas Triangle is geographically encompassed by the metropolitan areas of Houston, Austin/San Antonio, and Dallas/Fort Worth. Among the eleven megaregions initially reported from the continental U.S., the Texas Triangle has generated, arguably, the most controversy concerning whether the Triangle is simply a geometric coincidence or an integrated agglomeration. Fifteen years have passed since the initial identification of the Texas Triangle. Major changes in demographic, economic, and socio-political environment have taken place during this time period. This study aims to improve understanding of megaregions by interpreting megaregion as a process revealed by empirical data.

IMPLICATIONS

1. Interactively Agglomerating

County population density: Triangle counties are becoming denser and metros are growingly merged.

2. Networked Flowing

Strengthening economic linkage among Triangle metros revealed by freight and passenger movements and super commuting.

3. Territorial Re-sorting

There is a strong Triangle adherence suggested by the migration pattern.

4. Competitive Co-Producing

There is a trend of growing complementarity among the Triangle metros in their economic base sectors while competition also remains.

5. Identity Forming

“The Texas Triangle”, one section of Missouri Pacific’s premier name services, “Sunshine Special” in 1936, from St. Louis and Memphis to link Dallas, Fort Worth, Houston, Austin, and San Antonio.

“Texas Triangle” now probably better known as the tough road trip facing NBA teams against Mavericks, Rockets, and Spurs. The culture identity of the Texas Triangle megaregion remains to be built.
**Bike Georgetown**

**Bike Planning & Funding for Small Cities in Metropolitan Suburbs**

A CM²-Match Project for Tech Transfer and Community Services

**BACKGROUND**

Small communities across the country are aiming to improve their cycling and walking environments to provide a better quality of life for residents. However, they often face greater challenges to cycling than large cities. This is especially true of small Texas communities in metropolitan suburbs. Georgetown, TX is about 30 miles north of Austin, and is home to approximately 63,000 people (2017). The city partnered with the University of Texas at Austin in 2016/2018 to create a full bicycle master plan.

**METHOD AND PROCESS**

The project team engaged with the Georgetown community extensively through public workshops, online surveys, and neighborhood intercept surveys. The team led stakeholder meetings with City and County staff and representatives of regional and state agencies, and conducted field investigations. In addition, the team completed a SWOT analysis, 12 case studies of best practices, and 11 topical reports on bicycle level of stress analysis, crash analyses, cost estimates, funding study, and other issues.

**SWOT ANALYSIS**

A Strengths, Weaknesses, Opportunities, and Threats analysis was conducted based on information gathered from public engagements and field investigations.

**Vision Statement**

Georgetown will have a safe, well-connected bicycle network that is accessible to all ages, abilities, and backgrounds, supports the local economy, and promotes a bicycle friendly culture.

**Goals**

1. **Safety**
2. **Connectivity**
3. **Enhance Equity**
4. **Support the Economy**
5. **Foster Bicycle Culture**

**Objectives**

Five sets correspond to the five goals.

**Plan and Bicycle Treatment**

It is not feasible nor economical to provide bicycle treatment on all streets, roadways, and intersections. The plan achieves the most safety, connectivity, and broad benefits with limited resource requirements.

The essential elements of the proposed system can be characterized using the “5-4-3-2-1” framework: 5 types of bicycle infrastructure, 4 sets of critical connections, 3 closed bicycle loops, 2 corridors in central Georgetown, and 1 central core in the downtown district.

Five bicycle infrastructure treatments: off street paths, physically protected bike lanes, buffered bike lanes, striped bike lanes, and sharrows.

**Implementation: The 5 Es**

- **Engineering**
  - Adopt a Complete Streets policy
  - Adopt NACTO guidelines in manuals
  - Educate City engineers in bicycle facility design
  - Partner with bike advocacy groups
  - Encourage a bicycle advisory committee
  - Aim at a Bicycle Friendly Community Enforcement
  - Educate Policy officers about bicycle safety
  - Enhance local laws/regulations for safety evaluation
  - Create a bike/ped. monitoring program
  - Implement performance measures

- **Vision Statement**
  - Design intersections that prioritize protected bicycle and pedestrian crossings
  - Increase awareness of and respect for cycling through education and enforcement
  - Build bicycle corridors to connect all neighborhoods with the city center and major places
  - Overcome barriers at critical crossing points to provide connectivity in the City and beyond
  - Balance the needs and interests of cycling groups and the general public; Improve SR2S

- **Goals**
  - Establish Bike plan
  - Build bicycle corridors to connect all neighborhoods with the city center and major places
  - Adopt a Complete Streets policy
  - Enhance local laws/regulations for safety evaluation
  - Develop bicycle friendly codes; Pursue a Bicycle Friendly Community Designation

- **Objectives**
  - 5 E’s

- **Cost Estimates and Funding for Top Ten Projects**

- **Funding Sources**
  - Grants
  - Applications
  - Efforts

- **STUDENT TEAM MEMBERS**

**AUSTIN**

The University of Texas at Austin

**Summer Forum 2019**

- **PIs**: Dr. Ming Zhang, Dr. Evan Scott

- **Gra(s)**: Evan Scott

- **AUSTIN**

- **THE UNIVERSITY OF TEXAS AT AUSTIN**

- **CM²**

- **Summer Forum 2019**

- **PIs**: Dr. Ming Zhang, Dr. Evan Scott

- **Gra(s)**: Evan Scott
1. INTRODUCTION

Weather, socioeconomic attributes, and urban form have all been identified as factors that are related to cycling. However, existing research has not focused on particular urban form variables, geographies, or on geographies that are particularly similar to one another. Studies also often combine geographies that have similar levels of cycling, such as the Netherlands, rather than areas with lower cycling rates.

We reviewed predictors for cycling identified for developing and developed countries. For the former, the literature on predicting cycling in China and Latin America has found a weak connection between population density and certain other urban form measures and cycling rates (Zhao, 2013. Cervero et. al., 2009). One possible explanation is a uniformly high level of densities and mix of uses in these geographies. The significant factors, however, include proximity to transit, street density, bike infrastructure, etc. Moreover, demographics, particularly gender, are also found to be related cycling rates (Trang et al., 2012).

Contrary to the above evidence, studies from developed countries have found a positive correlation between population density and cycling (Parker et al., 2011).

Men are also more likely to cycle in most developed countries, but the significance level varies depending on the study and location (Pucher & Buehler, 2010.) Most studies we found also identified a significant positive relationship between bike infrastructure and cycling rates. (Parker et al., 2011). Moreover, the presence of sloping terrain has been well documented as a negative predictor of cycling (Ma & Dill, 2015.)

Because of the focus on single or similar geographies of previous studies, it is not clear how broadly applicable these results are to other geographies. Our studies attempt to fill this gap through a large-scale metropolitan-level analysis covering two countries, the United States and Mexico.

2. DATA

The Household and Individual data for the U.S. was obtained from the U.S. Census Bureau, chiefly from the American Community Survey (ACS) and Public Use Micrdata Sample (PUMS) datasets. The Mexican data was obtained from the 2015 Mexican Intercensal Survey provided by the national statistics agency.

Metroplitan areas are identified separately in each geography. We identified major cities and their surrounding suburbs in Mexico using the Mexican Population Council’s National Urban System, and utilized the Metropolitan Statistical Area (MSA) for the U.S. Data is primarily from the 2010 Census of the U.S. and the 2009 Economic Census of Mexico, complemented by other sources such as the NOAA global station climate data.

3. METHODS

We modeled the factors and their associations with cycling using logistic regression. The response is binary (cycling/ non-cycling), the explanatory variables include individual, household, and urban form factors. We chose only several urban form indicators due to the sample size of metropolitan areas (100 for each country), with the help of Principal Component Analysis.

To better capture the effects of the variables studies, we incorporated random effects in the models, including random intercepts by metropolitan area and random slopes for different housing types by metropolitan area. The housing type is regarded as a proxy for local built environment.

Table 1: Random effect model results for the U.S. and Mexico

<table>
<thead>
<tr>
<th>Variable</th>
<th>U.S.</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Age (Age)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live in Apartment</td>
<td>0.326</td>
<td>0.367</td>
</tr>
<tr>
<td>Live in Multi Family</td>
<td>0.250</td>
<td>0.271</td>
</tr>
<tr>
<td>Household size</td>
<td>0.020</td>
<td>0.026</td>
</tr>
<tr>
<td>Age/100</td>
<td>0.062</td>
<td>0.074</td>
</tr>
<tr>
<td>Income/100</td>
<td>0.017</td>
<td>0.015</td>
</tr>
<tr>
<td>Employment</td>
<td>0.034</td>
<td>0.024</td>
</tr>
<tr>
<td>Education</td>
<td>0.028</td>
<td>0.034</td>
</tr>
<tr>
<td>Urban form</td>
<td>0.038</td>
<td>0.035</td>
</tr>
<tr>
<td>SSR</td>
<td>0.043</td>
<td>0.024</td>
</tr>
<tr>
<td>SSR.1</td>
<td>0.036</td>
<td>0.031</td>
</tr>
<tr>
<td>SSR.2</td>
<td>0.033</td>
<td>0.035</td>
</tr>
<tr>
<td>SSR.3</td>
<td>0.031</td>
<td>0.035</td>
</tr>
</tbody>
</table>

Achievements

1. DEMOGRAPHICS AND SOCIO-ECONOMICS

We found that men consistently cycle more than women in both countries, with the gender gap larger in Mexico than in the U.S. While the elderly had low likelihood of cycling in both countries, in Mexico, the middle-aged were the most likely to cycle, creating an inverted-U relationship, while in the U.S. cycling consistently declined with age. In Mexico, cycling consistently declined with education, while in the U.S. those with at least a bachelor’s degree were most likely to cycle. Finally, in the U.S. service industry workers were most likely to cycle, while in Mexico agricultural workers were the most likely to cycle. This too may reflect urban form, with agricultural jobs more likely to be located in peripheral areas of a metropolitan area, and service jobs often concentrated in the core and in key hubs.

2. URBAN FORM

We found population density strongly associated with cycling in ways that are consistent across both countries. In the U.S., cycling is most likely to be a commuting mode where density is medium. By contrast, the suburbs are associated with lower cycling rates. Moreover, the random intercepts capture unobserved differences in urban form and climate data.

3. DISCUSSION

To understand the differentiated effects of population density on cycling in different geographies, our analysis is necessarily limited to identify what modes substitute cycling as the density changes, such as walking, public transit, or private vehicles. To extend the value of large sample metropolitan analysis, we also recommend incorporating greater granularity in urban form, i.e. the neighborhood form. Finally, if metropolitan-level cycling infrastructure data could be incorporated, which is at present not available, it would shed considerable light on its role across different metro areas and countries.

References


Figure 1: Random Slopes for housing types by metropolitan area. (Top: the U.S. Bottom: Mexico. Labels: names of metropolitan areas.)
Urban form, travel supply and commute behavior of the low-income workers: evidence from US and Mexico

RESEARCH AGENDA

1. BACKGROUND

Housing and transportation are household's two largest types of expenditures in most cities and regions. Due to pervasive income inequality and increasing housing costs, low-income residents often face particular challenges related to access to transportation (Suárez et al., 2016; Blumenberg and Manville, 2004).

Moreover, urban structure and transportation supply strongly influence low income's choice of travel in the US, even the poorest commuters in most cities generally do. Relatively low-density urban form, extensive highway systems, and unreliable transit make car travel necessary (Blumenberg and Manville, 2004). Nevertheless, low-income people are more transit-dependent compared with wealthier people and may select to live in transit-rich city centers (Glaeser et al., 2008). In high-density cities like New York City, in contrast, low-income people either live in the outer suburbs or urban fringes to reduce transportation costs (Suárez et al., 2016).

Despite a large amount of studies on the commute behavior of low-income populations (Suárez et al., 2016; Hess, 2005; Guerra, 2017; Hu and Wang, 2017), studies comparing variations between metropolitan and countries on commute strategies of the poor remains rare. Filling up this research gap sheds light on how national urban and transportation land use policies may shape the outcomes of low-income workers.

2. DATA AND MEASUREMENTS

In this study, we examine commute mode choice and commute times of low-income workers as a function of metropolitan form, road supply, and the individual attributes of commuters in the largest metropolitan areas using data from the American Housing Survey and Microdata Sample (PUMS) One Year Data (2012-2015) and the 2015 Mexican Intercensal Survey.

We use three criteria (Table 1) to define the low-income workers:
- National poverty line approach: Defined as households which have at least one person being employed, but are still below the national poverty line.
- Bottleneck approach: Defined as households in the 20 percent bottom of all the households in two national data sets.
- Metro bottom bottleneck approach: Defined as households in the 20% bottom of all the households in every metropolitan area (considering the variations in economic development in different regions).

We only report results using the third method, Table 2 demonstrates the definitions and descriptions of urban form, transport supply and commute variables.

3. METHODS

Four separate logistic models are conducted to examine the correlation of urban form and the commute behavior of the low-income commuters in two countries.

- Commute mode models: two multinomial logistic models of commuting behavior, which regards the mode choice of the working poor in two countries as a function of variations in commuting distance and socio-economic attributes (the category “others” is excluded in the model).
- Commute time models: two ordinal logistic models making commute taking time as a function of travel mode choice, urban form and socio-economic factors.

With most of urban form measured at the metropolitan level, we report cluster standard errors. We run models with and without car ownership to account for its endogeneity with other variables.

Table 1 Three approaches to define low-income workers

Table 2 Data descriptions

Table 3 Selected regression results

Note: results without parentheses are results without car ownership. Only results with significant lower than 0.1 are shown. + shows positively related to the variable, - shows negatively related to the variable. Results American. Gender, marital status, education. Income seasonality and car ownership (Reference: Single family) factors are not shown in the model.

Selected Reference

- HUI, L. & LANG, L. 2017. Housing location choices of the poor: does the mode choice of the working poor in two countries as a function of variations in commuting distance and socio-economic attributes (the category “others” is excluded in the model).
The Northeast Megaregion Transportation Planning and Investment Simulation (NEMR-TP&IS) Model

BACKGROUND

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 28 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.

1st & 2nd-YEAR PROGRESS

The first two years of work were focused around five sets of tasks: (i) building appropriate zone systems and populating them with available activity and survey data; (ii) developing highway and transit networks incorporating accurate LOS information; (iii) developing current and future (Year 2030) trip generation rates and totals by purpose and geography; (iv) developing robust trip distribution models; and (v) using national and metropolitan travel survey data to develop baseline mode share totals. All of these activities make use of TransCad modeling and data integration procedures.

3rd-YEAR RESEARCH PROGRAM

Work during the remainder of 2019 will involve developing multi-modal multi-facility traffic assignment procedures; testing the effects of new megaregional and metro-level facilities and investments on future travel patterns and facility use; exploring the potential impacts of new facilities and services on metropolitan economies and real estate markets; and developing TransCad modeling procedures to enable local MPOs to use the NEMR-TP&IS model for their own planning purposes.

### Three Complementary Modeling Geographies

<table>
<thead>
<tr>
<th>System Elements</th>
<th>Megaregional Model</th>
<th>4 Super-metro Models</th>
<th>National Freight Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>162 County-based Zones Purpose: HHR, HBR, NIH Models: Highway, Amtrak, commuter rail, inter-city bus, air</td>
<td>Uses NCHRP 356 method to estimate zone-based Productions and Attractions for HHR, HBR, NIH trips based on household demographics, auto ownership, and total and retail employment.</td>
<td>Separate gravity models for each trip purpose and super-metrom.</td>
<td>Updates 2012 FAF commodity flows based on 26 census O/D growth and projected population growth of destination zones.</td>
</tr>
<tr>
<td>Trip Generation</td>
<td>Single gravity model for each trip purpose.</td>
<td>Separate gravity models for each trip purpose and super-metrom.</td>
<td>Uses 2017 National Household Transportation Survey data to identify primary, secondary and tertiary mode shares by origin type, trip purpose, and trip length.</td>
</tr>
<tr>
<td>Trip Distribution</td>
<td>Uses 2017 National Household Transportation Survey data to identify primary, secondary and tertiary mode shares by origin type, trip purpose, and trip length.</td>
<td>Uses 2017 National Household Transportation Survey data to identify primary, secondary and tertiary mode shares by origin type, trip purpose, and trip length.</td>
<td>Most commodities types are tied to a single mode. For those that are not, regression models of mode shares based on origin zone location and trip length.</td>
</tr>
<tr>
<td>Mode Share</td>
<td>All-origins by mode and trip purpose based on fastest time.</td>
<td>All-origins by mode and trip purpose based on fastest time (one transit transfer allowed).</td>
<td>All-origins by mode and trip purpose based on fastest time (truck) and shortest path (rail).</td>
</tr>
<tr>
<td>Route Assignment</td>
<td>Allowed by mode and trip purpose based on fastest time.</td>
<td>Allowed by mode and trip purpose based on fastest time (one transit transfer allowed).</td>
<td>Allowed by mode and trip purpose based on fastest time (truck) and shortest path (rail).</td>
</tr>
</tbody>
</table>

### An Augmented 4-Step Modeling System

- **Step 1: Trip Generation**
- **Step 2: Trip Distribution**
- **Step 3: Mode Share**
- **Step 4: Route Assignment**

### Origin Zone & Trip Purpose - Top Mode Share

<table>
<thead>
<tr>
<th>Origin Zone &amp; Trip Purpose</th>
<th>Top Mode Share</th>
<th>2nd Mode Share</th>
<th>3rd Mode Share</th>
<th>4th Mode Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD &lt;1 mile HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Taxi</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD &lt;1 mile HBSchool</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Taxi</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD &lt;1 mile HBOther</td>
<td>Bike-ped</td>
<td>Local Bus</td>
<td>Car</td>
<td>Car</td>
</tr>
<tr>
<td>CBD &lt;1 mile HBMedical</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
<td>Car</td>
</tr>
<tr>
<td>CBD 1-3 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Local Bus</td>
<td>Taxi</td>
</tr>
<tr>
<td>CBD 1-3 miles HBSchool</td>
<td>Subway/Trolley</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 1-3 miles HBOther</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
<td>Subway/Trolley</td>
</tr>
<tr>
<td>CBD 1-3 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Local Bus</td>
<td>Car</td>
</tr>
<tr>
<td>CBD 3-5 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 3-5 miles HBSchool</td>
<td>Subway/Trolley</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 3-5 miles HBOther</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
<td>Subway/Trolley</td>
</tr>
<tr>
<td>CBD 3-5 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Local Bus</td>
<td>Car</td>
</tr>
<tr>
<td>CBD 5-10 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 5-10 miles HBSchool</td>
<td>Commuter Rail</td>
<td>Car</td>
<td>Local Bus</td>
<td>Subway/Trolley</td>
</tr>
<tr>
<td>CBD 5-10 miles HBOther</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Local Bus</td>
<td>Subway/Trolley</td>
</tr>
<tr>
<td>CBD 5-10 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Local Bus</td>
<td>Car</td>
</tr>
<tr>
<td>CBD 10-15 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 10-15 miles HBSchool</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 10-15 miles HBOther</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 10-15 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 15-20 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 15-20 miles HBSchool</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 15-20 miles HBOther</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 15-20 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 25-30 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 25-30 miles HBSchool</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 25-30 miles HBOther</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 25-30 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 35-50 miles HBW</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 35-50 miles HBSchool</td>
<td>Bike-ped</td>
<td>Car</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 35-50 miles HBOther</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
<tr>
<td>CBD 35-50 miles HBMedical</td>
<td>Car</td>
<td>Bike-ped</td>
<td>Commuter Rail</td>
<td>Local Bus</td>
</tr>
</tbody>
</table>

### Future-casting

- **Megaregional Model**
- **Metro Models**
- **National Freight Model**

<table>
<thead>
<tr>
<th>Projections and Alternatives</th>
<th>Megaregional Model</th>
<th>Metro Models</th>
<th>National Freight Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add new links and nodes as needed to represent new services.</td>
<td>Add new links and nodes as needed to represent new services.</td>
<td>Add new links and nodes as needed to represent new services.</td>
<td>Add new links and nodes as needed to represent new services.</td>
</tr>
<tr>
<td>Plot mode share percentages around current shares.</td>
<td>Plot mode share percentages around current shares.</td>
<td>Plot mode share percentages around current shares.</td>
<td>Plot mode share percentages around current shares.</td>
</tr>
</tbody>
</table>

### Remaining Issues

- How to incorporate pricing and congestion sensitivity into mode choice/share model?
- How to represent new transportation service types in mode share calculations?
- How to represent new transportation service types in mode share calculations?

### Assumptions

- How to represent new transportation service types in mode share calculations?
Determining Purpose and Need for Vulnerable Communities in the Megaregions

1. BACKGROUND

Rural and low density area residents in the Texas Megaregion (Houston, Dallas, Austin/San Antonio) are challenged with meeting travel needs. These residents are inadequately considered in transportation planning and decision making. Work, medical, shopping, recreation, and other trip purposes may be difficult. Federal process mandates a statement of need or purpose in order to address consideration of financing for transportation improvements. Displaying need where congestion or safety are not problems often lacks a convincing, well-established process. Additional challenges are created when transportation needs require crossing jurisdictional boundaries.

2. RESEARCH OBJECTIVE

This work will develop a rubric that assesses vulnerability and can be applied to decision making. The case study is US 290 corridor connecting the Megaregion cities, Houston and Austin.

3. STUDY PURPOSE

The intent is to better connect residents to:

- Jobs
- Transportation Options
- Health Care and Health Maintenance
- Recreation and Entertainment
- Social Contacts

4. METHODOLOGY

- Designate interstice counties.
- Assess socio-demographic variables by block group.
- Identify poverty level.
- Conduct a case study on the two most vulnerable block groups.
- Calculate percent of income spent on transportation.
- Develop rubric.

4. FINDINGS’ HIGHLIGHTS

- There are 34 vulnerable block groups within the study area.
- The block group with the highest poverty rate was in Bastrop County at 44%.
- There were 23 grocery stores and 21 medical facilities in the study area.
- 9 of the 23 grocery stores were inside a vulnerable block group.
- There is only one public transit provider in the corridor.
- Public transportation is a tremendous void in the megaregion communities.
- Improved public transportation access is necessary and desirable for interstice communities to travel within and to proximate triangle cities.

THE RUBRIC

The Rubric is a composite vulnerability value designed to include as a variable in decision making in a planning process. The value must be applied to a specific project for evaluation such as an intercity bus route, transit center or park and ride that would facilitate travel by enabling residents of several non-urban communities to gather for transport.

<table>
<thead>
<tr>
<th>Block Group</th>
<th>County</th>
<th>Percent Minority</th>
<th>State Minority Mean</th>
<th>Percent Non-English</th>
<th>State Non-English Mean</th>
<th>% of Total Income</th>
<th>State Total Income Mean</th>
<th>Vulnerable Block Group Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bastrop</td>
<td>64</td>
<td>3.0</td>
<td>38.0</td>
<td>33.0</td>
<td>3.1</td>
<td>19.0</td>
<td>10.0</td>
</tr>
<tr>
<td>2</td>
<td>Bastrop</td>
<td>48</td>
<td>2.3</td>
<td>18.0</td>
<td>15.0</td>
<td>0.5</td>
<td>14.0</td>
<td>1.0</td>
</tr>
<tr>
<td>3</td>
<td>Bastrop</td>
<td>30</td>
<td>2.1</td>
<td>12.0</td>
<td>10.0</td>
<td>0.3</td>
<td>28.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

REFERENCES

- Bureau of Labor Statistics. [Retrieved 10/15/18](https://data.bls.gov/timeseries/)
Multimodal Demand Analysis for the Texas Triangle

**RESEARCH AGENDA**

1. BACKGROUND

Multiple National Household Travel Surveys have shown that private vehicles dominated intra- and inter-megaregional travel in the United States, a travel pattern that is not efficient from both the individual and the societal perspective. An efficient mobility supply for megaregions aims to achieve multi-modality that optimizes the combination and utilization of different modes (automobile, rail, bus, and air) for megaregional passenger and freight movement.

This paper presents a case study of the Texas Triangle to simulate future scenarios in which changes in system performance (e.g., rail operating speed), demographic dynamics, and travelers' attitude may result in a more or less balanced modality split in megaregions.

2. RESEARCH QUESTIONS

- What are the composition of travel modes in the Texas Triangle?
- How would the emerging of HSR change the future travel market?

This study would assist future long-range transportation planning in the Triangle. The goal of the study is to investigate how traditional modes would perform with the impacts of HSR.

3. RESEARCH CONTENTS

This study utilizes the mode choice model from National Cooperative Rail Research Program Report 4. Household attributes from NHTS 2017 (long-distance trips/50-500 miles) in Texas are inputs for the mode and model choice processes are calculated from an excel spreadsheet.

The study also extrapolates the system performance for the Texas Triangle and calculates indicators (total household tours and person tours) to have a better sense of the travel demand within the region.

4. RESEARCH FRAMEWORK

We have developed a number of socio-economic and psychological scenarios and explored how mode shares fluctuate under different scenarios. (see table on the right)

Scenario 1 is the base scenario where there are no changes occurred to the future transportation system while scenario 2 imagines the emerging of HSR. Scenario 3 catches the demographic changes in the Triangle from 2012 to 2017, and we assume that the changes will continue. Scenario 4 is the opposite of scenario 3. Pessimistic case (Scenario 5) assumes that all people have negative attitudes for rail while optimistic scenario tells an antithetical story.

By investigating the coefficient behind the mode choice model, it also helps planners understand important factors in shifting people away from driving.

5. SCENARIO DESIGN

### Table 1: List of scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>No changes to the future transportation system</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>Assumes the future transportation system will change</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>Assumes the future transportation system will change, and the demographic changes in the Triangle from 2012 to 2017</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>Assumes the future transportation system will change, and the demographic changes in the Triangle from 2012 to 2017, and the changes will continue</td>
</tr>
<tr>
<td>Scenario 5</td>
<td>Assumes the future transportation system will change, and the demographic changes in the Triangle from 2012 to 2017, and the changes will continue, and the pessimistic case</td>
</tr>
</tbody>
</table>

### Table 2: List of parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>Personal car ownership</td>
</tr>
<tr>
<td>Bus</td>
<td>Public bus ownership</td>
</tr>
<tr>
<td>Rail</td>
<td>Public rail ownership</td>
</tr>
<tr>
<td>Air</td>
<td>Public air ownership</td>
</tr>
<tr>
<td>P</td>
<td>Person-oriented parameters</td>
</tr>
<tr>
<td>D</td>
<td>Demographic parameters</td>
</tr>
</tbody>
</table>

### Table 3: List of indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode Share Outputs</td>
<td>The share of auto-mobile is about 80% in no-business case, and rail is the lease favorable method because of its poor service system. Introducing HSR would significantly improve the rail ridership and divert a large proportion of drivers to public-transport. The current demographic change is positive for rail and air. Meanwhile, psychological factors have heavier influence on modal shifts.</td>
</tr>
</tbody>
</table>

**ACHIEVEMENTS**

1. Mode Share Outputs

The share of auto-mobile is about 80% in no-business case, and rail is the lease favorable method because of its poor service system. Introducing HSR would significantly improve the rail ridership and divert a large proportion of drivers to public-transport. The current demographic change is positive for rail and air. Meanwhile, psychological factors have heavier influence on modal shifts.

2. Future Travel Demand

Based on the metrics from long-distance NHTS Texas trips, long-distance person-tours are expected to grow from 269 million to 392 million by 2035. Both household-tour and person-tour estimations still need validating.

3. Remarks

When compared with European countries, the modal shares seem optimistic. The KITE model developed by Frei et al(2010) indicate that the long-distance (70 kilo-meters) rail shares for train are 10% for Germany, 28% for Switzerland and 22% for Czech Republic.

It is unrealistic to predict that the HSR would prompt changes in rail ridership to European level. Our region itself has a number of issues to deal with.

First and foremost, the authorities in the Triangle should take into account the dependency of car in the region and promote education addressing this issue.

Next is the lack of incentives for such change within transportation agencies and general public. Initiating major state-wide project is under scrutiny especially after SH-303, and public-led HSR construction would have many problems to overcome.

A successful marketing strategy from the government is necessary to reverse public attitudes on public funded infrastructure constructions. The utilization of HSR could lead to a sustainable future where less the region would have less VMT or Greenhouse Gas emissions.
Collaboration Between Metropolitan Planning Organizations at the Megaregional Scale – National Survey of MPOs

1. BACKGROUND

Metropolitan Planning Organizations (MPOs) are the most significant and durable institutions operating at the metro-regional scale and they have specific planning and implementation powers designated by federal and state governments. If megaregional planning promises to be more than just a new construct, its meaning and potential should be recognized by MPO managers. To evaluate the current significance and potential for megaregional planning, we analyze the results of a summer, 2018 survey of 377 designated MPOs, This survey is complete and garnered a nearly 57 percent response rate.

2. RESEARCH QUESTIONS

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 in 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?

3. RESEARCH CONTENTS

This work aims to establish the degree to which a key set of regional institutions, MPOs, understand megaregional concepts and actively plan at this geographic scale. The survey results provide evidence from the directors and senior staff of MPOs about current and degrees of collaboration. The results also highlight what the respondents view as major barriers to increased collaboration at the megaregional scale.

4. RESEARCH FRAMEWORK

Spatial fix arguments for the megaregional scale require demonstrating that human, environmental, socio-economic and infrastructural interactions are significantly concentrated in a megaregional spatial geometry. As the megaregional discourse has progressed, analysts homed-in on a relatively discrete set of relationships including infrastructure systems, economic linkages, settlement patterns and land use. It is this domain where MPOs currently constitute the most salient institutional actors. This survey project asks a detailed set of questions about types and degrees of collaborations between MPOs at the megaregional and other scales.

5. TIMETABLE

This survey of MPOs was completed between April and June of 2018. The results are now being analyzed in more detail the determine how the sample and respondent characteristics might influence the results.

Achievements:

Basic Survey Response Characteristics: 214 responses, 211 completed - 56.7% response rate

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>74.06%  157</td>
</tr>
<tr>
<td>No</td>
<td>25.94%  55</td>
</tr>
<tr>
<td>Total</td>
<td>100%    212</td>
</tr>
</tbody>
</table>

Is your MPO area within, or adjacent to, one of the nine U.S. mega-regions designated in the above map?

Answer % Count

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not very important</td>
<td>26.77%  34</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>33.67%  42</td>
</tr>
<tr>
<td>Important</td>
<td>27.56%  35</td>
</tr>
<tr>
<td>Very important</td>
<td>12.60%  16</td>
</tr>
<tr>
<td>Total</td>
<td>100%    127</td>
</tr>
</tbody>
</table>

In light of the other planning and implementation priorities of your MPO, how would you rank the importance of your collaborations with other MPOs and/or other organizations to address transportation and related planning issues at the mega-regional scale?

Answer % Count

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>42.27%  55</td>
</tr>
<tr>
<td>No</td>
<td>57.73%  71</td>
</tr>
<tr>
<td>Total</td>
<td>100%    96</td>
</tr>
</tbody>
</table>

In your view, what are the major barriers to more extensive collaboration with other MPOs and/or other organizations to address transportation and related planning issues at the mega-regional scale?

Answer % Count

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>37.74%  46</td>
</tr>
<tr>
<td>No</td>
<td>62.26%  76</td>
</tr>
<tr>
<td>Total</td>
<td>100%    57</td>
</tr>
</tbody>
</table>

What topics and/or project areas at the mega-regional scale have been a focus of your collaborations with other MPOs and/or other organizations in your mega-region?

Answer % Count

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Development issues</td>
<td>29.55%  35</td>
</tr>
<tr>
<td>Environmental issues</td>
<td>25.82%  31</td>
</tr>
<tr>
<td>Housing and land use planning</td>
<td>22.19%  27</td>
</tr>
<tr>
<td>Air pollution issues</td>
<td>12.59%  15</td>
</tr>
<tr>
<td>Transportation issues</td>
<td>21.32%  26</td>
</tr>
<tr>
<td>Social aspects</td>
<td>11.03%  13</td>
</tr>
<tr>
<td>Energy issues</td>
<td>4.55%   5</td>
</tr>
</tbody>
</table>

Are there sufficient funding resources for projects engage in more metropolitan scale collaborations at the megaregional scale?

Answer % Count

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>59.83%  73</td>
</tr>
<tr>
<td>No</td>
<td>40.17%  49</td>
</tr>
<tr>
<td>Total</td>
<td>100%    59</td>
</tr>
</tbody>
</table>

Are there specific funding sources to support joint projects at the megaregional scale between other MPOs and/or other organizations?

Answer % Count

<table>
<thead>
<tr>
<th>Answer</th>
<th>% Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>40.17%  49</td>
</tr>
<tr>
<td>No</td>
<td>59.83%  73</td>
</tr>
<tr>
<td>Total</td>
<td>100%    59</td>
</tr>
</tbody>
</table>

Figure 8. The National Highway System (EIS), 2006, Bureau of Transportation Statistics (BTS), 2007

University of Texas at Austin
PI: Michael Oden
GRA(s): Evan Scott

Summer Forum 2019

[End of document]
How Does Regional Transportation Governance and Capacity Influence Investment Outcomes? Creating a Robust Dataset for MPO Research

RESEARCH AGENDA

1. BACKGROUND
Regional and megaregional transport systems enable the economic and social interactions that make metro regions significant engines of growth and innovation. Governance of our regional scale transportation systems attracts limited attention from researchers, however.

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) coordinate transportation 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. Members and staff work together on MPO committees to advance plans for the region. To receive federal transportation dollars, the MPO must approve a short-range Transportation Improvement Plan, or SRTP, a plan program identifying federally funded projects in the region—and a long-range plan on which the program is based. The MPO must travel demand models to anticipate its future needs and evaluate potential investments.

2. RESEARCH QUESTIONS
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, in asks whether transit agencies and airport interests are represented on the board, what MPO committees exist for non-auto modes, and what their travel model capabilities are. It also asks whether MPO decisions on flexible federal funding favor transit or not.

3. RESEARCH CONTENTS
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.

4. RESEARCH FRAMEWORK
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 necessary variables, the database can be used to investigate indicators of board composition, travel representation, airport representation, and advancement of travel demand modeling.

5. ROADMAP
The research is collecting robust baseline data on MPO governance. All relevant information is assembled by consulting MPO websites and information on board membership, as well as data on transit operators from the National Transit Database. In addition, data from the Government Accountability Office has been collected to identify flexible funding transfers favoring transit in metropolitan areas. Finally, data on transit operators MPO participation will be merged with flexible funding data and used to explore and model the relationships between transit operator involvement in MPO decision-making and relative extent of flexible funding transfers.

ACHIEVEMENTS

1. MPO Board Composition History and Hypothesis
The first MPOs were designated in the 1960s with the beginning of comprehensive, coordinated, and continuous regional transportation planning in the Federal Aid Highway Act of 1962. Every urban region with more than 50,000 people is required to have an MPO, and there are currently 404 MPOs across the country. MPOs control regional access to federal transportation project funding, but the governance structures of MPOs vary substantially. This research hypothesizes that MPOs with voting or committee representation for non-automobile modes will provide more flexible funding for non-automobile projects. To test this hypothesis, the research has focused so far on creating a first-of-its-kind comprehensive database of MPO governance structures.

2. Database Creation Process
The project explored the possibility of alternative methods—like surveys—for developing a robust baseline data on MPO research. Consulting MPO websites was preferred as the most viable option to assemble the wide range of available information. Along with the websites—MPO bylaws, MoUs, Long Range Transportation Planning report and modeling documentation were also reviewed. Further, for a more nuanced information such as voting structure, whether a transit agency is represented directly and/or indirectly on the MPO board, modeling approach they follow, whether the agency participates through MPO technical advisory committees and other MPO committees, forums, and studies or activities.

3. Preliminary Results
With the MPO data already compiled in the database, it is possible to start looking at common trends. There appears to be a relationship between region population and board size. Very large boards (greater than fifty members) are common in the largest metropolitan areas (over a half million people). Most MPOs have transit representation in their voting boards. On aggregate level, transit comprises about 3.5% of the total voting seats. As might be expected, the vast majority of MPOs are using the classic four-step model; around half of MPOs develop their travel demand models in-house.

PRELIMINARY FINDINGS BASED ON 154 MPOS (~40%):

1973 Highway Act Requires MPOs that include elected officials

Megan Ryerson
UNIVERSITY OF TEXAS AT AUSTIN

Claudia Tangirala
Penn State

Megan Ryerson
UNIVERSITY OF TEXAS AT AUSTIN

Claudia Tangirala
Penn State

Preliminary Findings Based on 154 MPOS (~40%):
The Impact of Transportation Network Companies on the Texas Triangle

1. BACKGROUND
Transportation Network Companies (TNCs) like Uber and Lyft are relatively new forms of transportation in which online platforms are used to connect drivers to riders. In recent years these services have experienced explosive growth. Between 2016 and 2017 the number of rides took on Lyft's platform grew by 130%.1 Conservatively, TNC market penetration is estimated to have reached 24% in the United States as of 2018.2 Despite their explosive growth TNCs are still a significantly under researched form of transportation, particularly from the perspective of why people choose to use them. Moreover, very little is understood from an academic perspective about the differences between heavy users of TNCs and lighter users of TNCs.

2. RESEARCH QUESTIONS
This research focused on three research questions:
- How are people in Texas using Uber/Lyft?
- Why are people in Texas using Uber/Lyft?
- What are the characteristics of heavy TNC users?

3. RESEARCH FRAMEWORK AND METHODS
To better understand how TNCs are impacting the Texas Triangle megaregions we conducted a survey in the 4 largest metro regions in Texas (Austin, Dallas-Ft. Worth, Houston, and San Antonio). These are shown below. A survey was used because very little empirical data is available about TNC usage due to lack of data sharing.

The survey was conducted by the survey firm QuestionPro using their online platform. 250 responses were collected from each of the MSAs in Texas.

6. TIMELINE
This research has been completed as of May 2019. Future research will focus on the impact of other shared mobility services like e-scooters on urban transportation. This research is being submitted to a journal for publication.

7. References

Survey Results
From the panel survey we obtained 1000 complete responses and 983 valid responses. 71.44% of respondents were female and 28.56% were male. No single age category was dominant, but a plurality of users responded that they were between 36 and 45. About half of the respondents were white. The next largest demographic group was Hispanic/Latino (23.8%). Regarding income, 26.55% of respondents made less than $25,000 dollars last year, which was the largest single choice. The rest of the responses were fairly evenly distributed, except only about 4% of respondents made $150,000 or more last year. Exactly half of all respondents had less than a bachelor's degree. Finally, 87.69% of respondents reported that they have regular vehicle access.

User Segmentation
In order to understand the differences between heavy and 'normal' users we segmented the responses. We classified a heavy user as someone who used a TNC two times a week or more. As shown in Figure 2b we can see that 88.5% of users were normal users and 11.5% of users were heavy users. We then compared our survey results between the two groups.

Heavy users have much different patterns of use compared to normal users. Table 3 details the demographic differences between these types of users. Heavy users have a much greater preference for using these services during weekdays, as compared to normal users. 69.3% of heavy users use TNCs primarily on weekdays whereas normal users display opposite patterns of usage. About 29% of normal users use TNCs on work days and 63% of them use them on non-work days. Heavy users are far more likely to use TNCs for commuting purposes as shown in Figure 3.

In terms of demographics the differences between the two groups are displayed below in Table 3. We find that overall heavy users tend to be wealthier, somewhat more educated, and to have less vehicle access. Heavy TNC users are less white than normal users overall. Such a finding needs to be further explored in additional research and surveys and suggests an interesting direction of investigation.
AGENDA

1. BACKGROUND

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.

2. OBJECTIVES

• Synthesize useful and powerful walkability metrics that directly address the needs, resources, and perceptions of older people;
• Develop a concise typology of focused metrics that allow planners to effectively identify the barriers to walkability for seniors;
• Link neighborhood deficiencies identified by these metrics to specific policy and infrastructure solutions, allowing planners and seniors to advocate for targeted neighborhood changes.

3. APPROACH AND METHODS:

• 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;
• Identify, compare, and contrast major existing walkability indices and metrics, determining how well they include the elements of walkability that respond to senior needs and concerns and avoid those that create barriers to walkability for seniors;
• Conduct multiple focus groups with diverse seniors in the mega-region to assess their perceptions of neighborhood walkability;
• Develop a concise set of powerful metrics capturing the most relevant and important features of the built environment supporting walkability for diverse seniors;
• Link deficiencies in neighborhood walkability for seniors to actionable policies, improvements, and programs.

4. TIMETABLE:

Summer 2019 Completion

ACHIEVEMENTS

1. Literature Review

Many walkability metrics focus on the needs of younger travelers 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 travelers that seniors find difficult or frightening.

2. Focus Groups

We showed images of five different pedestrian environments to active seniors no longer in the work force in focus groups in Austin and San Antonio, asking what elements encouraged or discouraged walking. We began with the most varied and dense environment and ended with a very suburban area with no destinations and limited intersections and traffic. We show three of the five images below. We found: 1) important gender differences—men were far more likely to favor active environments than women; 2) serious concerns about both safety (falls, crashes) and security (crime, harassment) in all environments but particularly the most active; 3) fears that businesses and retail establishments indicated sketchy neighborhoods; 4) a general dislike of intersections and requests for traffic signals and heavily marked crosswalks at all intersections; 5) a sense that busy bustling places were for young people, posing too much danger to seniors; and, 6) substantial concern about any amount of auto or bike traffic (even if parked). We have completed all but two planned focus groups.

3. Missing the Mark

Many of the factors suggested by the literature were either not important to the seniors we interviewed or they placed a very different value on these pedestrian attributes. They were not concerned about destinations and were worried about the kind of land uses often recommended to encourage walking. They were critical of almost any intersection treatment, even if there were traffic lights (unlikely to be feasible for all intersections). They wanted extremely wide sidewalks unencumbered by other travelers but asked for somewhere to sit. They tended to see many amenities, from places to shop to attractive vegetation, as ugly or potentially dangerous (slips and falls and places for criminals to hide).
Weequahic Crossing
An Equitable Growth Plan for Newark NJ and the Newark Liberty International Airport (EWR)

1. BACKGROUND
Leading industries in the New York-New Jersey regional economy are increasing demand for airport services. The Port Authority & regional stakeholders seek to leverage EWR’s unique geography to create a world-class airport. This dual architecture and planning project aims to design a new landside terminal for Newark Liberty International Airport. It reactivates the isolated communities around the airport and promotes new economic opportunities for the city and its residents. It establishes an aerotropolis styled innovation district which converts underutilized land around the airport into multi-modal, pedestrian scaled mixed-use development.

2. Land Use & Design Concept

Current land use around EWR contains large parcels used mostly for parking and some airport support services.

Aligned with Kasarda’s Aerotropolis concept, rezoning contiguous areas to facilitate land-uses that host support activities, new office spaces and commercial activity promote diversified Aerotropolis-centric employment clusters. This dual architecture and planning project aims to design a new landside terminal for Newark Liberty International Airport. As previously introduced, this concept, the studio extended and abstracted the conceptual control lines to drive the form finding process of the design.

3. Transportation & Economic Growth

There is no pedestrian or bus access to the Airport Station and no direct rail or bus service between Lower Manhattan and EWR. Our proposal adopts the RPA’S Trans-Regional Express (T-ReX). On the eastern side of the railroad tracks, the headhouses are designed to process fast-moving regional traffic quickly whereas on the west side of the train tracks, they serve local traffic within the City of Newark. The Express Bus proposal addresses the lack of bus service between the new airport city, South Ward, Downtown Newark, and other major destinations. This Express Bus system is an extended local bus service more like BRT rather than a peak period commuter bus.

4. Landside Terminal Designs

This studio proposes two terminal-headhouse designs, each of which has its own benefits.

i. Oasis

The key idea of the Oasis design is to provide a connection between the Wequahic Park and the airside concourses with the landside terminal being the anchor of the airport city. Based on this concept, the studio extended and abstracted the conceptual control lines to drive the form finding process of the design.

ii. Triad

In the Triad Concept, the studio implemented some of the ideas from Utrecht Station in Amsterdam in order to allow passengers to seamlessly flow from Wequahic Crossing into the headhouse, making it a part of the local urban fabric. In the end, the final shape has three wings with a shared public space in the middle, known as the ‘vortex’.

5. Master Plan Concept

In both schemes, the area immediately surrounding the terminal buildings are defined with public spaces to be utilized by the community, and newcomers we aim to attract. Public markets, cafes, and beautiful landscapes occupy the space in front of the headhouse, creating an interactive town square that draws both community members and visitors passing through Newark airport. Intended to replace the underutilized industrial space along the west side of Frelinghuysen, south of the proposed headhouse, a large-scale mixed-use development will be constructed.

Effectively, this plan returns the street of Frelinghuysen to the people of Newark, turning an avenue of derelict and neglected space, into a center for activation, commerce and community engagement.

Design Proposals

1. Land Use & Transit Oriented Development

Identifying the most suitable land for redevelopment, the studio prepared concept diagrams to show how the character of Wequahic Crossing could evolve with sustained investment and new growth.

The studio proposes a dual-terminated transportation strategy based around (1) Efficient Headhouse Accessibility and (2) Enhanced Home-Work Connectivity for Local Residents.

2. Oasis Headhouse Terminal Designs

Central to this studio’s proposal is the development of a new, world-class landside terminal for Newark Liberty International Airport. As previously introduced, this landside terminal should consolidate the three existing terminals into one and be relocated to sit atop the Northeast Corridor Rail Line.

Co-locating the terminal with a rail headhouse will improve regional accessibility to the airport increasing rail use as a mode of airport access and egress.

Adoption of new technologies allow traveler flow and operational programs to be significantly simplified. As a result the future space needed per passenger is greatly reduced.

3. Master Plan

A large-scale mixed-use development will replace underutilized industrial space along the west side of Frelinghuysen, south of the proposed headhouse. These blocks will host residential, office and retail uses, connected by a 2,400ft linear pedestrian path, which weaves through the center of the blocks, away from the vehicular activity on Frelinghuysen. North of the headhouse, at the intersection of Frelinghuysen and Dayton, are a series of triangular blocks dedicated to institutional and innovation hub uses.

1. BACKGROUND

The 2019 studio builds upon the conclusions of the 2016 Rebooting New England studio which proposed the creation of a modern passenger rail network linking New York City to Boston, that would link all of New England's disinvested mid-sized cities to each other and to those two global cities. The 2016 studio proposed that a new inland high-speed rail right-of-way be created to link all these inland cities. This new route would also provide redundancy in this system when the current coastal route is threatened by sea level rise and storm surges as a result of climate change. The studio proposed that this rail network be used to underpin a broader economic development strategy for these places to the benefit of the entire New York-New England region.

The 2016 studio estimated that the proposed $100 billion rail investment could result in $500 billion to $1 trillion in economic benefits over a 40-year period, providing a 2.5:1 benefit-cost ratio. The Rebooting New England studio also proposed that the vast majority of necessary capital funds be provided by the federal government, most likely through debt financing. The current studio has not attempted to replicate this analysis or these recommendations. Instead, the 2019 studio focused on the feasibility of sided a new inland rail alignment between Hartford, Connecticut and Providence, Rhode Island.

2. RESEARCH FOCUS AREAS

The New Prospects for New England studio recognizes that to build a new inland rail right-of-way broad support will need to be garnered from Connecticut's residents. Therefore, itfocuses on the benefits that can be created for Connecticut separated into three key elements:

• It proposes two new alternative high-speed rail rights-of-way linking Hartford, and Providence; an inland alternative to the coastal route abandoned by the Federal Rail Administration in its 2017 NEC Future Tier I Environmental Impact Statement.

• It recommends how this new rail corridor could be integrated into the landscape of The Last Green Valley National Heritage Corridor in Eastern Connecticut, and the measures that could be taken to both mitigate its negative impacts and seize the economic opportunities it would create for the Heritage Corridor's communities and residents; and

• Finally, it outlines how the proposed high-speed rail line—and the proposed 35-minute travel times to both New York and Boston it would make possible—could transform downtown Hartford, Connecticut and repair some of the damage done more than half a century ago, when Interstate 84 and I91 were jammed through this historic urban center, and the city was cut off from the Connecticut River.

3. PRECEDENTS

The studio's key recommendations are based in part on precedents it observed in the North of England, where the UK government is investing more than $100 billion in high-speed rail links and the broader Northern Powerhouse economic development initiative to revitalize the region's left behind cities. The studio traveled to Manchester, England in February 2019 to meet with local officials and experts involved in the region's Northern Powerhouse economic development initiative. The studio witnessed the remarkable economic transformation already underway in Manchester, Liverpool, Leeds, and Sheffield, a transformation that began as soon as funds were committed to building the HS2 high-speed rail link between London, Manchester, and Leeds. The studio believes that a similar transformation could be achieved in Downtown Hartford and other New England cities as soon as commitments are made to the New York - Boston high-speed rail link.

While in England, the studio also visited the Peak District National Park to learn how the proposed Northern Powerhouse high-speed rail line and improved motorways will be sited in and around the Park. The studio also learned how new economic and tourism synergies are being created between the National Park and nearby urban areas.

ACHIEVEMENTS

1. Identifying Alternative Rail Alignments

The studio proposes two alternative high-speed ready rail alignments between Hartford and Providence; two capital cities which previously had no direct interstate or rail connection. One alignment runs through Willimantic, CT. It runs with the contours of the landscape which reduces costs by avoiding unnecessary tunneling and bridging. The second alignment runs through Storrs, CT and while it requires more tunneling this helps avoid impacts on the environment and historic buildings. This alignment also avoids the Soutpe Reservoir, Providence’s primary source of drinking water. A service plan was also produced by the studio.

2. Exalting Ecology

For high-speed rail to work for Connecticut it cannot just work for the cities and towns where the trains stop. High-speed rail must work for the landscape it travels through. The studio recommended a raft of growth policies and design interventions to protect the environment: an endowment to provide funding for conservation, technical planning assistance, and main street revitalization; complementary zoning to centralize development around stations and protect open spaces; public art; priority conservation areas; dynamic flooding design interventions; and animal crossings designed to attract all types of animals to use them.

3. Revitalizing Metropolitan Hartford

To harness the economic development that would occur in Hartford under speculation from the announcement of a new high-speed rail line the studio proposed a number of strategies. Supporting small cap, incremental development to infill parking lots would allow Hartford to change in a manner that would distinguish it from other New England cities and towns. Furthermore, tunneling the rail alignment under Hartford would allow the use of the historic Union Station, turning it into a multi-modal hub for residents. Finally, it is recommended that the L44 highway be moved to the other side of the Connecticut River, allowing Hartford to reconnect to it riverfront.