Summer Forum 2018

CM² Cooperative Mobility for Competitive Megaregions

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Regional Opportunities and Challenges for Transit Oriented Development
The Case of the Texas Triangle

INTRODUCTION

BACKGROUND

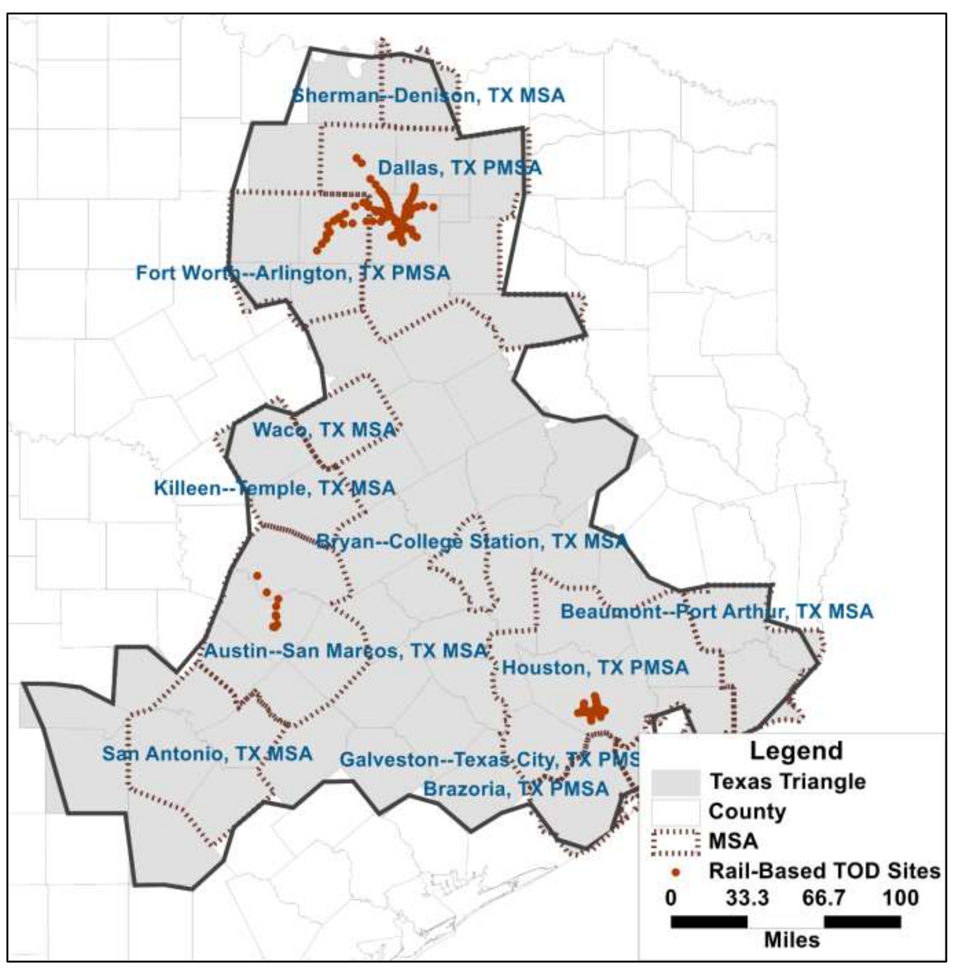
In the Texas Triangle, MPOs are actively exploring integrated transportation-land use strategies to tackle the problems associated with conventional car-oriented sprawl. Unfortunately, transit-oriented developments (TODs) have only been practiced locally by a limited number of communities and transit 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**.

RESEARCH TASKS

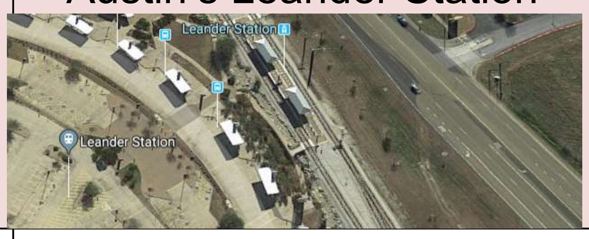
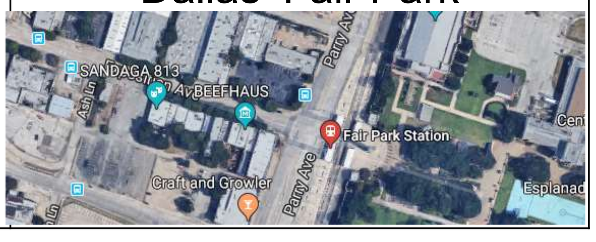
1. Summarize types and service characteristics of **transit systems** in the Texas Triangle.
2. Review **literature** on TOD to identify best practices at the regional and state level.
3. Design a **survey** of organizational practices and opinions on TOD implementation.
4. **Interview** key TOD stakeholders of the selected metropolitan regions.
5. Study **regulations** at all levels of government, especially as they pertain to transit-based **value capture techniques.**
6. Develop **TOD typologies** for potential and existing sites within the Texas Triangle.
7. Develop **TOD implementation strategies** focused on value capture techniques.

TOD SITES IN THE TRIANGLE



INVENTORY OF TEXAS TOD

An integral component to understanding the state of TOD in the Texas Triangle was understanding the types of TOD being developed and planned. Inventorying land use, formal plans, and transit types around all rapid transit stations, the following typologies were developed, each with its own **land use and scale, transit modes utilized,** and **characteristics of transit connections.**

TOD Typology	Texas Examples
Urban Core(s) ***(Rail-Based)*** 1 in Austin 4 in Dallas 12 in Houston	Houston's UH-Downtown 
Urban Core(s) ***(BRT-Based)*** 6 in Austin 11 in S Antonio	Austin's Republic Square 
Town Center ***(Rail-Based)*** 1 in Austin 4 in Dallas 3 in Houston	Dallas' Mockingbird 
Town Center ***(BRT-Based)*** 3 in Austin 3 in S Antonio	San Antonio's Ewing Halsell 
Neighborhood Center 33 in Austin 42 in Dallas 21 in Houston 9 in S Antonio	(Dallas') Downtown Plano 
Suburban 5 in Austin 15 in Dallas 3 in Houston	Austin's Leander Station 
Special Destination 5 in Dallas	Dallas' Fair Park 

CONCLUSION

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 120 TOD-ready sites remain underdeveloped. Most pressingly, agencies need direction on new and useful Texas value capture mechanisms—especially TIRZs and TRZs—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. Quality codes can both guide development to these sites and depoliticize the agonizing approval process reported by all parties for density-increasing TOD projects.

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.

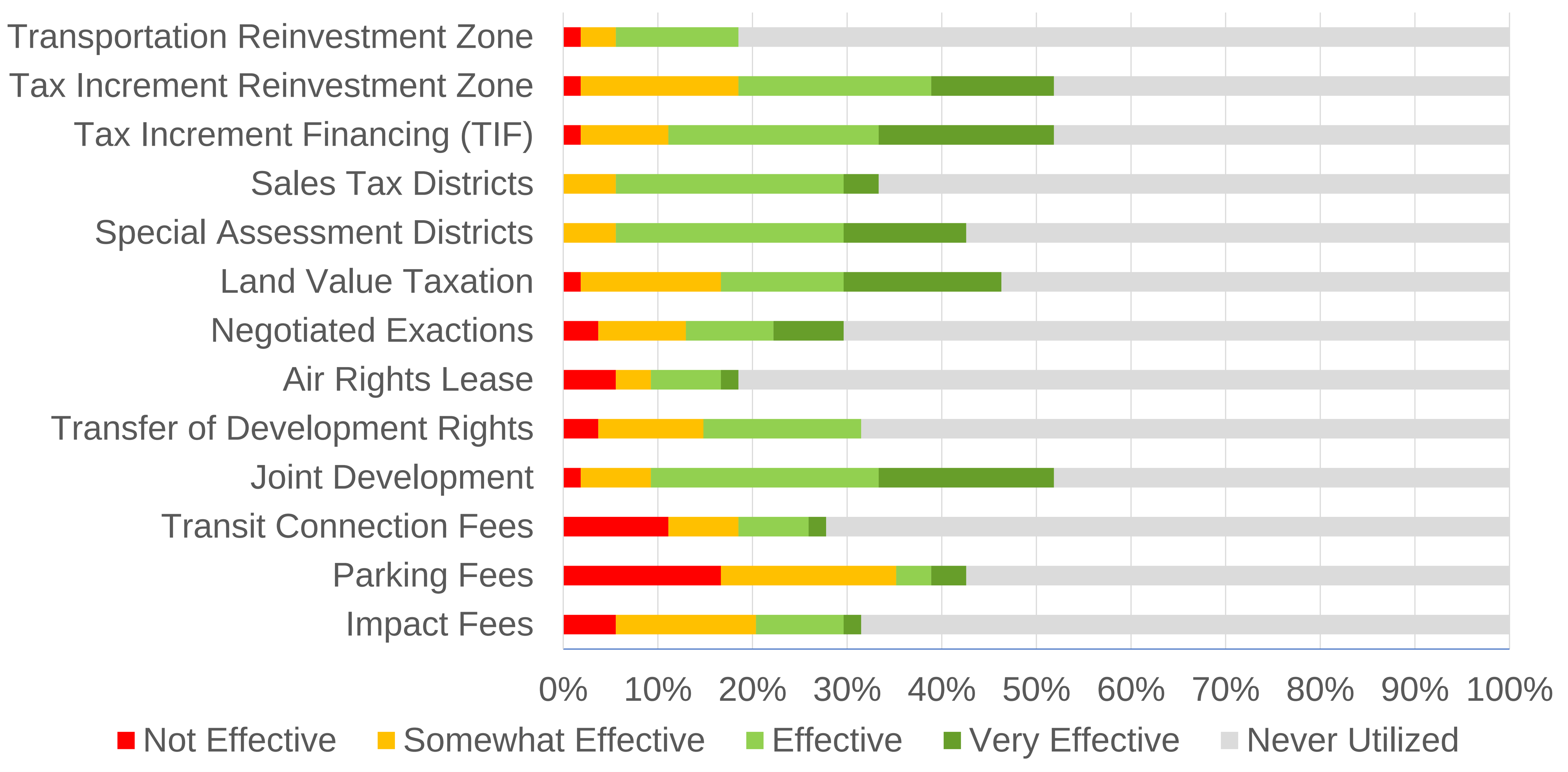
SURVEY + INTERVIEW FINDINGS

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. Four categories of our population were identified and surveyed:

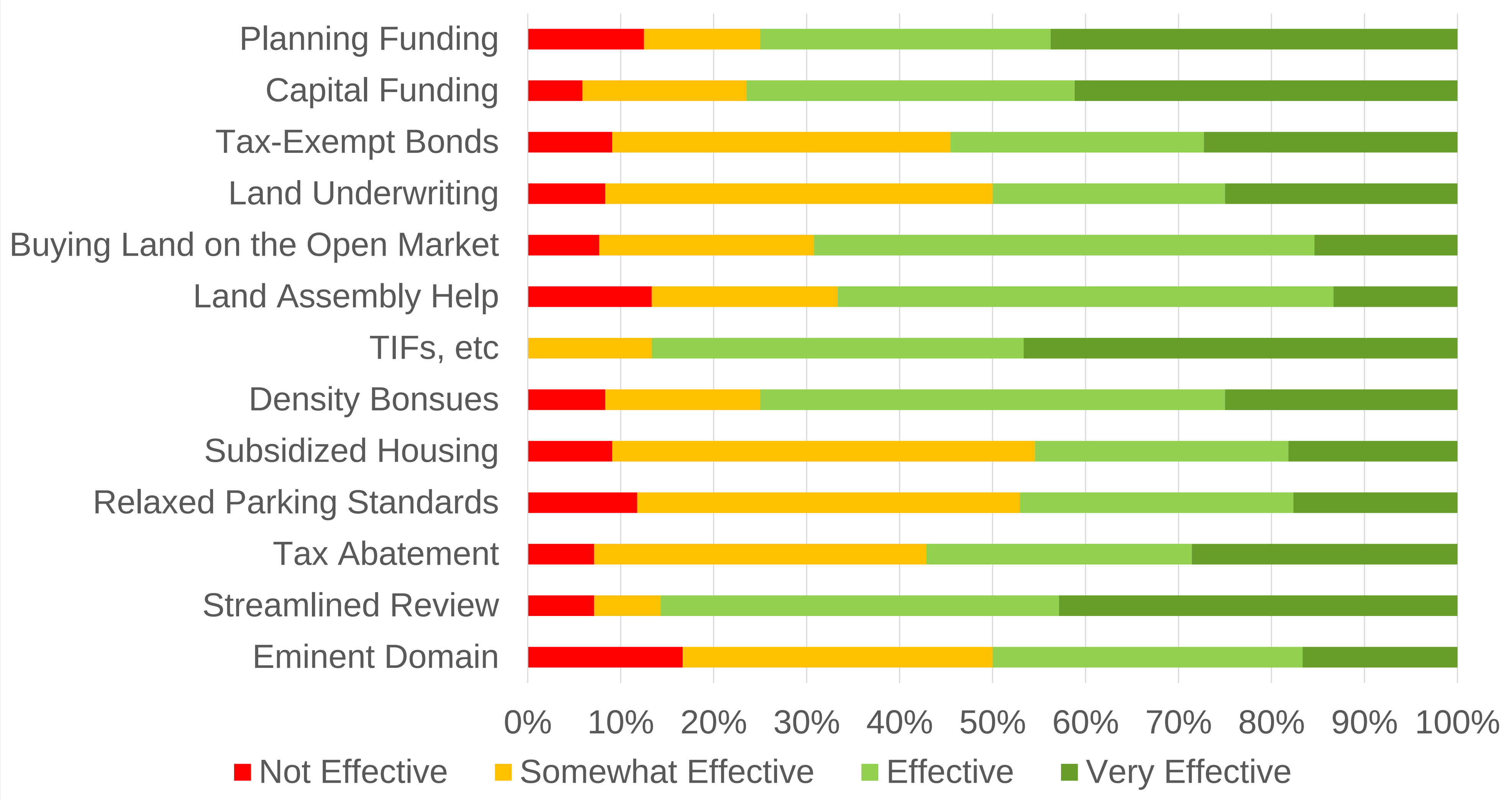
- **Regional and State Agencies -** (MPOs, COGs, TxDOT, etc.)
- **City Agencies -** (All city planning departments with transit services)
- **Transit Agencies -** (All transit agencies in the Texas Triangle)
- **Property Developers -** (For-profit and nonprofit property developers)

CLARIFIED VALUE CAPTURE OPPORTUNITIES

Survey respondents and interviewees rarely utilize value capture techniques, yet most report both an **interest in value capture as an effective tool** and that **capital funding is one of the most significant barriers** to TOD implementation. The following are the value capture techniques available for TOD projects in the Texas Triangle and their rating of effectiveness.



RATED PLANNING TOOL EFFECTIVENESS



IDENTIFIED LAND DEVELOPMENT CODE BEST PRACTICES

The survey and subsequent interviews illuminated the importance of appropriate land use codes in generating TOD development. Findings indicate the importance of the following:

- Flexibility to **phase development**, often through ability to build convertible surface parking
- Careful **consideration of market conditions** for residential and commercial properties**,** both allowing for development quickly and ensuring appropriate density as populations rise (a certainty in the Texas Triangle)
- When appropriate, **form-based codes.** These allow developers freedom to adapt to market demands while ensuring properties are created in keeping with master plans
- **TOD-zone specific regulations** which can both improve financials of development and ensure success of the transit serving the site. These commonly include reduced parking minimums, requirements for bike parking facilities and bike lanes, and requirements for a quality walkable environment. Sometimes, TIF revenue can fund infrastructure improvements undertaken by developers

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UNIVERSITY OF TEXAS AT AUSTIN

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

RESEARCH AGENDA

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 more generally frame the level of comfort and satisfaction riders have with transit service (Transit Design Guide, 2017). Framing the necessary logistics to create simple, legible, and pleasant experiences at transit hubs grows the capacity and sustainability of the whole system.

2.RESEARCH QUESTIONS

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. For USDOT or private service providers involved in multi-modal services, would BIM technology in general advance and optimize multi-modal integration in transit hubs, and would a template advance and organize this effort?

3. RESEARCH CONTENTS

This proposal 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 multi-modal 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.

4.RESEARCH FRAMEWORK

Proprietary BIM software contains standard templates specific to an Architecture, Structural or Construction stakeholders. BIM content libraries exist with examples specific to certain typologies, like education or small scale residential, but are not however transportation specific, much less focused on multi-modal integration in transit
hubs (Afsari and Eastman 2014). Furthermore, the National BIM Standard-United States®
(NBIMS-US™) provides consensus based standards through referencing existing standards, documenting information exchanges and delivering best business practices for the entire built environment.

5. ROADMAP

This research will begin with the creation of a base BIM template for multi-modal transit hub design. This template will be continuously reiterated through the design and curation of advanced custom 3D parametric components.
A supplement to this template database structure will include what we call "User Based Scenarios" (UBS). Continuing these modality studies will facilitate further development of a multitude of 3D BIM components for multimodal transport integration (Asriana and Indraprastha 2016).
To further advance this BIM modelling technique, 4D time based assemblies necessary for transfer nodes could start to include 5D cost implications and 6D schedule design of robust multi-modal time-tables. One specific model could serve as the pilot for what a 7D (operational control) could mean for a line-bound public transport service.

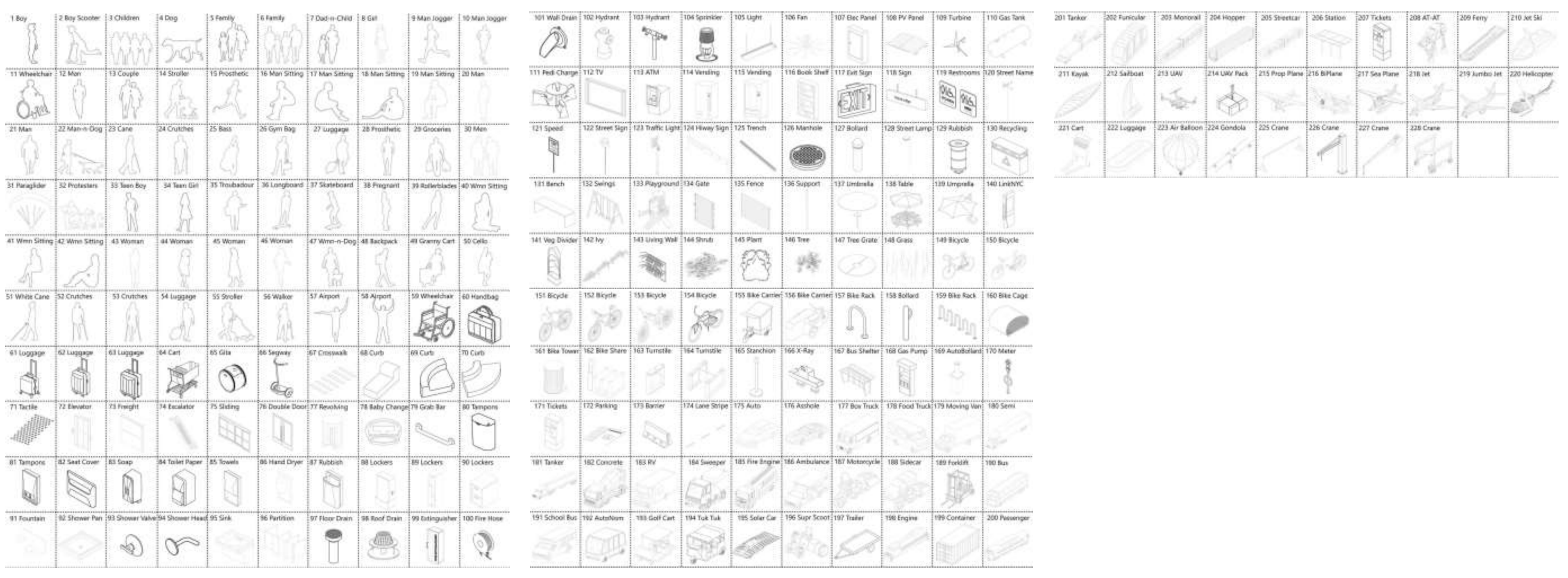
6.TIMETABLE

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 parametrics will be continuously developed through the summer of 2018, after which it will be immediately disseminated and then integrated with a spring of 2019 design studio.

ACHIEVEMENTS

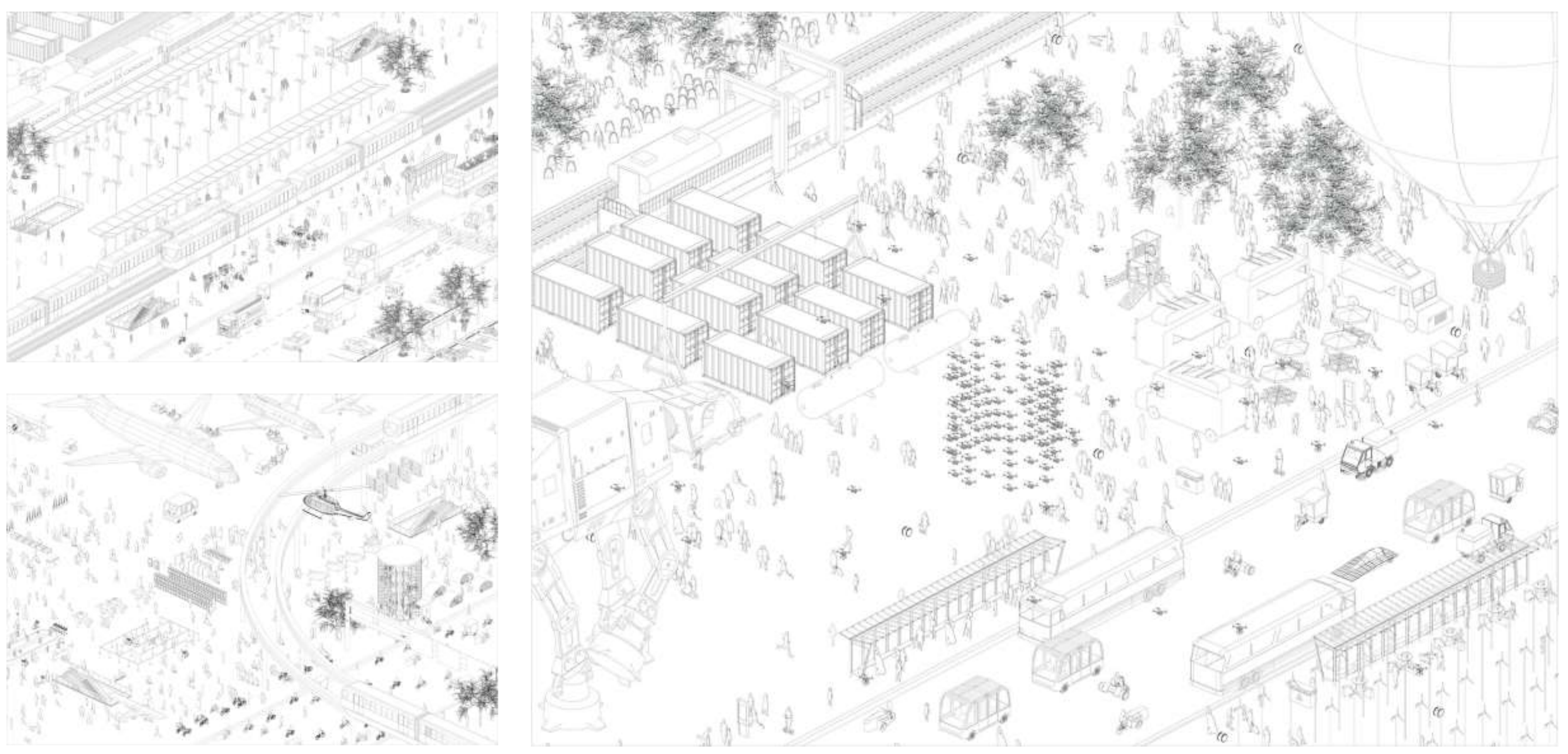
1. Multi-modal Transit Hub BIM Template

A base template composed of components relevant to the design of transit hubs have been created and curated and then inventoried. These components are the basis for the standardization of this design typology. This inventory is made to continuously expand and adapt. With more users, permutations and additions of components will continuously evolve the template.



2. User Based Scenarios (UBS)

The template is tested using user-based scenarios. This design methodology proposes a data structure based on a focus and context approach in which information is mapped from diverse demographics in order to imagine the multi-modal transportation transfers they would potentially encounter. Through the integration of template with these contextual applications, missing components will be identified and time-based parameters will be tested. This also allows for the demonstration of efficacy in each component.

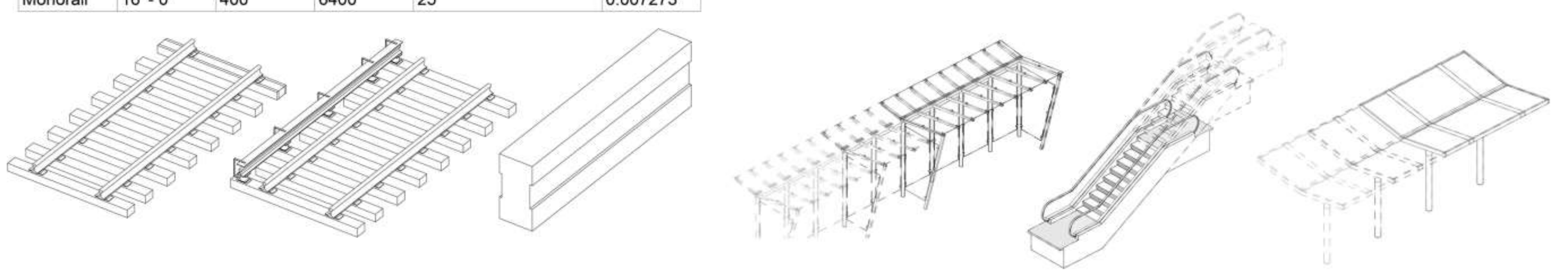


3. Parametric Components

Components are created with a focus on spatial parametrics. This will allow for the malleability necessary for contextual integration. In addition, parameters based on time, cost, and operability will be integrated into key components, enhancing their viability in the advanced modelling of transfer nodes.

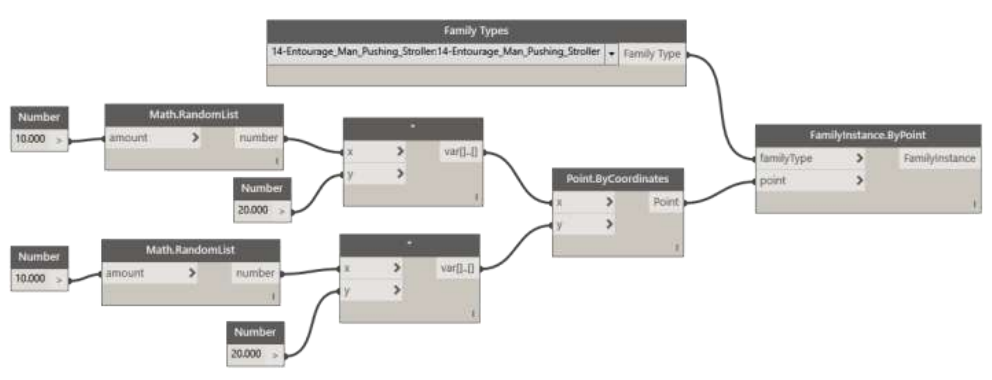
Rail Schedule

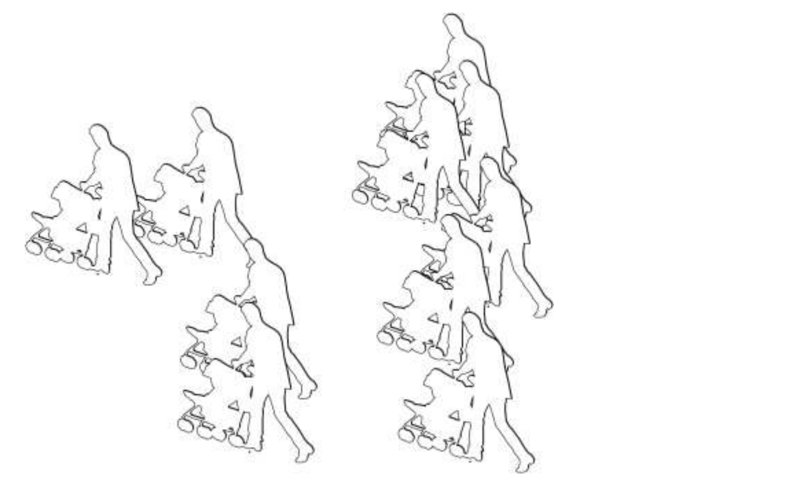
Comments	Length	Cost per Foot	Total Cost	Average Speed (MPH)	Time (Minutes)
Railroad	16' - 0"	300	4800	15	0.012121
Subway	16' - 0"	350	5600	20	0.009091
Monorail	16' - 0"	400	6400	25	0.007273



4. Algorithmic Distribution

Using visual programming, entourage components were randomly distributed at various densities. Responding to these arbitrary distributions acts as an emulation for the type of responses typically necessary in transit hub design.





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To What Extent Does the Surrounding Built Environment Affect Bicycle Sharing Ridership within the Top 4 American Bikeshare Systems?

RESEARCH AGENDA

1. BACKGROUND

Bicycle sharing systems allow customers to temporarily check out a bicycle from a station and return it to any other station in the network for a small fee or annual membership price. They exist in 119 cities in the US and serve as a vital part of the travel demand management toolbox to help serve recreational/tourist-based, commuter and first-last mile trips in urban environments.

New York Citibike, Chicago Divvy, Washington D.C. Capital Bikeshare and Boston Hubway rank as the top four station-based bikeshare systems in the United States by number of stations in operation. These cities also rank at the top end of providing and promoting infrastructure supporting safe cycling and active transportation in general.

City	# Stations	Avg. Daily Station Use
New York Citibike	832	102
Chicago Divvy	631	38
Washington D.C. Capital Bikeshare	450	53
Boston Hubway	212	21

2.RESEARCH QUESTION

What factors of the built environment in cities with the largest four bikeshare systems in the US correspond to bikeshare station ridership levels?

3. RESEARCH CONTENTS

Through this research project, we compared average daily bikeshare station ridership to the following surrounding built environment factors:

- **Bicycle Safety**
  - Cycling Infrastructure & Bike Lanes
  - High Comfort/Low-speed Roadways
- **Aesthetics**
  - Parks/open space
  - Tree Canopy
- **Community Character**
  - Population & Housing Unit Density
  - Average Structure Age
  - Median Gross Rent & Home Value
- **Active Transport Connectivity**
  - Sidewalks
  - Bus Stops & Rail Stations
  - Transit Trip Frequency

4.RESEARCH FRAMEWORK

In order to generate values for each individual station area, we compiled a built environment inventory for all independent variables within ¼ mile of each individual station using GIS. These values are then fed into a forward stepwise multiple variate regression model to measure the significance of any correlations that occur.

5. SOURCES

Literature Sources:

Fishman, E., S. Washington, and N. Haworth. 2013. "Bike Share: A Synthesis of the Literature." *Transport Reviews*, 33(2).

Ma, T., C. Liu, and S. Erdoğan. 2015. "Bicycle Sharing and Transit: Does Capital Bikeshare Affect Metrorail Ridership in Washington, D.C.?" *Compendium of TRB 94th Annual Meeting*: 1-21.

Noland, Smart, and Guo. 2015. "Bikeshare Trip Generation in New York City." *Transportation Research Part A*.

Wang, X., Lindsey, G., Schoner, J., and Harrison, A. (2016) "Modeling Bike Share Station Activity: Effects of Nearby Businesses and Jobs on Trips to and from Stations". Journal of Urban Planning and Development, 142(1).

Data Sources:

-2016 American Community Survey (5 Year Est.)
-People For Bikes Dataset
-City/County GIS Data Portals
-Historic GTFS Feeds from Transitfeeds.com
-New York Citibike, Chicago Divvy, Washington D.C. Capital Bikeshare and Boston Hubway ridership data from 2013-2017.

RESULTS

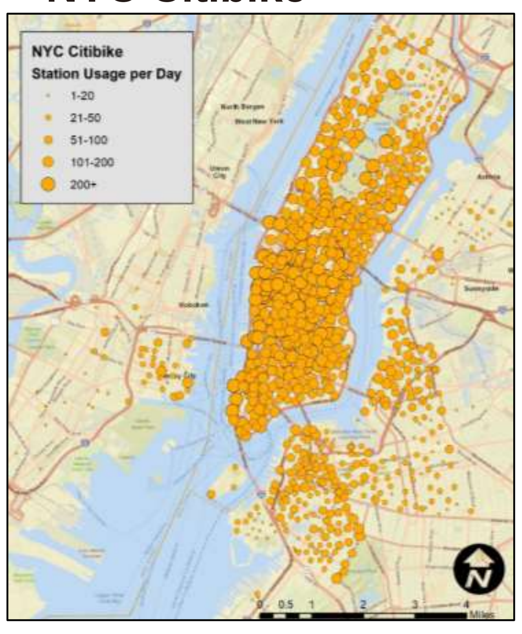
1. DEPENDENT VARIABLE:

Daily Bikeshare Station Usage = (# of checkouts + # of check ins) / (# of days station is open)

The underlying data comes from the following time frames:

- New York: July 2013 - October 2017
- Chicago: June 2013 – July 2017
- Washington D.C.: September 2010 – April 2017
- Boston: July 2011 – October 2017

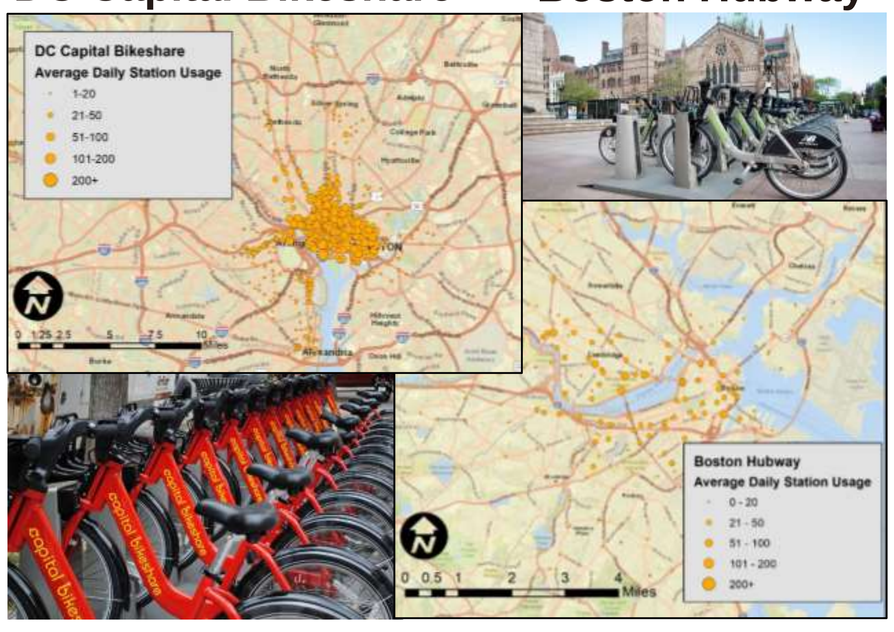
NYC Citibike



Chicago Divvy

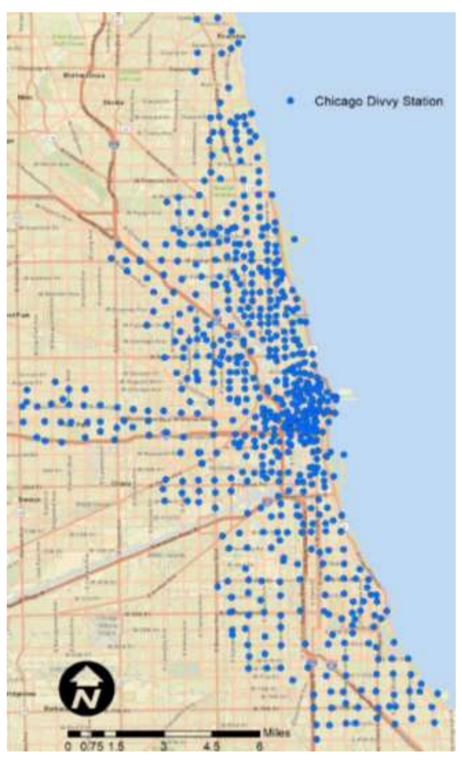
DC Capital Bikeshare

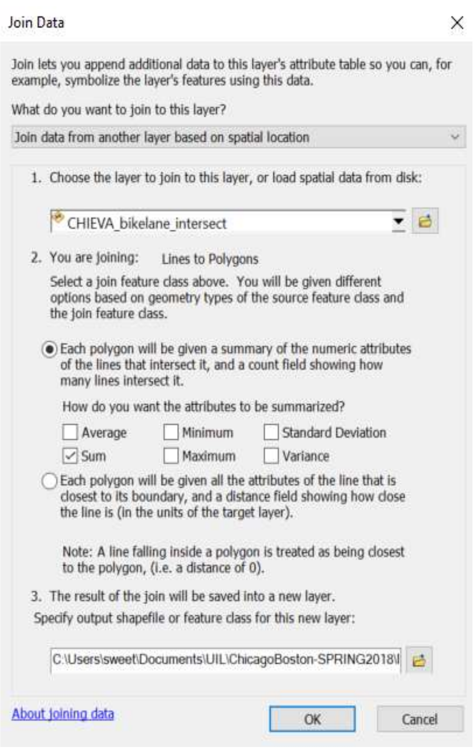
Boston Hubway



2. INDEPENDENT VARIABLES

1) Generate ¼ mile airline buffer around station areas
2) Intersect independent variable data with these ¼ mile access-sheds
3) Spatially join independent variable count/area/length data with each station location buffer
4) Bivariate correlations with Pearson's R
5) Forward Stepwise Regression to account for covariance of dependent variables.





3. Stepwise Regression Results

In comparing the average daily ridership of each individual station area to the myriad of indicator kernel density values generated at each location, we first generated a bivariate correlation table and used this data to subsequently run a stepwise regression function that analyses each candidate predictor variable in the model individually and returns only those that allow the model to achieve a 90% level of confidence.

NYC Citibike Model

R	*R-Squared*	***Adjusted R-Squared***	*N*
0.6974	0.4863	**0.4838**	765
Variable	*Coefficient*	*p-value > t*	*Tolerance*
GrossRent	0.0360	5.3171E-5	0.3570
Bikelane_Length_M	0.0024	1.0976E-6	0.3676
HouDens	1.5514	1.4228E-10	0.0869
TreeCount	-0.1191	0.0000	0.7601
DistRail_meter	-0.0359	0.0020	0.7925
OpenSpaceArea	-3.1822E-5	0.0026	0.9542
PFB_HC_Length	0.0008	0.0009	0.3673
DistTransit_meter	-0.1125	0.0130	0.9168
PopDens	-0.4062	0.0101	0.0891
REValue	3.5891E-5	0.0128	0.6784

Chicago Divvy Model

R	*R-Squared*	***Adjusted R-Squared***	*N*
0.7681	0.5900	**0.5839**	609
Variable	*Coefficient*	*p-value > t*	*Tolerance*
GrossRent	0.0342	5.7086E-9	0.2348
HouDens	0.5171	3.4071E-9	0.4789
OpenSpaceSqMeters	5.7387E-6	0.0001	0.4015
BikeLaneIntersectMeters	0.0021	1.9045E-9	0.3546
SidewalkAreaSqMeters	-6.4038E-5	0.0031	0.4214
PCB_HC_Meters	-0.0018	0.0314	0.7208
OpenSpaceIntersectSqMeters	2.4046E-5	0.0034	0.4763
REValue	3.4652E-5	0.0122	0.3471
TreeCanopySqMeters	-3.3078E-5	0.0141	0.6626
Intercept	-30.0444		

Washington D.C. Capital Bikeshare Model

R	*R-Squared*	***Adjusted R-Squared***	*N*
0.7174	0.5147	0.5078	428
Variable	*Coefficient*	*p-value > t*	*Tolerance*
StreetTreeDC	0.0486	0.0000	0.6396
GrossRent	0.0270	4.0518E-8	0.7840
ParkArea	5.4190E-5	0.0000	0.9677
HouDens	0.9505	2.2717E-9	0.8849
BikelaneLengthDC	0.0011	1.3534E-5	0.5763
RailStop	11.7417	0.0003	0.8122
Intercept	-60.8302	0.0000	0.6396

Boston Hubway Model

R	*R-Squared*	***Adjusted R-Squared***	*N*
0.6668	0.4446	**0.4243**	171
Variable	*Coefficient*	*p-value > t*	*Tolerance*
REValue	2.5446E-5	0.0002	0.5002
DistRail_meter	-0.0088	0.0024	0.6172
HCBikeLength	0.0004	0.0345	0.7128
GrossRent	0.0080	0.0031	0.6001
PopDens	0.1062	0.0582	0.5721
RailStop	-1.2046	0.0875	0.6209
Intercept	-12.9255		

CONCLUSIONS

The stepwise regression models returned that the following indicators could be used to predict bicycle station ridership (# in parenthesis indicates how many of the four city models held this indicator as significant):

Always Positive Coefficients:
- Median Gross Rent (4)
- Median Home Value (3)
- Bike Lane Length (3)
- Housing Unit Density (3)

Always Negative Coefficients:
- Distance to Rail Stops (2)

Mixed Results:
- High Comfort Cycling Roadways (3)
- Population Density (2)
- Open Space (2)
- Trees/Tree Canopy Area (3)

Limited Significance:
- Sidewalk area (1)
- Median Structure Age (0)
- # of rail stops within ¼ mile (1)
- Frequency of transit trips (0)
- - Proximity to Bus Stops (0)

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Can Crowdsourcing Support Co-productive Transportation Planning in a Megaregion? Evidence from Local Practice

RESEARCH AGENDA

1. PROBLEM STATEMENT

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.

2.RESEARCH OBJECTIVE

To evaluate crowdsourcing as a method for public participation in transportation planning to scale from local and regional to megaregional contexts.

This project supported two studies to address this guiding objective. The first analyzes bike share planning in New York and Chicago through an online map system to crowdsource bike share station locations. The second study analyzes the space and time of involvement through a traditional set of public meetings, and a new crowdsourcing platform called Ride Report.

3. RESEARCH QUESTIONS

Study 1, Q1: Did bike share systems built stations close to where the public suggested?

Study 1, Q2: How does the proximity of suggested and built bike share stations vary geographically across the system?

Study 2, Q1: How do the space and time of public involvement through traditional and crowdsourced means relate?

3. WHAT IS CROWDSOURCING AND WHY DOES IT MATTER?

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.

4. APPROACH

Both studies explore an emerging theory for participatory planning: co-production (Watson 2014), which emphasizes public actions over words. Crowdourcing provides a context for co-productive planning, analyzed through case study evidence from Austin, Chicago, and New York.

The first study uses geostatistics on public suggestions for bike share station locations and actual construction locations. The second study uses spatial data on public meeting participation locations with a counter-example of crowdsourced data from the Ride Report platform in Austin, Texas (Ride Report 2017).

References

Alexander, E. R. 2001. "The Planner-Prince: Interdependence, Rationalities and Post-Communicative Practice." Planning Theory & Practice 2 (3):311–24.
McAndrews, Carolyn, and Justine Marcus. 2015. "The Politics of Collective Public Participation in Transportation Decision-Making." *Transportation Research Part A: Policy and Practice 78.*
Ride Report. 2017. "Ride Report Austin." https://ride.report/austin.
Watson, Vanessa. 2014. "Co-Production and Collaboration in Planning – The Difference." *Planning Theory & Practice 15* (1):62–76.

ACHIEVEMENTS

Study 1. In New York & Chicago, Planners Support Co-productive Participation Across Large Regions with Public Participation Geographic Information Systems (PPGIS)

- Web-scraped 10,062 public-suggested locations for bike share stations.
- 10% of suggested Divvy (Chicago) locations received a station within 100 feet. 5% for Citi Bike (New York)
- Spatial cluster analysis showed up to 17% of suggestions statistically close to built stations.
- Crowdsourced co-production shows opportunities and challenges for megaregions.

Griffin & Junfeng Jiao. (in press) "**Crowdsourcing Bike Share Station Locations: Evaluating Participation and Placement**." *Journal of the American Planning Association*. https://doi.org/10.1080/01944363.2018.1476174.

JAPA Journal of the American Planning Association

Public Suggested **Thousands of Locations** for **Bike Share Stations** in New York and Chicago

map image from Divvy Bikes/CDOT/OpenPlans

<1/3 ➔

Up to **29%** of Stations **Built Near Suggestions**, depending on location and calculation method


photo by NYC DOT (CC BY-NC-ND 2.0)

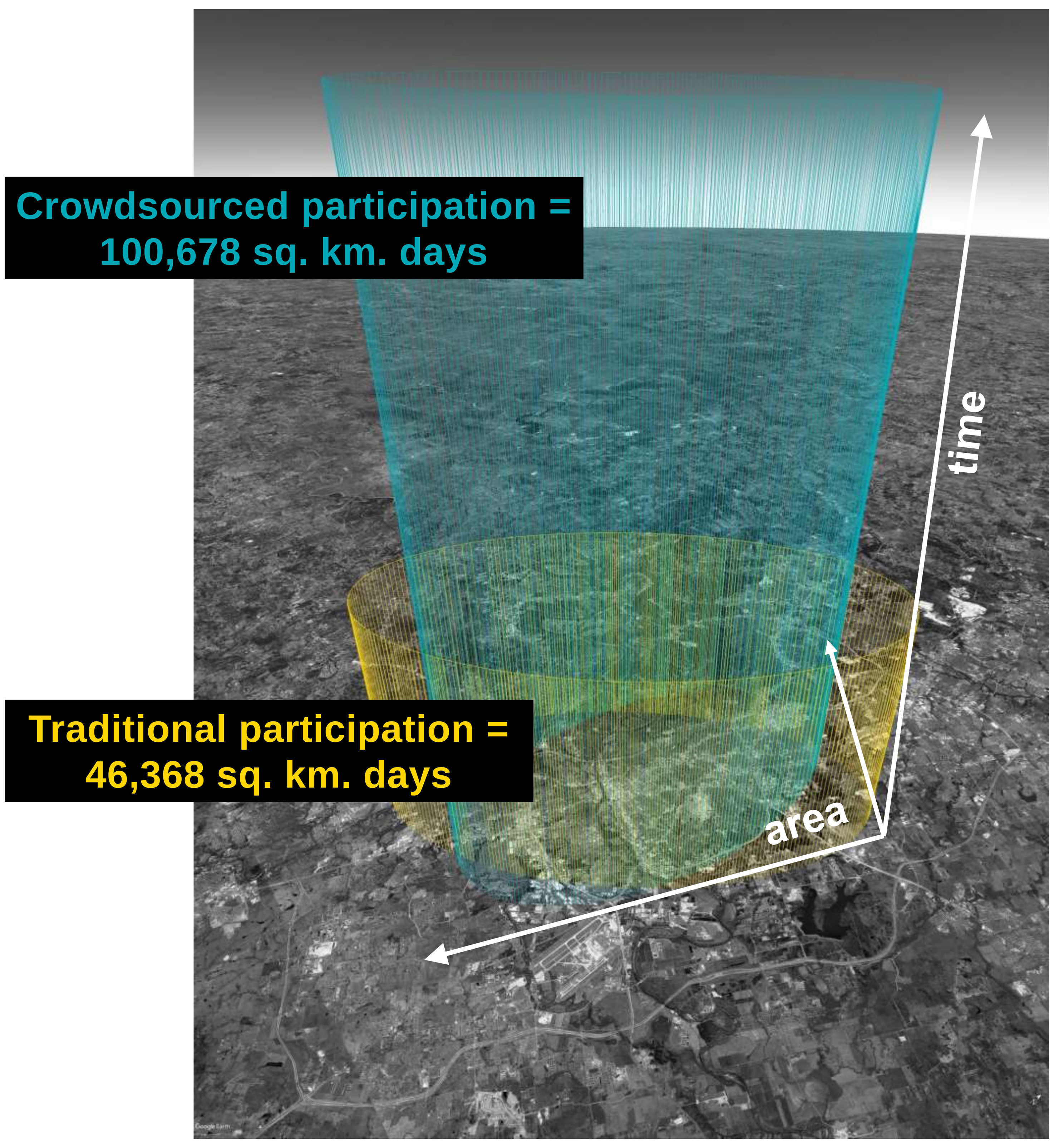
Public Can **Co-produce Information for Planning**


images public domain courtesy openclipart.org

- Crowdsourced mapping bridges participants and planners to learn from each other
- Planners can measure outcomes and improve methods of public involvement

Study 2. In Austin, Equity Limited by Digital Exclusion, yet Expanded over Space and Time

- Participation research typically analyzes who and where people participate, but ignores time.
- Deviational ellipses of bike planning public meeting locations (yellow in image) and crowdsourced ratings of streets in Austin via the Ride Report app (blue in image) show similar spatial footprints.
- Adding a 3rd dimension of time shows increased space-time opportunity for participation on crowdsourcing platforms.
- The *elliptic cylinder* is presented as a measure of space-time for evaluation of public participation. We adapt the volume of the elliptic cylinder ($V = \pi x y z$) for participation as time in days times square kilometers of participation ($V = D\ km^2$) .
- Time is an important dimension to consider in participatory planning, in addition to space.
- Planners can expand equity in participation through time and space, particularly by combining crowdsourcing and traditional participation—both may support for megaregional contexts.



Conclusion: Digital approaches to participation such as crowdsourcing can potentially up-scale involvement and shared understanding over space and time. However, these methods are purpose-built, and do not, at present, replace traditional participation techniques. New approaches to combine traditional and crowdsourced participation methods may be necessary to foster equitable participation at the megaregional scale.

CM² Cooperative Mobility for Competitive Megaregions **Summer Forum 2018**

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Transit Deserts USA: Lessons from 52 Cities

RESEARCH AGENDA

1. BACKGROUND

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.

Access to quality transportation has been shown to decrease inequality in cities and increase people's mental and physical health. To this end cities need to make sure that all people have access to quality transportation. However, transit dependent populations (those who do not or cannot drive) are particularly vulnerable to being underserved by transportation. This research aims to identify areas where transit dependent populations are being underserved by existing transit networks.

2.RESEARCH QUESTIONS

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.

3. RESEARCH CONTENTS

This study uses data from the 5 year 2015 American Community Survey (ACS) to identify areas with high transit demand. Supply is calculated using various GIS information, obtained from local municipalities or OpenStreet Maps, and General Transit Feed Specification (GTFS) data. Processing models created in ArcMap are used to calculate the need metrics at the block group level.

4.RESEARCH FRAMEWORK

In order to identify areas that are underserved by transit a three step process is used. First, the transit supply is calculated using various tools in ArcMap. This transit supply metric is then Z-scored to normalize it. Next, the transit demand is calculated using ACS data and also Z-scored. Finally, the transit supply is subtracted from the transit demand to find the transit gap or transit desert index score.

All areas in cities are then classified based on their transit desert index score. Areas with an index score between -1 and 1 standard deviation are considered properly served. Areas with an index score below -1 are consider transit deserts i.e. areas of undersupply. Finally, areas above 1 standard deviation are considered transit oases i.e. areas with transit oversupply.

5. ROADMAP

As of June 2018 52 cities have been mapped out using this method. The results have been made publicly available on www.transitdeserts.org. A journal article is also under development from this research.

The next step for this research is to attempt to crowdsource data about transit undersupply and transit oversupply. The website will serve as the backbone for these efforts. The goal is to allow the public to vote on the transit status of their neighborhoods and see the results in real-time.

6.TIMETABLE

Research on the 52 largest American cities has concluded as of summer 2018. The crowdsourcing efforts and additional research efforts are on-going.

ACHIEVEMENTS

1. Supply

This study attempts to take a comprehensive and multi-modal view of transportation. While the exact nature of the metrics used varies from city due to obvious variations in the transit networks of each city, in general the metrics used are **street length, sidewalk length, public transit route length, bike route length, number of public transit routes, average number of transit trips per hour per stop and average daily trips per stop.**

2. Demand

This research uses the transit dependent population as a proxy for transit demand. Demand is calculated using a modified version of a formula developed by the USDOT (Steiss, 2006). The three-step formula used is found below:

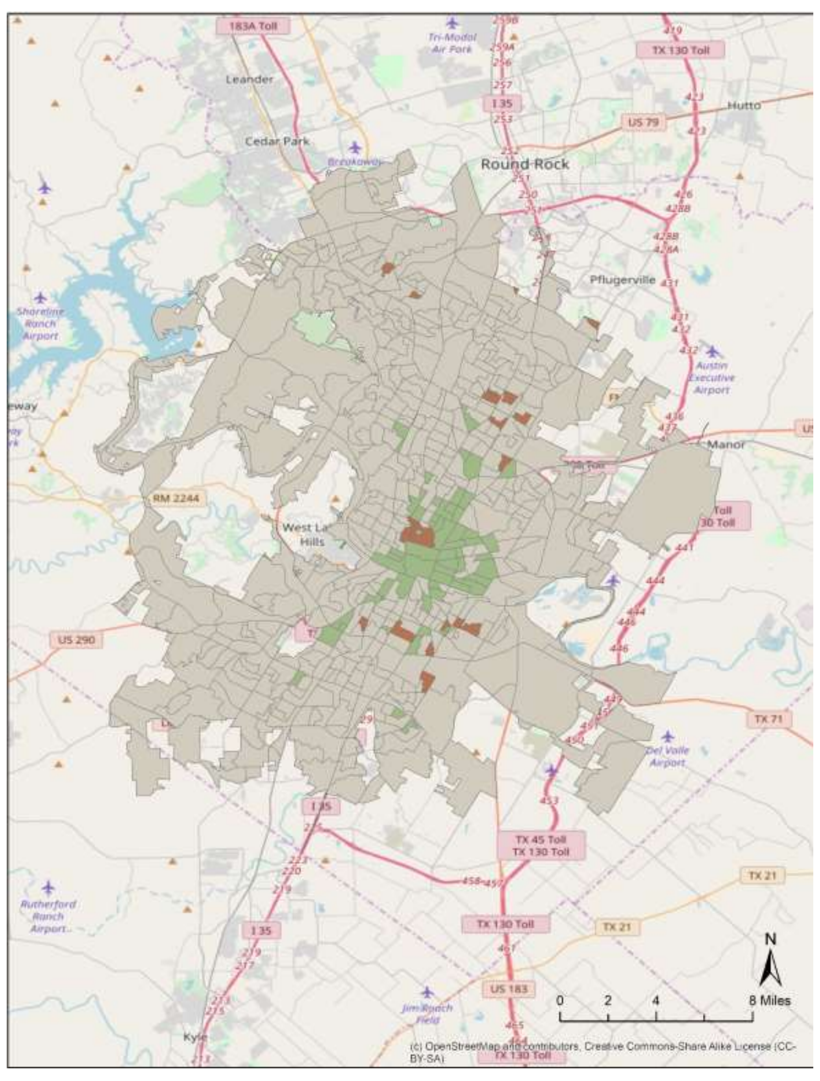
1) **Household Drivers** = Population 16 and Over - Persons Living in Group Quarters
2) **Transit Dependent Household Population** = Household Drivers – Vehicles Available * National Carpooling Ratio
3) **Transit Dependent Population** = Transit Dependent Household Population + Population 12-15 + Non-Institutionalized Persons in Group Quarters

3.The Transit Gap

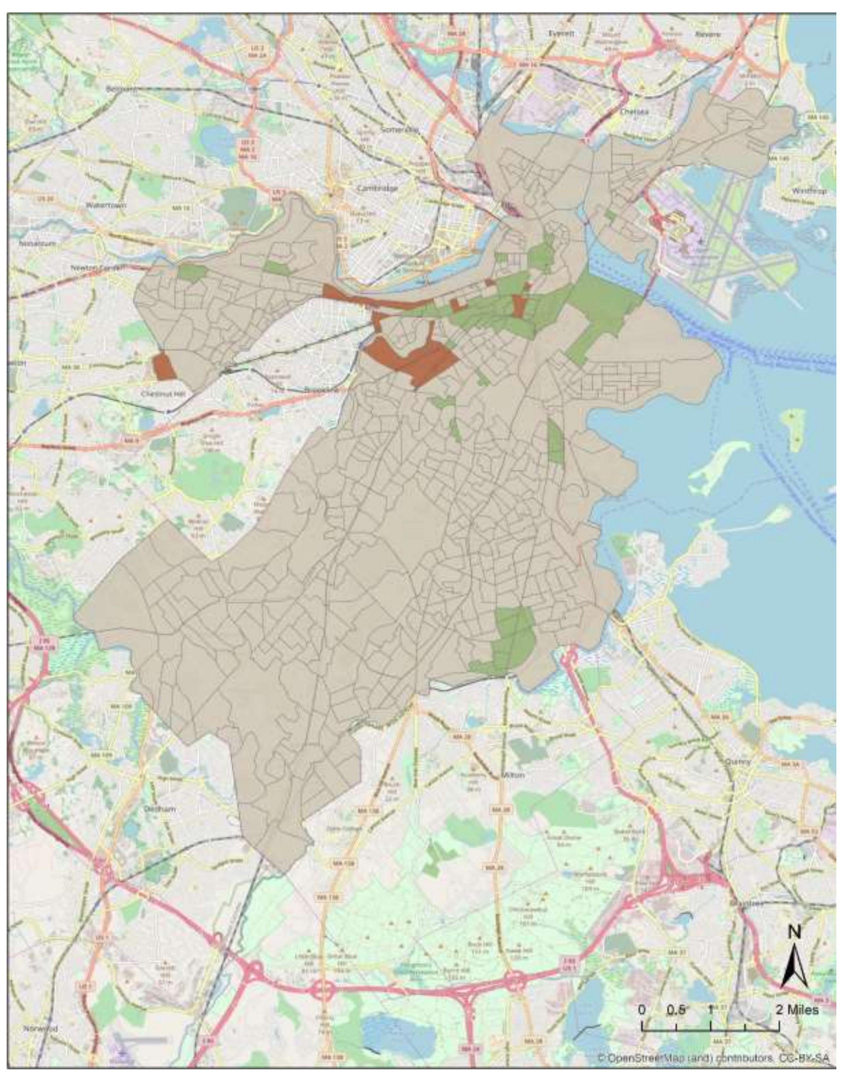
Lastly the transit supply z-score is subtracted from the demand z-score to obtain the transit gap z-score. As mentioned above the areas are than classified into transit deserts, properly served areas, and transit oases areas. Our research indicates the following:

- **The vast majority of areas of properly served**
- **Transit oases areas tend to occur in Central Business Districts**
- **Transit deserts do not follow a clear spatial pattern but may be poorer and younger on average**

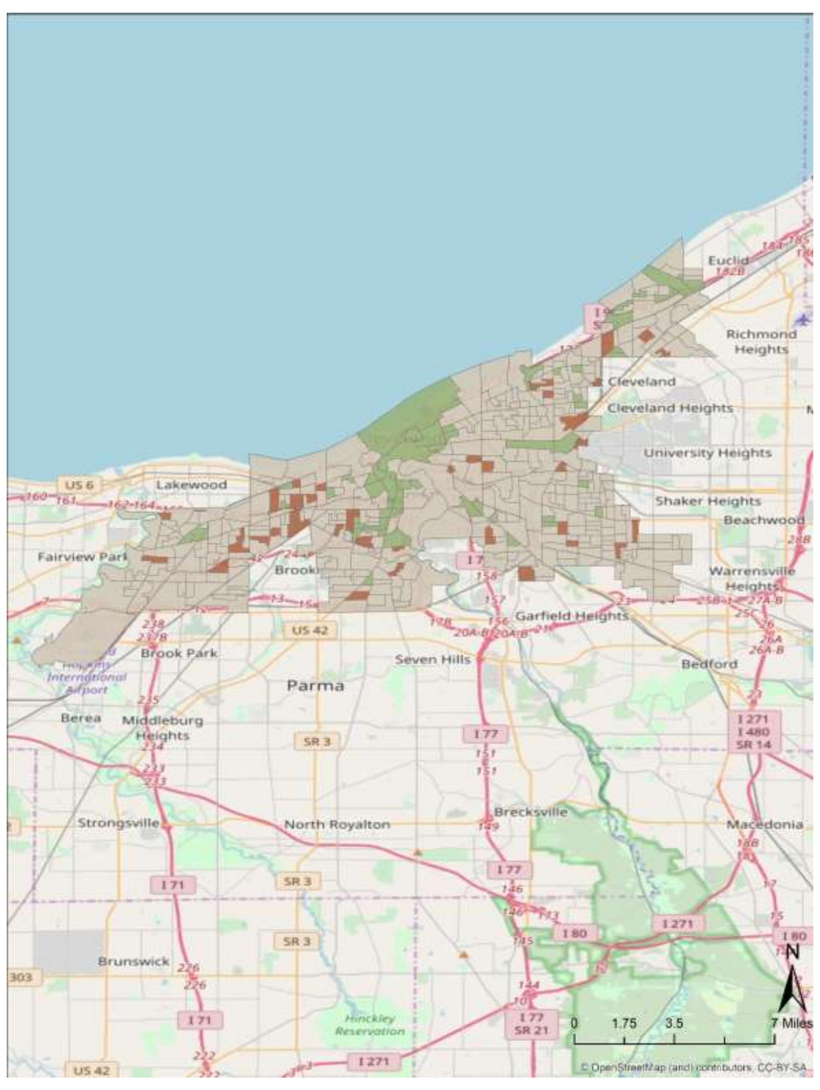
Several of our maps are displayed to the right and below. The maps below are supply and demand maps for Denver, Phoenix, DC, and Philadelphia. Green areas have high supply and red areas have high demand.



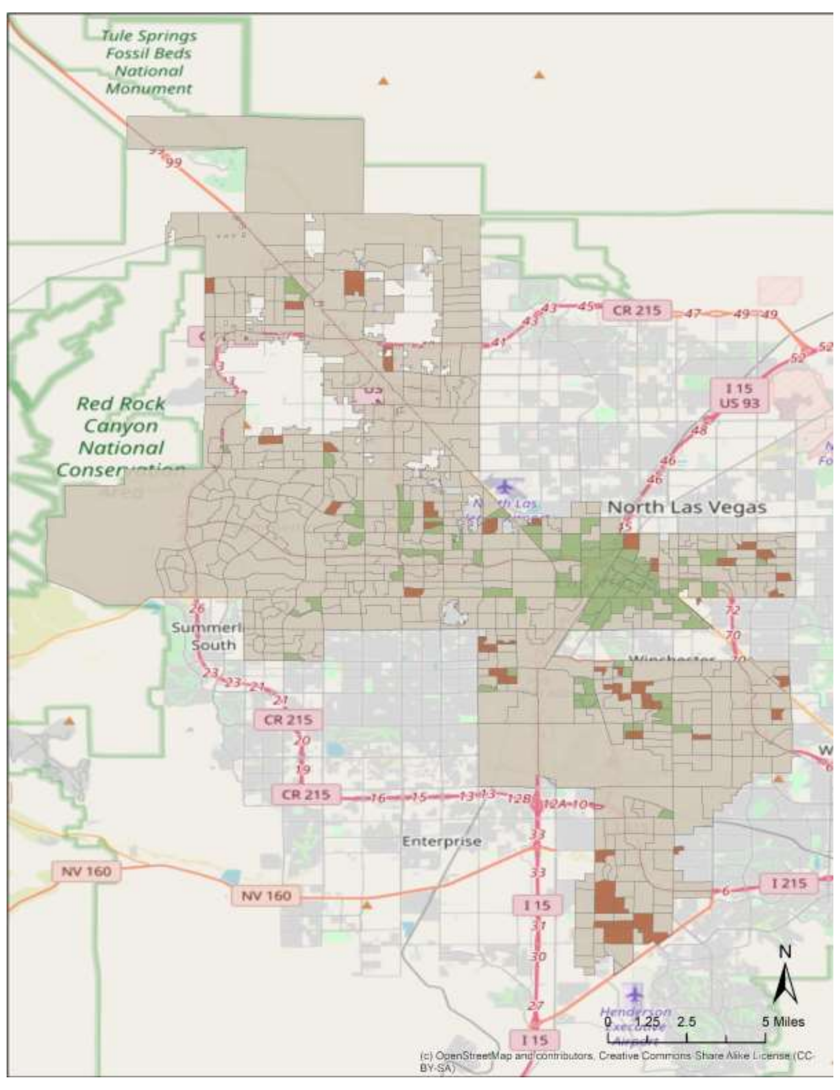
Austin



Boston



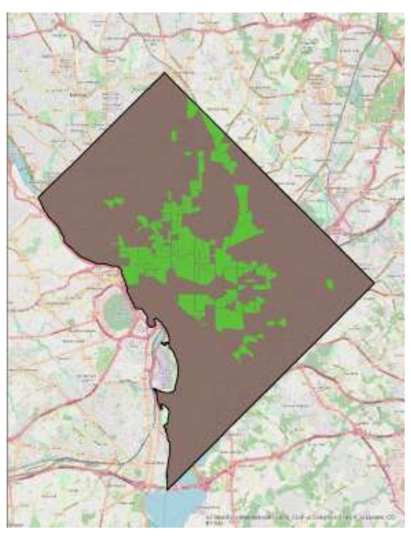
Cleveland

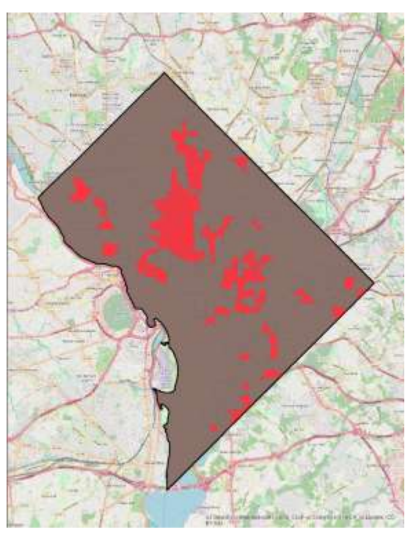


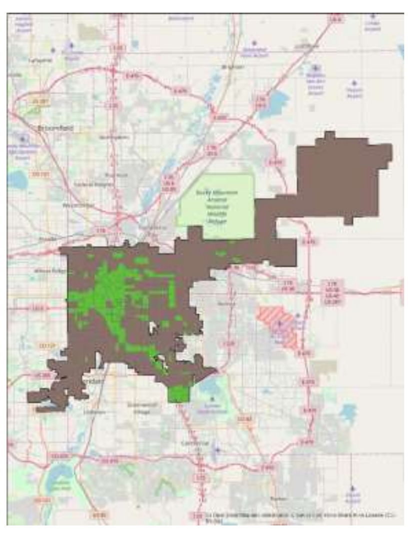
Las Vegas

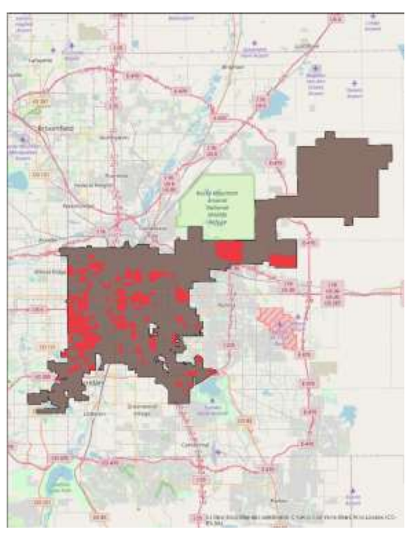
Legend

Properly Served (-1 to 1 STD)	Transit Desert (> -1 STD)	Transit Oasis (> 1 STD)









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CM² Cooperative Mobility for Competitive Megaregions

Summer Forum 2018

UNIVERSITY OF TEXAS AT AUSTIN

PI: Dr. Sandi Rosenbloom

GRAs: Kyle Smith, Aaron Sessions

USING TECHNOLOGICAL INNOVATIONS ACROSS THE MEGAREGION TO ENHANCE THE MOBILITY AND ACCESS OF SENIORS

1. BACKGROUND

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.

2.RESEARCH QUESTIONS

- Will new technology and key aspects of the shared economy meet some senior mobility needs across a megaregion?
- Will internet and technological resources reduce the need for travel by seniors with decreasing ability to drive?
- Do shared ride platforms and other forms of the shared economy provide a realistic mobility option for seniors in suburban and rural areas?

3. RESEARCH CONTENTS

Our research consisted of two pilot groups with 11 total participants. As of early June, we have talked to 79 participants in eight focus groups, and are using questionnaire data from these groups in our research. There are some important aspects to this group's demographics:

- Individuals were between 68 and 98 years old
- We spoke with 83 women and 7 men
- 14 individuals are married/partnered
- 84% of our participants still drive

4.RESEARCH FRAMEWORK

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.

5. RESEARCH RESULTS

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%

All questions included a number of examples and company names.

6.TIMETABLE

The project will be completed by July 1, 2018

ACHIEVEMENTS

1.Literature Review

Conducted a literature review and evaluated socio-demographic data on the use of the shared economy and emerging technologies by seniors.

2. Graduate Seminar

Structured a graduate seminar in the University of Texas at Austin Community and Regional Planning Program.

3. Focus Groups

Conducted a series of focus groups with almost 100 diverse seniors living across the Austin Metropolitan area.

Focus Group Research

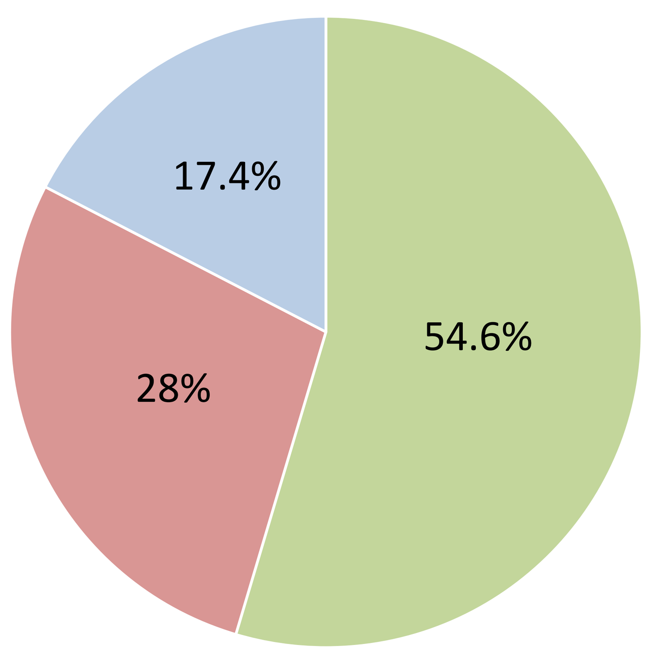
What Participants Knew

- Many participants had not heard about most of these services
  - Men were more likely to know about and have used some services
- There were many misconceptions about what services were/did
- There was some interest in learning more as discussions progressed

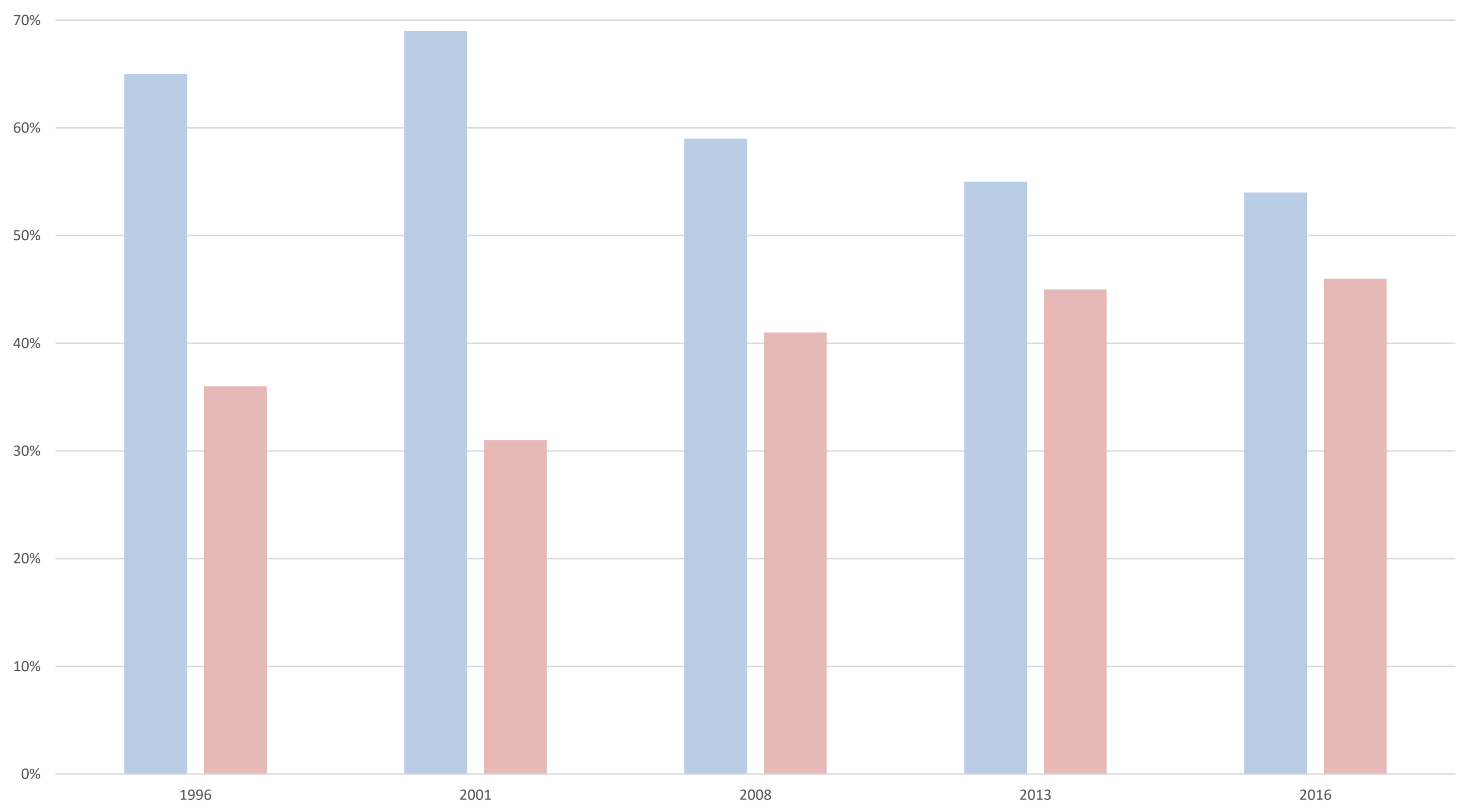
Common Discussion Themes

- No internet or smart phone experience
- Unwilling to give credit card info
- Reluctance to pay for services they could do themselves
- Paying for local transportation seems a strange/foreign idea
- Fear of strangers coming to or entering the house (bringing groceries, etc)
- Fear of drivers in TN services
- Concerns about quality, ease of returns

Where Seniors Live (2016)



65+ Movers Who Stayed in Same Metro Area



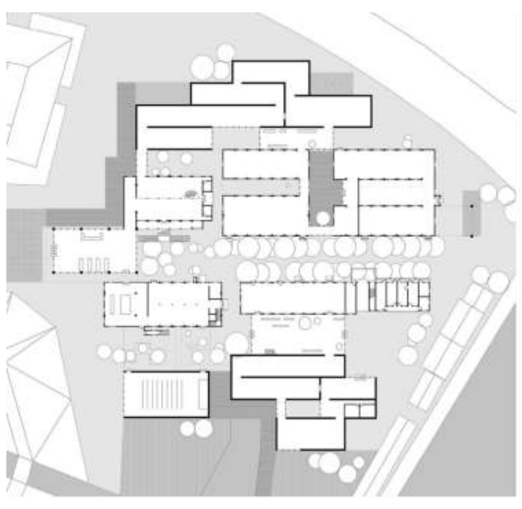
Seniors Who Moved 2015-2016

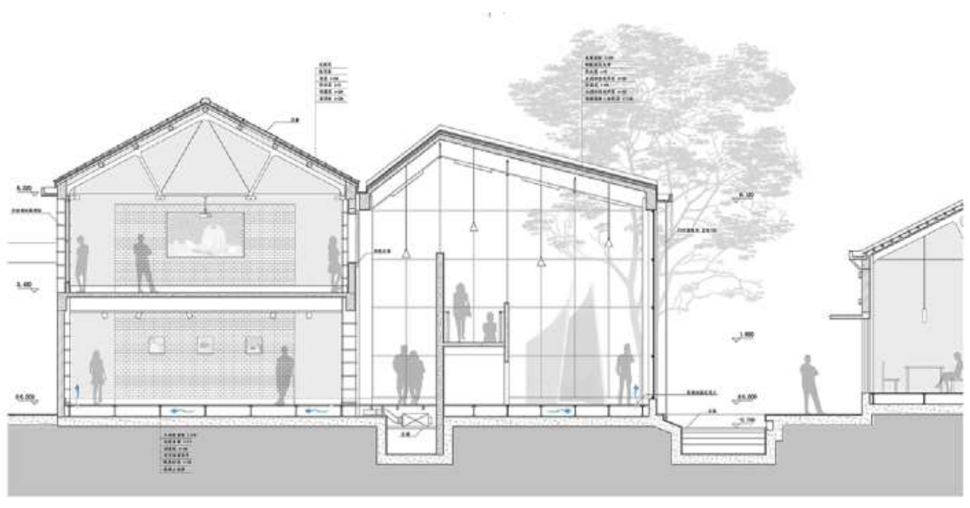
3.2% of seniors moved » **4.3%** of all people that moved that year were seniors

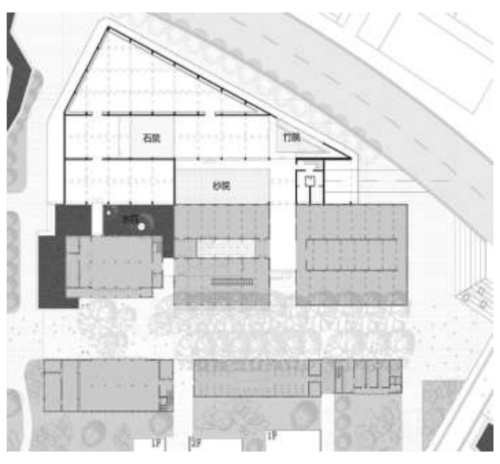
They Moved to or Stayed In

Suburbs	A Principle City	A Non-Metro Area
55%	32%	13%

Two moved "out" for every one that moved "in"







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Spring Exhibition 2018

UNIVERSITY OF TEXAS AT AUSTIN

PI(s): Gian-Claudia Sciara
GRA(s): Paulina Urbanowicz (summer 2018)

Transit Operators in Metropolitan Transportation Decisionmaking

RESEARCH AGENDA

1. BACKGROUND

Concerns that public transit interests and investment needs have been underrepresented in metropolitan transportation spending decisions are longstanding.

Since the early 1970s, federal law has required that urban areas with populations over 50,000 have a state-designated metropolitan planning organization (MPO) to coordinate transportation planning and spending for the region.

The MPO is governed by an appointed board, most members of which hold elected office in counties or cities in the region. To receive federal transportation dollars, the MPO approves a fiscally constrained short-range Transportation Improvement Plan, or TIP, that identifies all regional projects supported by federal money.

The 2012 Moving Ahead for Progress in the 21st Century (MAP-21) law required MPOs for the first time to include transit operators on their voting boards, a significant policy shift.

The TIP – and the extent to which it shifts federal highway funds to support transit instead -- can suggest how MPO spending decisions support transit.

2.RESEARCH QUESTIONS

(1) What are the contours of transit agency representation on and participation in MPOs boards? Which MPOs include board seats for transit? How else are operator interests represented?

(2) How has enhanced representation in the MPO process impacted transit funding outcomes? Are MPOs directing more flexible funding resources to transit than they have in the past?

3. RESEARCH METHODS

This project will create a database identifying which MPOs include voting board seat(s) for transit agencies (one or more). It will also assemble data on metro regions' use of flexible transportation funding for transit investments.

The study hypothesizes that, for metro regions where transit operators participate have MPO board voting seats, we will observe higher shares of funding flexed to transit investment than for regions where the transit operator(s) have no MPO board voting seats. We expect a voting seat will afford transit operators greater influence in MPO decision-making and more ability to help steer flexible funds to transit needs. We will test these propositions with statistical models.

4. RESEARCH DATA

Information on MPO board composition and transit operator participation will be assembled from MPO websites and MPO bylaws.

The project will use records from the Federal Highway Administration's Federal Management Information System to track flexible funding transfers in metro areas over the last 10 years.

The study aims first to provide descriptive analysis of trends (over time and by geography) of flexed funding. Next, it will model the impact that transit operator representation via MPO board seats has on flex funding transfers.

5.PROJECT PLAN

Summer 2018: Data collection – (1) transit participation in MPO; and (2) metro level flex funding transfers.

Fall 2018: Review recent literature on transit and transportation governance.

Spring 2019: Develop model of flex funding as function of MPO's transit representation & other factors.

Summer 2020: Project report and paper.

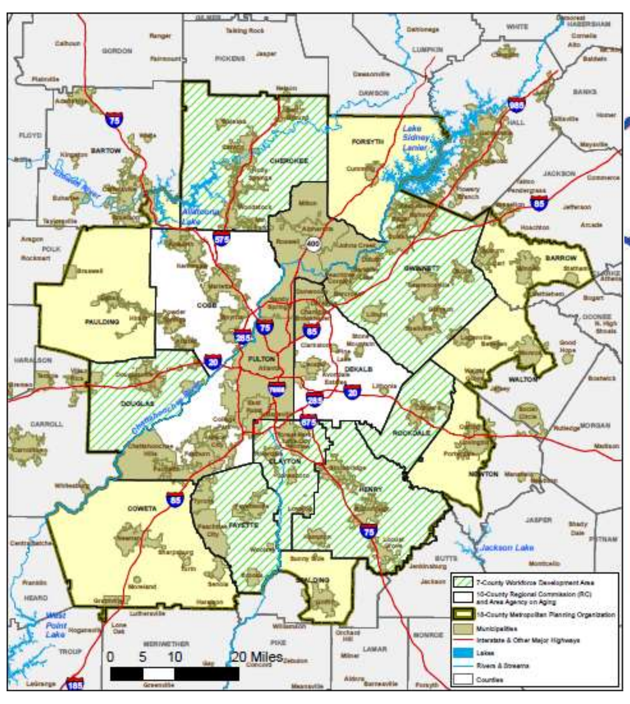
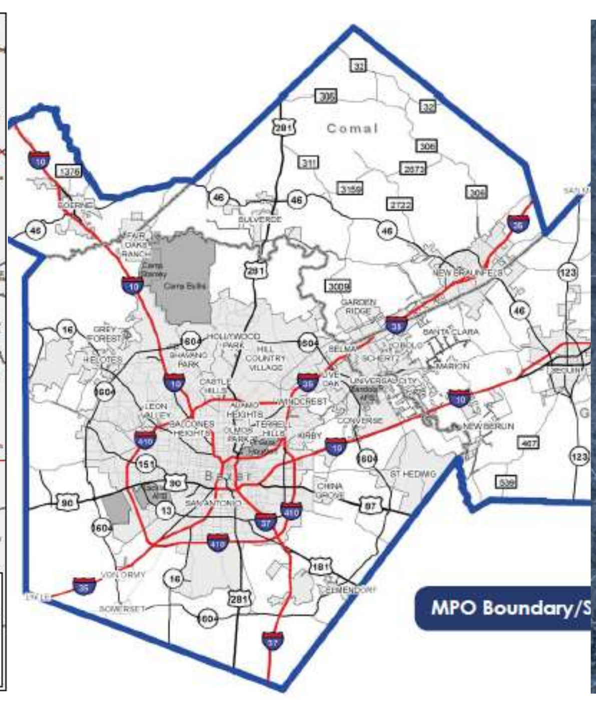
CONTEXT

1.Key facts about MPOs.

Responsible for: Regional transport plans; Investment programs

Comprised of: Cities & counties; Transport agencies

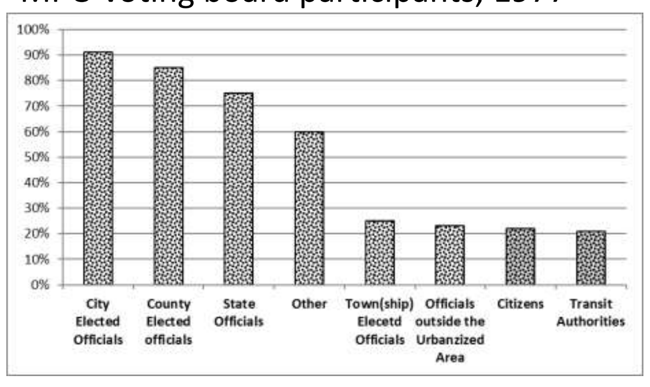
Challenges: Board representativeness; Not an owner / operator; No independent funding; No land use authority

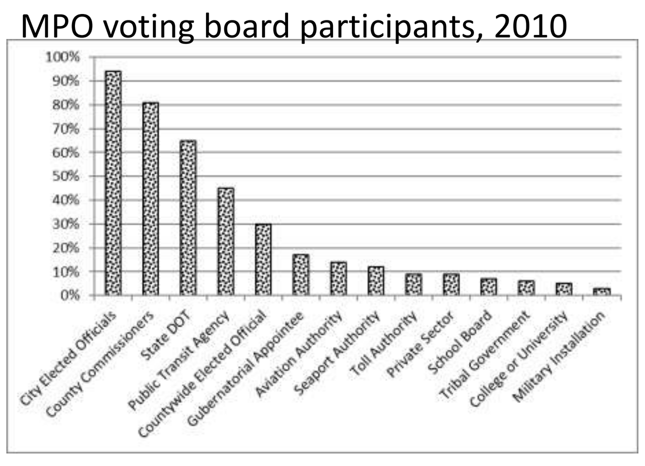
2. MPO board seats for transit matter.

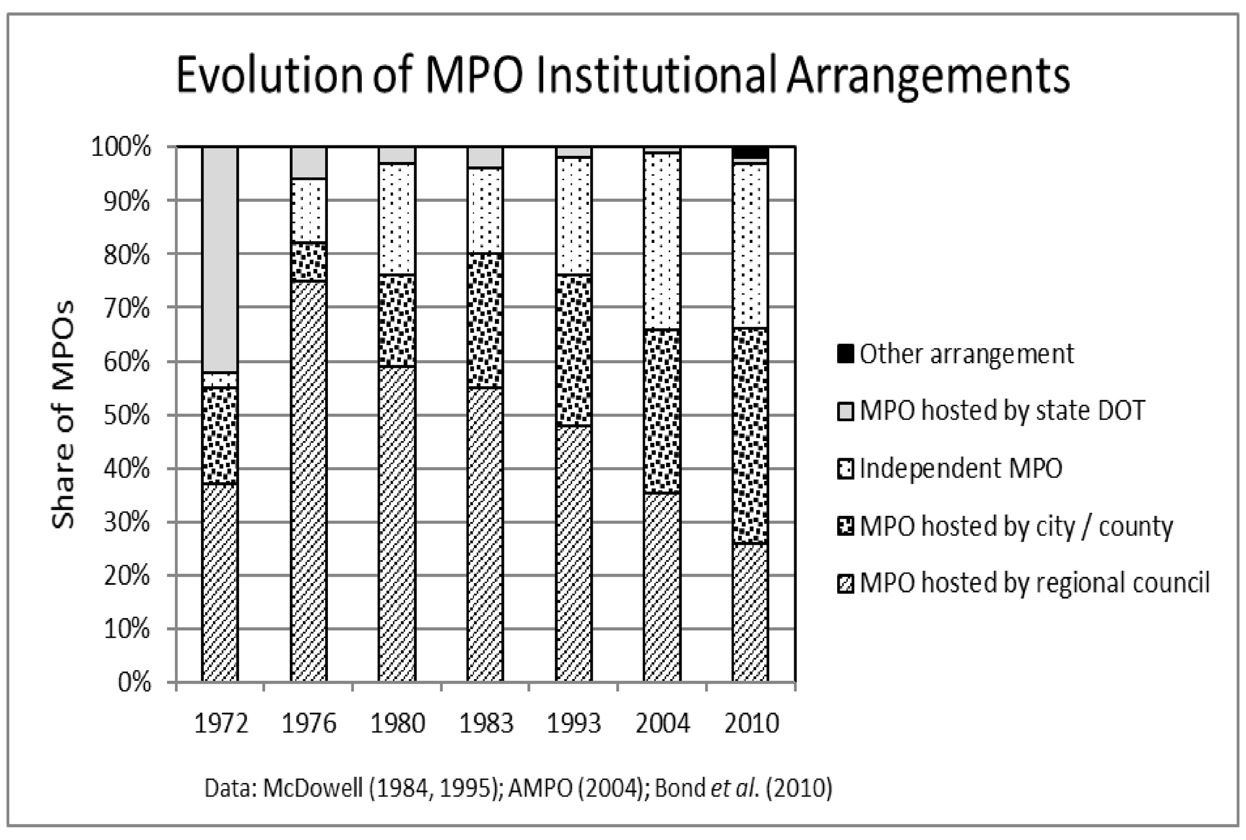
Landmark transportation bills since 1991 have enhanced state and local decisionmakers' ability to assemble the resources needed for multimodal transportation solutions. The metropolitan transportation planning process, organized by MPOs, is an important means of realizing the benefits of increased funding flexibility, for example. A transit operator with a voting seat on the MPO board has greater opportunities to act as a strategic board partner who influences transportation planning, funding, and policy decisions. Transit operators who are not actively participating in the broader policymaking and investment decisions at an MPO may be missing big opportunities to seek out innovative funding for their priority investments.

MPO voting board participants, 1977



MPO voting board participants, 2010



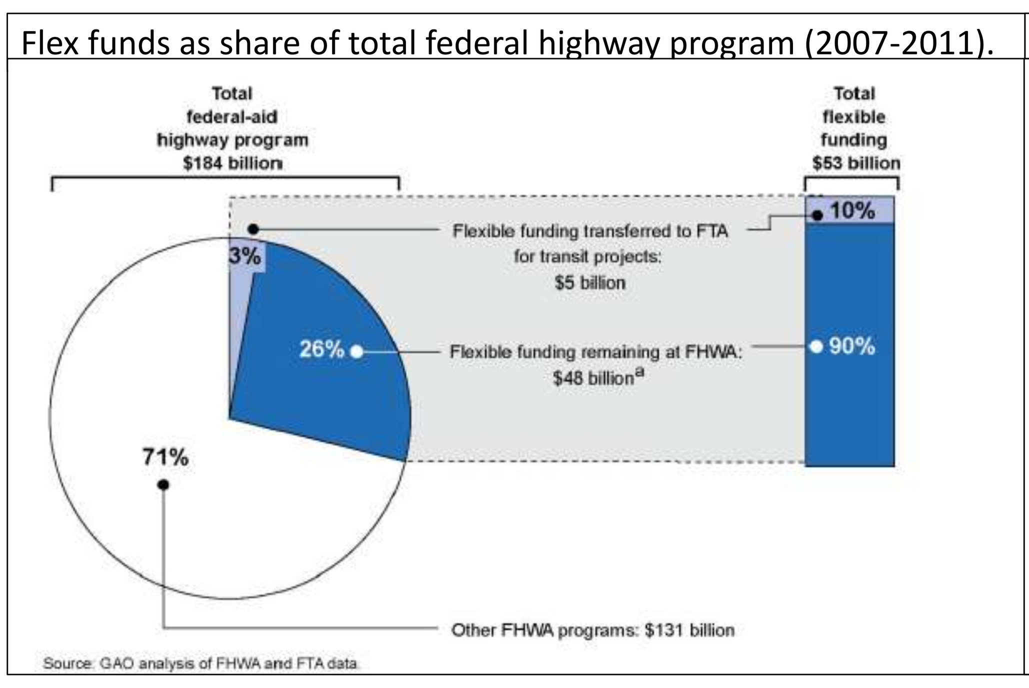


Some MPOs are independent, others are hosted by a variety of public entities.

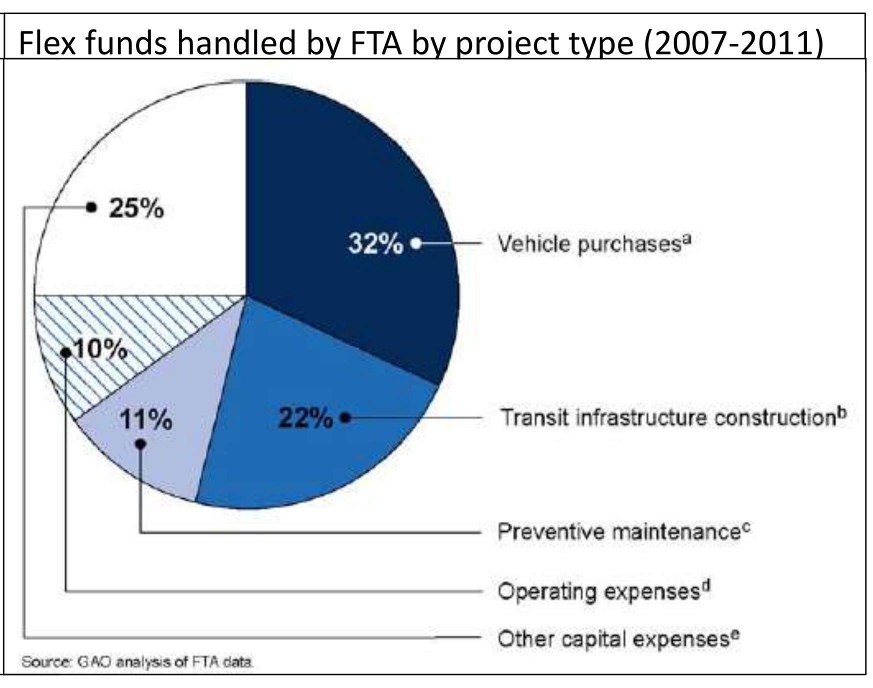
3. MPOs can direct flexible funds to support transit.

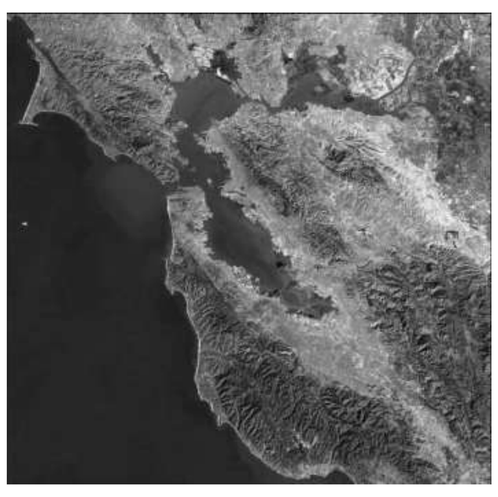
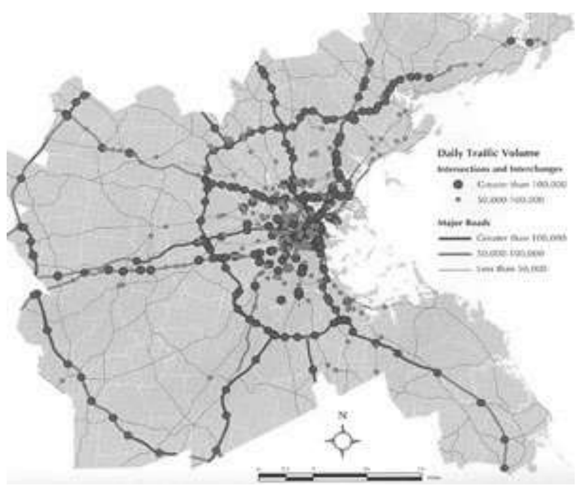
Flexible funding is generally a small share of transit funding available to a region and a small share of a transit operator's budget. Yet, flex funds have a big impact local governments' ability to meet their transportation needs. Flex funds have been used in some urbanized areas to purchase new vehicles, start new service, improve transit access for bikes and peds, and avoid service cuts.

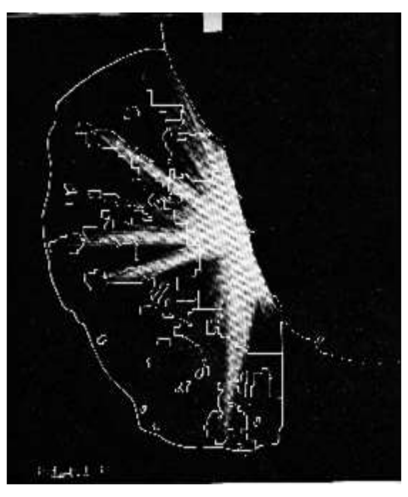
Flex funds as share of total federal highway program (2007-2011).



Flex funds handled by FTA by project type (2007-2011)



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