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

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16. Abstract

Transit-oriented development (TOD) has been largely the practice of local communities and transit agencies, but few have explored TOD opportunities and challenges from a regional perspective. This research aims to fill the gap, with a focus on the Texas Triangle. The project contains six tasks. Task 1 summarizes the types and service characteristics of transit systems in the Texas Triangle. Task 2 reviews literature on TOD, paying particular attention to TOD planning/design guidelines and policies/tools for implementation from a regional, state, or national perspective. This task also investigates innovative practices for financing TOD projects. Task 3 designs and conducts a survey of transit agencies, cities, MPOs, state agencies, and relevant private sectors concerning their perceived barriers to TOD in the Texas Triangle. Task 4 interviews key stakeholders of TOD to form a case study in Austin, Texas. Task 5 develops TOD implementation strategies focusing on value capture techniques. The research activities were integrated into a planning studio in the fall of 2017. Finally, Task 6 develops a regional TOD typology for sites in the Texas Triangle and proposes guidelines for TOD planning and design for each type.

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Executive Summary

Transit-oriented development (TOD) has been largely the practice of local communities and transit agencies, but few have explored TOD opportunities and challenges from a regional perspective. This research aims to fill the gap, with a focus on the Texas Triangle megaregion.

The Texas Triangle megaregion is rife with new rapid transit infrastructure investment. New systems—both rail-based and rubber-tire based—were constructed both to offer a needed alternative to personal vehicles and to guide regional development around the Triangle's booming core cities—Austin, Dallas, Houston, and San Antonio. Additionally, in the Texas Triangle, MPOs are actively exploring integrated transportation-land use strategies to tackle the problems associated with conventional car-oriented sprawl. For example, Capital Area Metropolitan Planning Organization (CAMPO) incorporated an "Activity Centers" concept into its long-range transportation plan in the Austin metropolitan area. In Houston, the Houston-Galveston Area Council (HGAC) implemented a "Livable Centers" concept that clusters jobs, shopping, entertainment, and/or housing into defined mixed-use areas. In Dallas, the North Central Texas Council of Governments (NCTCOG) has been expanding its programs for integrating development with Dallas Area Rapid Transit (DART) systems. Transit-oriented development (TOD) is a vital tool for implementing these regional development concepts.

This study aimed to take a regional approach to assess opportunities and challenges facing large and small communities in the Texas Triangle in developing transit-oriented development (TOD). To accomplish this goal, several core research questions were identified.

Research Questions

1. How have higher-level TOD ideas been received by various public agencies tasked with implementation, e.g., MPOs, TxDOT, transit operators, cities or other local communities in Texas?
2. What types of planning practices exist in communities of various sizes and with various transit technologies?

3. What factors—financial, institutional, and legal—have affected further adoption and implementation of TOD or similar ideas?
4. How do planners at various levels of governance and property developers differ in their identification of barriers o TOD implementation? How do these identified barriers differ among different jurisdictions?

The project contains six tasks in pursuit of answers to the research questions. Task 1 summarizes the types and service characteristics of transit systems in the Texas Triangle. Task 2 reviews literature on TOD, paying particular attention to TOD planning/design guidelines and policies/tools for implementation from a regional, state, or national perspective. This task also investigates innovative practices for financing TOD projects. Task 3 designs and conducts a survey of transit agencies, cities, MPOs, state agencies, and relevant private sectors concerning their perceived barriers to TOD in the Texas Triangle. Task 4 interviews key stakeholders of TOD to form a case study in Austin, Texas. Task 5 develops TOD implementation strategies focusing on value capture techniques. The research activities were integrated into a planning studio in the fall of 2017. Finally, Task 6 develops a regional TOD typology for sites in the Texas Triangle and proposes guidelines for TOD planning and design for each type.

In inventorying the state of TOD in the Texas Triangle, this research found that many of the megaregion's new transit infrastructure investments remain underutilized, as evidenced both by often-low ridership figures and by significant underdevelopment around many of the megaregion's 181 rapid transit stations. Better transit-oriented development (TOD) based on national best practices is needed around the megaregion both to drive citizens out of their personal vehicles and guide development in compact, efficient, and sustainable manners.

Most Texas Triangle planning agencies—at the state, regional, and local level—agree that TOD would benefit their communities, but less than 1⁄4 report having even adopted a definition for TOD. Generally, surveyed and interviewed public agency planners in the Texas Triangle wish their jurisdictions were better equipped to implement TOD. Surveyed and interviewed developers and planners agree that demand often exists to construct around rapid transit investments, but both parties agree that TOD plans for station areas need to be better suited to

market conditions for progress to boom—generally entailing significantly higher density than is allowed now, as well as abilities for developers to be flexible with their development plans.

Of all identified issues plaguing TOD progress in the Texas Triangle, the most pressing is the lack of funding for capital projects related to transit infrastructure and infrastructure more generally that surrounds transit stations. 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. This research inventories the advantages and disadvantages to TOD-related value capture mechanisms in the state of Texas, as well as their statutory provisions.

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. Planners and developers were largely supportive of form-based codes which allow for higher densities and for developer flexibility, often identified as key to realizing progress at TOD sites.

State and regional planning agencies hold the key to disseminating best practices for all of these areas of issue—with rapid transit technologies, land use strategies, value capture mechanisms, and more—and would likely see great success in generating TOD guidelines for their large-scale jurisdictions. These guidelines should be generic enough to apply to a breadth of station typologies suited to local interests, but specific enough to provide guidance to relevant local agencies. In addition, state and regional agencies can deliberately utilize funds in manners that are clearly supportive of TOD development. Regional smart growth maps that utilize the principles of TOD networks, often published by regional planning agencies, are an excellent start in disseminating how funds will be utilized, and where planners and developers from around the region should concentrate their interests.

With an increase in quality partnerships, valuable TOD-specific development codes, and improvements in demonstrated state and regional investment, the case of TOD in the Texas Triangle megaregion is a case of tremendous and yet-unrealized potential.

Chapter 1. Introduction: Transit-Oriented Development in the Texas Triangle Megaregion

In the Texas Triangle, MPOs are actively exploring integrated transportation-land use strategies to tackle the problems associated with conventional car-oriented sprawl. For example, Capital Area Metropolitan Planning Organization (CAMPO) incorporated an "Activity Centers" concept into its long-range transportation plan in the Austin metropolitan area. In Houston, the Houston-Galveston Area Council (HGAC) implemented a "Livable Centers" concept that clusters jobs, shopping, entertainment, and/or housing into defined mixed-use areas. In Dallas, the North Central Texas Council of Governments (NCTCOG) has been expanding its programs for integrating development with Dallas Area Rapid Transit (DART) systems. Transit-oriented development (TOD) is a vital tool for implementing these regional development concepts.

Unfortunately, however, TOD in the Texas Triangle has been practiced locally only by a limited number of communities and transit agencies, and where it is practiced it sometimes results in little development, regardless of TOD-friendly regulations. For instance, the City of Austin began formal TOD planning through an approved TOD ordinance in 2005. However, as of 2017, only three station area plans (for three of nine constructed stations) along the MetroRail Red Line (commuter rail) have been adopted. In spite of this, significant development has occurred around the Austin area, even where station area plans don't exist. On the other hand, the City of Leander, a northern suburb of the Austin region, completed an award-winning TOD plan for a site of 2300 acres around the northern terminus of the Red Line in 2005, yet has seen little realized development—for now.

Many other communities in Central Texas are either too small to afford operation of their own rapid transit systems, or lack resources to plan and implement TOD projects. Regional agencies such as CAMPO have expressed strong interests in providing formal regional TOD guidance for the purpose of utilizing TOD as a tool to achieve their regional development objectives.

The TOD knowledge base is very rich from the demand side on how citizens, transit users, and real estate markets are likely react to TOD. On the other hand, the knowledge on TOD from the

public sectors is rather limited in Texas. How have higher-level TOD ideas been received by various public agencies tasked with implementation, e.g., MPOs, TxDOT, transit operators, or local planning agencies in Texas? What types of practices exist in local communities? What factors—financial, institutional, and legal—have affected further adaption and implementation of TOD or similar ideas? The proposed project aims to take a regional approach to assess opportunities and challenges facing large and small communities in Texas Triangle.

This project relates directly to FAST Act Priority 1, Topic Area 2: "Increase access to opportunities that promote equity in connecting regions and communities, including urban and rural communities"; the specific subtopic of relevance is: "Capitalizing on Access-Enabling Spatial Strategies." TOD is one of many spatial strategies being highly advocated in recent years. In addition, the project pertains to Topic Area 3: "Innovations in multi-modal planning and modeling for high-growth regions."

This report consists of 9 chapters. After this introduction, Chapter 2 "Research Methods" examines the research methods utilized in the generation of this report. Following this, Chapter 3 "Review of TOD Practices at the Regional Level and Beyond" examines literature from around the Texas Triangle megaregion and the nation to discuss best and worst practices of TOD at several levels of implementation: local, regional, and state. After that, Chapter 4 "Transit Technologies in the Texas Triangle" examines all of the rapid transit technologies employed in the Texas Triangle's most prominent cities. Chapter 5 "TOD Typologies in the Texas Triangle" generates typologies—idealized, planned, and realized—for areas surrounding rapid transit stations in the Texas Triangle. Next, Chapter 6 "Surveys of Public Agencies and Developers" discusses the creation of a survey and its findings: a breadth of opinions on TOD practices at several levels of governance around the Texas Triangle. Following this, Chapter 7 "Interviews of Austin, TX TOD Stakeholders" utilizes survey findings to dive deeper into the opinions of a single cohort of stakeholders bound by the same TOD-related realities to examine the differences in their perspectives. After this, Chapter 8 "Value Capture Practice in the Texas Triangle" spells out the value capture techniques being utilized in the Texas Triangle, and discusses the efficacy of these techniques within the Texas Triangle megaregion. Finally, Chapter 9 "Conclusions and

Recommendations" discusses necessary next steps in improving the state of TOD in the Texas Triangle.

Chapter 2. Research Methods

2.1. Research Tasks

This study aimed to take a regional approach to assess opportunities and challenges facing large and small communities in the Texas Triangle in developing transit-oriented development (TOD). To accomplish this goal, several core research questions were identified.

Research Questions

5. How have higher-level TOD ideas been received by various public agencies tasked with implementation, e.g., MPOs, TxDOT, transit operators, cities or other local communities in Texas?
6. What types of planning practices exist in communities of various sizes and with various transit technologies?
7. What factors—financial, institutional, and legal—have affected further adoption and implementation of TOD or similar ideas?
8. How do planners at various levels of governance and property developers differ in their identification of barriers o TOD implementation? How do these identified barriers differ among different jurisdictions?

Research Tasks

In pursuit of answers to these research questions, six research tasks were identified.

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

2.1.1. Transit Inventory

A preliminary task in this research was to closer-examine transit systems in the four main metropolitan regions of the Texas Triangle: Austin, Dallas, Houston, and San Antonio. As one may expect, each of the metropolitan regions offers a portfolio of city bus lines and paratransit services. While there are some distinctions between different cities' service—such as with the strength of Houston's commuter bus network—generally there is little differentiation among cities for these core services. In addition, these bus services rarely attract transit-oriented development. As a result, the inventory consists exclusively of rapid transit systems.

Two core headlines were noted regarding rapid transit systems of the Texas Triangle. First, each metropolitan area is experimenting with its own distinct portfolio of rapid transit system—these systems prove as diverse as the cities themselves. Second, each metropolitan area in the megaregion has recently invested in rapid transit. While the Dallas metropolitan area was the first to implement rapid transit in the megaregion with its light rail system, it continues to invest heavily in that system's expansion while continuing to construct several new rail lines. Each of the metropolitan areas of the Texas Triangle has implemented a rapid transit system within the last ten years.

The completed rapid transit inventory includes basic transportation background for each of the metropolitan areas examined, as well as system characteristics and history for each rapid transit system that the metropolitan area currently operates. In addition, a GIS inventory was generated of all rapid transit stops and land uses around rapid transit stops in the Texas Triangle. This was utilized to generate the inventory of TOD sites.

2.1.2. Literature Review

The second preliminary research task involved a literature review of best practices of TOD development at the national, regional, and local levels. This literature review would inform the remainder of the research tasks. Plans at all levels of governance were reviewed as well as published research. Differences of opinions were explored regarding the following core elements of TOD planning practice:

- The central purposes of TOD planning
- Definitions of TOD for different authors
- Plans' stated benefits of TOD
- TOD practice (including transit modalities, land use and intensity, and environmental considerations)
- Strategies for implementation (including TOD zoning, TOD incentives, smart growth maps, joint development opportunities, and measuring performance of TOD development or potential)

2.1.3. Survey

The core component of this research, the public agency survey was generated utilizing findings of the literature review—both published academic works as well as regulations at the national, regional, and local levels. The survey provided a general definition of TOD – deliberate development oriented towards transit stations in a manner that supports transit services and enhances community livability through the design of compact, walkable, and mixed-use environments – but also encouraged agencies to utilize their own definitions of TOD if they had adopted a definition. While some agencies' practices reflect the definition above, this survey was also intended to capture practices that focus on compact development and walking- and cycling-friendly designs near transit, even if the practice is not branded "TOD."

The survey consists of 26 questions, divided into five sections: Background Information, Concepts and Perspectives, Current Practices of TOD or Similar Development and Design near Transit, Barriers to TOD Implementation, and Effectiveness of Strategies to Overcome Barriers to the Implementation of TOD. The survey was administered through Typeform and took approximately 30 minutes to complete. In the fall of 2017, the survey was open for one month, and one attempt was made every week, in email or call form, to send the survey to our list of contacts in order to maximize survey responses. In the spring of 2018 the survey was opened for several months and attempts were made via email to contact all who had been identified as possible survey participants that did not complete the survey. In an attempt to secure responses

from all large organizations in the Texas Triangle, several employees were contacted at larger organizations from which no response had been received.

When the survey closed, respondents' answers to the survey questions were coded using a database approach. In the database, variables were used (abbreviated expressions) to represent survey questions which usually come in long sentences. For questions allowing multiple selections, each answer was represented by one variable.

The public agency survey was sent to three specific groups within the Texas Triangle. First, it was sent to regional and state offices of planning: metropolitan planning organizations (MPOs), councils of government (COGs), and the relevant state department of transportation, TxDOT. Second, the survey was sent to all registered public transit providers in the Texas Triangle. Third, all municipal planning agencies in the Texas Triangle which had some form of public transit service were sent the survey. Some surveys were sent to multiple contacts for each agency, generating multiple responses from a single organization. In these cases, all responses were coded and given equal weight. Responses were received from a broad array of agencies with jurisdictions large and small from around the Texas Triangle. Public transit was the least-well represented group in the survey, with a lower response rate than any other population.

As a follow-up to this survey, in the spring of 2018 a similar survey was administered to for-profit and nonprofit developers around the Texas Triangle. Similar to the public agencies survey, this survey was adapted nominally to gauge and compare developers' opinions and practices with transit-oriented developments to those of the planners with whom they work. With a much larger target population, this survey was administered with convenience sampling. All of the largest developers with operations in the Texas Triangle were contacted, as well as all of the largest trade organizations representing developers in the Texas Triangle. Additionally, dozens of developers in the Texas Triangle that had projects in transit-oriented developments were contacted. Unfortunately, few developers completed the survey.

2.1.4. Interviews

Following the surveys, interviews were conducted of planners, developers, and community groups around the Austin metropolitan region to ground survey results and allow for an examination of Austin's TOD progress at a site-specific level. These interviews utilized a combination of convenience sampling and snowball sampling. First, several planners and developers in the Austin region were identified as having an interest or stake in TOD and were contacted. One of the first developers that was interviewed contacted the research team to request an interview when he received a survey request. Following each interview, subjects were asked if they would like to share names of others in Austin with whom the research team should speak about TOD in Austin. Interviews were conducted in the City of Austin and in Leander, a suburban city with its own distinct planning practices.

2.1.5. Value Capture Regulations and Techniques

One of the core findings of the surveys and interviews was that many public agencies around Texas are interested in utilizing value capture techniques, but simply do not know how to utilize the techniques available to them. While many agencies were aware of their lack of know-how in regard to value capture, others were not aware of their misunderstandings of the processes involved in value capture. It was vital to provide a clear explanation for different value capture techniques available to agencies in the Texas Triangle.

This was accomplished in two stages. First, an inventory was generated of value capture techniques that have been utilized for TOD sites around the country. This inventory was based on the literature review. Following this, survey and interview results, as well as a meeting with a preeminent value capture expert[1], informed which value capture techniques are available to planners in the Texas Triangle.

[1] Vadali, Sharada Ph.D. (2017). Value Capture Tools—Texas Style. *Texas A&M Transportation Institute*. Lecture.

2.1.6. TOD Typologies

The final research task involved developing TOD typologies for all TOD stations in the Texas Triangle. The purpose of this task was twofold. The first purpose was to identify and categorize existing development patterns. The second purpose of these typologies was to provide a guide to assist planners in implementing specific kinds of TOD development pattern at specific sites.

In identifying TOD typologies in the Texas Triangle, the first task was to inventory all rapid transit stations in the Texas Triangle and generate buffers around stations areas to capture demographics and land use utilizing GIS. Following this, built-environment data which captures the current state of TOD sites was examined. Then, to generate an understanding of future expectations for TOD sites as well as their relationships with other sites in a network, formal plans for sites were studied. With this information, Texas Triangle-specific typologies were identified, and these typological assessments were applied to all rapid transit stations in the Texas Triangle to form an inventory.

Chapter 3. Review of TOD Practices at the Regional Level and Beyond

Transit-oriented development (TOD) denotes a mixed-use, compact, and active-transportation friendly environment within close proximity to transit stations. The concepts that drive TOD can be applied to the regional scale as well. A network of TODs forms a regional structure of nodes and/or corridors.

This review will focus on studies and practices of TOD at the regional, state, and national level. Over a dozen sets of guidelines or recommendations were found from these levels of governance, as well as multiple academic reviews of these documents. While this review focuses on these levels, it is grounded in a discussion of best practices at all levels of governance regarding basic definitions and stated purposes of TOD. Through these self-ascribed definitions, transit authorities, planners, municipalities and developers can utilize common language to work collaboratively to determine what TOD should be in their environment. The review will then address different transit modalities and how this affects types of TOD that are possible at a given location. Finally, this review will examine strategies for implementation that have been successful in regions throughout the United States. We will use this information to inform applicability to Texas Triangle TOD.

3.1. Central Purposes of State and Regional TOD Planning

TOD guidelines for regional, state, and national levels serve varying purposes; however, based on an analysis of a plethora of documents from diverse perspectives, it is clear that most guidelines serve a common purpose: to address TOD as a means to create more livable, sustainable communities, regardless of the intended scale of implementation.

Many TOD documents provide goals or purposes for TOD within a given jurisdiction, and these often vary from one jurisdiction to the next. For example, the ultimate goal of Cleveland's

regional TOD plan is to "promote vibrant and livable station areas"[2] for their customers, while San Diego's strategy focuses on creating "vibrant, healthy communities that are accessible to transit.[3] Other strategies focus on using TODs to address future challenges based on current trends. For example, the state of California identifies TOD as one of several "livable communities" strategies to address California's ongoing growth challenges, particularly traffic congestion.[4] Indiana also uses their regional TOD Strategic Plan to address and plan for long-term projections of regional population, household and employment changes through 2040, and what effects these projections will have on the demand for transit-oriented development.[5]

In addition to addressing future projections, a few state and regional TOD plans identify specific goals and the ability for TOD to contribute to accomplishing these goals. The state of Florida, in an attempt to veer away from automobile dependence, uses its guidelines as an avenue to transition from an auto-oriented state towards a state with more compact, livable environments generated by TOD.[6] The San Diego region's guidelines also identify specific goals in its statement of main purpose. These include reduction of greenhouse gas emissions, increase in transit ridership, walking, and biking, and the provision of a greater mix of housing and employment opportunities for all residents of the region.[7]

Many guidelines also identify valuable and useful resources for the planning and implementation of TOD. The Greater Cleveland guidelines establish a plan for public involvement in the TOD planning process, identifying ways for stakeholders to understand the planning tools available to meet stated objectives and developing a plan that will allow stakeholders to take ownership of TOD projects.[8] Delaware Valley also uses their regional guidelines as a "toolkit" designed to provide public officials, planners, transit operators, developers, and citizens with resources that

[2] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.*
[3] SANDAG. (2015). Transit Oriented Districts: A Strategy for the San Diego Region. *SANDAG.*
[4] California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. *California DOT.*
[5] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect*.
[6] Florida Department of Transportation (FDOT). (2012). Florida Transit Oriented Development Guidebook. *Florida Department of Transportation.*
[7] SANDAG. (2015). Transit Oriented Districts: A Strategy for the San Diego Region. *SANDAG.*
[8] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America*.

can encourage public and private investment at rail stations.[9] Additionally, San Diego's regional TOD strategy also includes the use of "tools" that local jurisdictions can use to implement transit-oriented development.[10]

While TOD guidelines throughout the United States form diverse perspectives, all see the potential of TOD to benefit their jurisdictions. With these benefits in mind, most planning agencies are utilizing these guidelines in an attempt to foster quality TOD development. These context-adaptive "toolkits", specific to cities, regions, or states, are vital components in planners' advocacy for TOD in their jurisdictions.

3.2. State- and Region-Wide Definitions of TOD

In order to create a coherent TOD strategy or implementation plan, it is important to first generate a jurisdiction-specific, adjudicated and approved definition TOD. These jurisdiction-specific definitions—both those which acknowledge that they are jurisdiction-specific and those that see their definition as universal—can reveal differing aspirations, goals, or perceived benefits each state or region seeks through TOD implementation. These definitions prove vital in jurisdictions' generation of "mutual understanding" amongst different parties with interests in TOD.

Common among all state and regional definitions of TOD in official guidelines and strategic plans were three core components: density, mixed uses, and walkability. California's definition of TOD offers a representative example of how other states and regions may define TOD as well. California's definition states, "Transit-oriented development (TOD) is moderate to higher-density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment and shopping opportunities designed for pedestrians without excluding the auto".[11] This definition highlights three common core components to these definitions:

[9] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*
[10] SANDAG. (2015). Transit Oriented Districts: A Strategy for the San Diego Region. *SANDAG.*
[11] California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. *California DOT.* 10.

"moderate to higher-density development," a major transit stop accessible by an "easy walk," and a mixed-use environment containing a variety of live, work, and play opportunities.[12]

The first common core characteristic of a TOD definition relates to density, in particular the relatively-higher density associated with TOD. California and Delaware Valley define this as "moderate to high density".[13] Chicago guidelines for density rely on an interpretable "dense and compact" nature.[14] Other definitions rely on interpretation relative to surroundings, including Maryland's guidelines' definition that TOD is development of "relatively higher density"[15], and Cleveland's description of that density as "elevated".[16]

In addition to defining TOD in terms of its relatively higher density, definitions also included a description of TOD in terms of its mixed-use nature. California, Cleveland, Chicago, Delaware Valley, Indiana, and Maryland, all include mixed-use as a core component of TOD. Some guidelines, such as those of California and Delaware Valley, define this mixture of uses more explicitly, stating that, "Mixed uses include residential, commercial, and office, or some combination."[17]

The third core concept of state and regional TOD definitions—walkability—is included in virtually all TOD guidelines. Similar to California's definition, most state and regional TOD guidelines define transit-oriented development in terms of pedestrian orientation, or as Cleveland puts it, "pedestrian circulation and accessibility".[18] Chicago, San Diego, and Indiana discuss the ability to "walk to and from a transit station" as a result of higher densities and close proximities. Furthermore, California, Delaware Valley, and Maryland define this as an "easy walk".

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[12] California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. *California DOT.* 10.
[13] Ibid.
[14] Center for Neighborhood Technology (CNT). (2013). Transit-Oriented Development in the Chicago Region: Efficient and Resilient Communities for the 21st Century. 5. *Center for Neighborhood Technology.* 5.
[15] Maryland DOT. (2003). Purple Line Transit-Oriented Development Guidelines and Principles. *Maryland DOT.*
[16] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.* 5.
[17] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*
[18] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.* 5.

In addition to these three commonly-included core concepts, some TOD definitions also include references to a reduced dependence on private vehicles and to the better transit choices that come with TOD. For example, Chicago's definition of TOD describes benefits of destinations in TODs that are within "easy and affordable access at a fraction of the cost of using an automobile".[19] Similarly, Delaware Valley defines TOD as enabling "residents and workers to drive their cars less and ride mass transit more"[20] while Indiana's definition emphasizes "reduced dependency on vehicles that generate greenhouse gases".[21]

Whether prescribing greater mobility choices, reducing dependence on private vehicles, or emphasizing pedestrian-oriented, mixed-use environments built at higher densities, it is evident that state and regional TOD definitions all shape how TOD is conceptualized and implemented in a given jurisdiction, highlighting the importance of a concerted, deliberate effort in generating a quality definition of TOD, especially important for interorganizational collaboration at a large scale.

3.3. State and Regional Plans' Stated Benefits of TOD

Planning agencies do not advocate for TOD without reason—leading to agencies' advocacy is a realization that the benefits of TOD may be significant for a state or region. Often, the discussion of these perceived benefits is explicit within published TOD guidelines.

The main state and regional benefits identified by guidelines of TOD implementation generally involve increased transit ridership, increased property values, and health and environmental benefits that are seen as deriving from a more pedestrian- and cyclist-oriented environment dependent less on personal vehicle ownership. In the latter category, benefits often include greater daily physical activity and improved air quality due to reduced personal vehicle use. While these benefits are significant at a local level, a regional or state network of TODs allows these benefits to grow exponentially. Figure 3.1 of the Transit Cooperative Research Program

[19] Center for Neighborhood Technology (CNT). (2013). Transit-Oriented Development in the Chicago Region: Efficient and Resilient Communities for the 21st Century. 5. *Center for Neighborhood Technology.*
[20] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*
[21] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.*

reviews the internal weight of stated goals of TOD from the perspective of transit agencies. These goals generally align with non-transit agencies' goals for TOD as well.[22]

Figure 3.1. Relative Frequency of Stated Transit-Agency Goals for TOD Projects[23]

Unsurprisingly for an inventory of transit agency benefits of TOD, increased transit ridership holds more weight as a stated goal of TOD than any other goal. While the potential for property tax increase ranks lowest among goals of transit agencies, one may assume that these increases are far more important for municipal agencies. While the Transit Cooperative Research Program recorded different weights for each stated goal, most guidelines reviewed mention most (if not all) of the stated goals in this chart.

[22] Transit Cooperative Research Program (TCRP). (2004). Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects. *Transit Cooperative Research Program.*
[23] Ibid.

Undoubtedly, an increase in transit ridership can result in a decrease in vehicle miles traveled (VMT), an important root of the perceived environmental benefits of TOD. California states that TOD "reduces air pollution and energy consumption rates,"[24] while other guidelines such as those of the Chicago region noted that TOD results in "lowered regional congestion, air pollution, and greenhouse gas emissions".[25] Outside of the commonly-mentioned realm of potential air quality improvements, guidelines of California and the Cleveland region also note TOD's potential improvement of the conservation of open space, or at least the reduction in consumption of existing open space. As California guidelines discuss, TOD consumes less land than conventional, low-density dispersed development thus "[reducing] pressure to convert prime farmland and other resource lands to urban uses and allows agricultural land to be used more productively".[26]

Hand-in-hand with guidelines' discussion of reduced personal vehicle usage and increased transit ridership, virtually all TOD guidelines also address TOD's inherent fostering of walkable environments. High-caliber, deliberate "walkability" in a TOD brings many benefits, including an increase in public safety. As the guidelines of California discuss, TOD can promote public safety by creating places that are busy during the day and at night, placing eyes on public spaces even during off-peak times. Additionally, TOD design principles require deliberate infrastructure for pedestrians and bicyclists with the goal of improving their safety and comfort. By reducing automobile dependence—especially within the boundaries of TOD sites—TOD can also contribute to a reduction in accident injury rates, as noted in Maryland's TOD guidelines.

Leaving the realm of transportation, many TOD guidelines also note TOD's potential boost for economic development and propensity to increase property values. Guidelines of California discuss TOD's potential to increase households' disposable income as a result of reduced automobile expenditures. TOD also has the potential to result in a revitalization of depressed activity centers and neighborhoods, an enhanced tax base and reduction in government spending

[24] California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. *California DOT.*
[25] Center for Neighborhood Technology (CNT). (2013). Transit-Oriented Development in the Chicago Region: Efficient and Resilient Communities for the 21st Century. 5. *Center for Neighborhood Technology.*
[26] California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. C*alifornia DOT.* 43.

per capita, and a decrease in new infrastructure needs through the implementation of more compact development patterns.[27] Similarly, Cleveland's regional plan recognizes TOD's role in revitalizing neighborhoods, increasing homeownership rates, and generating higher tax revenues from increased retail sales and property values. It also notes TOD's role in improving an area's economic health through a generation of new employment and its resulting new income generation at TODs, as well as a purported higher rate of return for developers.[28]Chicago, Indiana, and Florida also recognize these economic development benefits, particularly the increase in tax revenue through higher property values.

Finally, TOD guidelines often identify an improvement in housing diversity as one of the core benefits of TOD. For example, guidelines of California and Cleveland note a potential for more affordable housing in TOD environments. In addition, many argue that affordable housing that does exist in TODs can be more truly affordable than non-TOD affordable properties, as relatively-low cost transportation options often exist in abundance at TOD sites.

All of these benefits offer persuasive arguments for quality TOD's capacity to strengthen states, regions, and communities that implement TOD. Transit-oriented development can address a plethora of pressing issues, especially when its discussion of benefits is generated for specific contexts. Whether a setting's most pressing problems are environmental, social, economic, or otherwise, TOD guidelines are easily tailored to offer solutions to specific issues.

[27] California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. *California DOT.*
[28] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.*

3.4. TOD Practice

All TOD guidelines are not created equal, nor do their creators desire them to all be the same. An apt set of guidelines should be directly applicable to a specific context, be that context site-level, network-level, city-level, state-level, or even federal-level. For this literature review, several guidelines were analyzed that encompass more than just the jurisdiction of one municipality. Much like TOD guidelines' discussions of benefits, significant differences were discovered in their proposed "practice" of TOD, especially in terms of transit, land use and intensity, and environmental considerations such as walkability and engineering standards. The different approaches to the creation of TOD guidelines can inform a Texas planning agency's construction of their own guidelines.

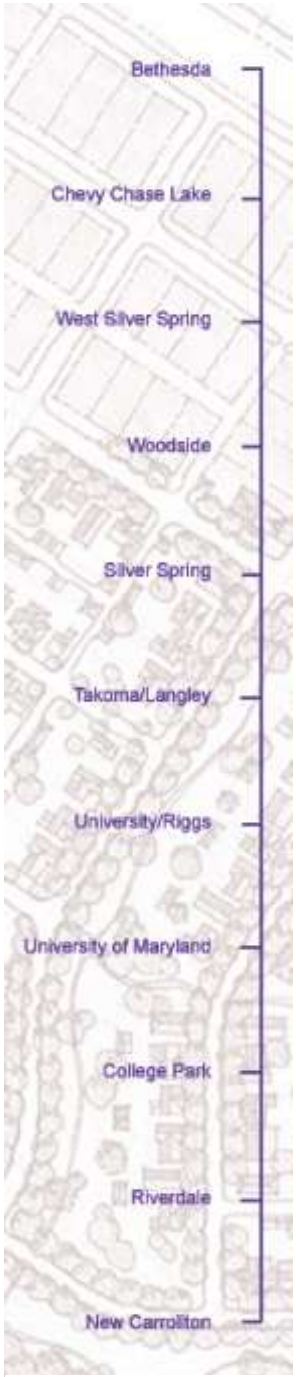


Figure 3.2. Maryland's guidelines are for specific stop locations

3.4.1 Transit Modalities

One of the clearest differentiators of TOD guidelines are their treatment of transit modalities. While some guidelines are clearly geared towards TODs for higher-investment fixed-guideway systems, others acknowledge the benefits of TODs for relatively low-investment projects, such as those which utilize buses. Some TOD guidelines are even geared towards specific in-process flagship capital investment programs, such as the TOD guidelines for Maryland's Purple Line light rail system. For a Texas-wide approach, the consideration of high level bus service (often referred to as "BRT-Lite" service; see Appendix A) is apt, as many areas within the Texas Triangle are not considering fixed guideway systems. In Austin for example, while there are areas with extremely dense bus service, there are currently no in-process plans for fixed guideway systems. To consider Austin's current condition or Waco, which spatially is prime within the megaregion although has a relatively small operating budget,

one should not prescribe TOD only to municipalities investing in infrastructure costing hundreds of millions of dollars.

The Maryland Purple Line's 2003 set of TOD guidelines predates final funding consideration of the Purple Line project by a large margin, and as of 2017 ground has not yet been broken for this new transit line. However, the benefits of developing relatively specific guidelines in an early stage are clear, and the conclusions made in the guidelines were likely a part of the argument in the final stretches for acquisition of capital investment. The first and foremost of benefits for this type of guidelines are that they may be used to reference a specific environment that are already known. For example, Maryland's Purple Line guidelines note the specific towns in which the Purple Line will stop, even though the exact stop locations were not known when the guidelines were created (see Figure 3.2).[29] These locations are not discussed in this document in-depth, which is a lost opportunity, but they were known and likely considered when other recommendations were made. This type of guidelines may also state with confidence development goals with specific transit ridership goals in mind, minimizing ambiguity for recommendations and maximizing overall utility of the land and transit system.

While line-specific TOD guidelines are certainly valuable, there are some areas which aspire to TOD which do not yet anticipate significant development in transit, or, more commonly, there is a major planning body (such as at the state level) providing guidelines on TOD for all of their constituents, even those outside of areas where fixed-guideway systems are cost effective. For example, Florida's DOT TOD guidelines are applicable to the entire state of Florida in spite of the fact that Florida is indisputably categorized as generally auto-oriented, even in cities. To make its guidelines useful, Florida offers clear guidelines for different transit types (light rail, commuter rail, buses, etc.) as they apply to TOD. For example, the guidelines discuss headways of specific transit types, and roughly how much transit-oriented development may be planned for these given headways. The guidelines suggest "premium levels of service" are ideal for TOD, which may be perceived differently by different areas of Florida. Even though these guidelines can sometimes be specific, they almost universally add sections explaining from a basic level the concepts of TOD for those who are not familiar with TOD. In these sections, writers discuss

[29] Maryland DOT. (2003). Purple Line Transit-Oriented Development Guidelines and Principles. *Maryland DOT.*

TOD at a very high level, explaining non-specifically what TOD is and how it can be applied in the broadest of senses. This may also be valuable to the creation of a Texas Triangle-level set of guidelines, as jurisdictions within the megaregion may be unfamiliar with the concept, especially if they do not have significant transit.

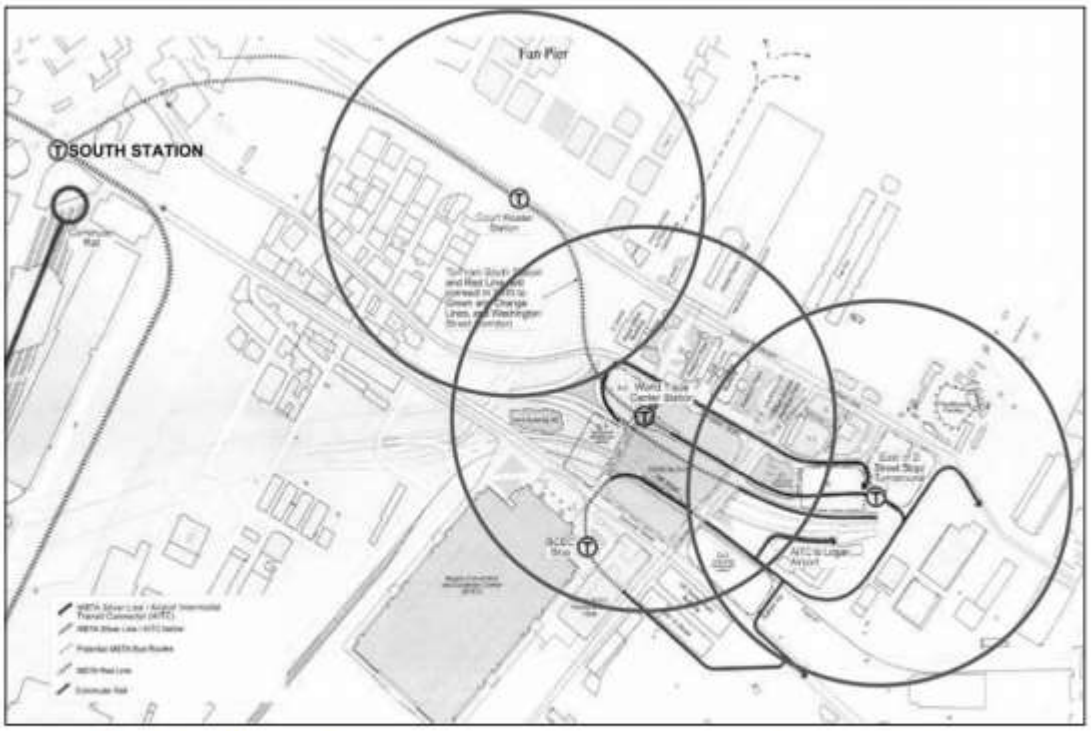
Federal Transit Administration New Starts Application Statistics

	Length (miles)	Number of Stations	Ridership (000)	New Riders (000)	Station Spacing (miles)	Ridership per mile	Ridership per station
COMMUTER RAIL							
Tri-Rail (South Florida)	71.1	19	68	30	3.7	1,000	3,600
Harrisburg Corridor One Rail	37.4	7	1.6	NA	5.3	NA	200
Orlando Commuter Rail	31.0	12	7.4	3.7	2.6	200	600
Minneapolis North Star	40.0	6	5.6	1.3	6.7	100	900
Salt Lake Weber County	43.0	8	11.8	6.1	5.4	300	1,500
Nashville East Corridor	32.0	6	1.9	1.9	5.3	100	300
Raleigh-Durham Regional Rail	28.1	12	NA	NA	2.3	NA	NA
Average Commuter Rail	**40.4**	**10.0**	**16.1**	**8.6**	**4.5**	**340**	**1,183**
LIGHT RAIL TRANSIT (LRT)							
Sacramento South Corridor	4.3	4	11.3	2.6	1.1	2,600	2,800
St Paul/Minneapolis Central Corridor	11.0	16	43.3	6	0.7	3,900	2,700
Charlotte Northeast Corridor	10.7	14	10.5	3.5	0.8	1,000	800
Salt Lake Mid-Jordon	10.6	9	9.5	3.7	1.2	900	1,100
Norfolk, VA	7.4	11	6.5	1.6	0.7	900	600
Los Angeles Exposition Corridor	9.6	8	NA	NA	1.2	NA	NA
Orange County, CA Centerline	9.3	16	NA	NA	0.6	NA	NA
Denver West Corridor	12.1	12	28.7	4.7	1.0	2,400	2,400
Tampa Bay Regional Rail	20.1	26	NA	NA	0.8	NA	NA
Portland South Corridor	8.3	15	46.5	9.4	0.6	5,600	3,100
Dallas Northwest/Southeast	20.9	16	45.9	10.7	1.3	2,200	2,900
Average LRT	**11.3**	**13.4**	**25.3**	**5.3**	**0.9**	**2,438**	**2,050**
BUS RAPID TRANSIT (BRT)							
Houston North Corridor	5.4	8	11.4	3.1	0.7	2,100	1,400
Houston Southeast Corridor	6.0	11	13.9	3.3	0.5	2,300	1,300
Kansas City Troost Corridor	9.0	25	9	1.2	0.4	1,000	400
Springfield Pioneer Parkway	7.8	14	3.7	0.4	0.6	500	300
King County Pacific South	10.4	14	8.2	NA	0.7	800	600
Fort Collins Mason	5.3	17	5.9	1.1	0.3	1,100	300
Kansas City South town	9.7	33	4.4	NA	0.3	500	100
Average BRT	**7.7**	**17.4**	**8.1**	**1.8**	**0.5**	**1,186**	**629**

Figure 3.3. FTA New Starts Statistics, as provided by FDOT for application to Florida[30]

[30] Florida Department of Transportation (FDOT). (2012). Florida Transit Oriented Development Guidebook. *Florida Department of Transportation.*

One step further in general applicability was TCRP's TOD guidelines, one of the only published federally-funded (and federal-level) TOD guidelines in existence. Unsurprisingly, this set of guidelines offers little advice for specific types of projects. It does however make excellent use of examples (see Figure 3.4), and its writers have chosen what they believe are the most prime examples of TOD successes around the country. The goal with this document is for planners to use it generally (especially those less familiar with TOD) and then to complete further research on more specific comparable guidelines as they see fit. This document is particularly apt for its reach: nearly all planners can benefit from its clear layout of TOD information and generalized ideas about TOD. That being said, those tasked with TOD for a specific area will need more specific guidance along the line.



Map 10.3. Walkable ¼-Mile Radii Surrounding Silver Line Transit Stations in the Seaport District. The line will connect the isolated Seaport District with multimodal South Station. *Source:* MASSPORT.

Figure 3.4. TCRP's federal guidelines make use of examples, such as stations around Boston[31]

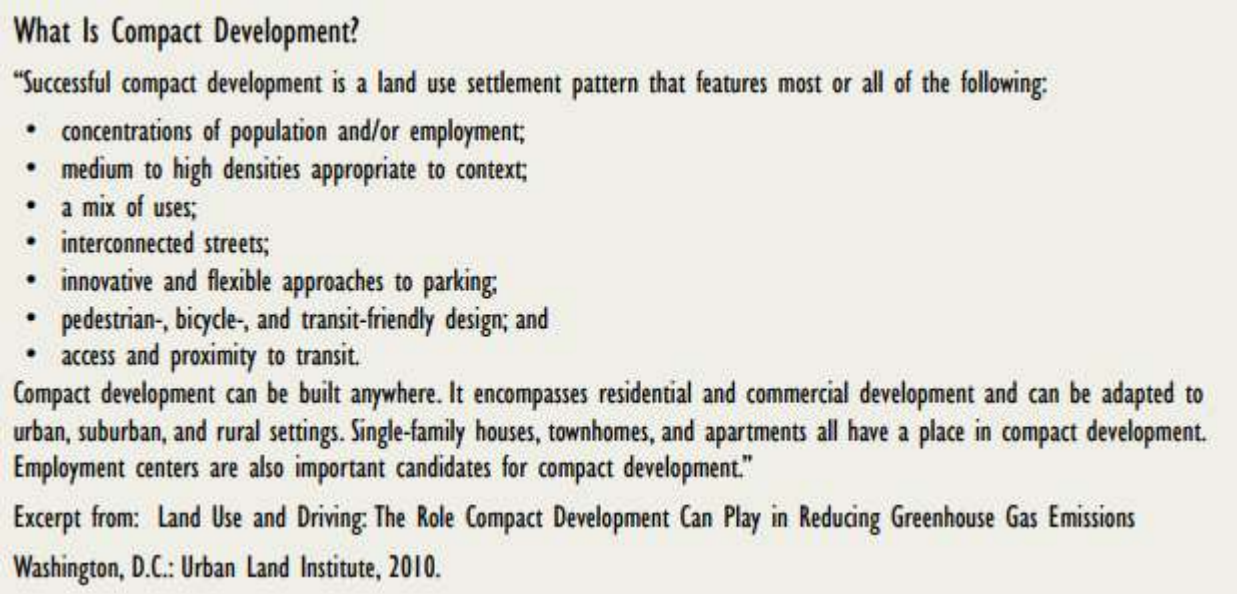
[31] Transit Cooperative Research Program (TCRP). (2004). Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects. *Transit Cooperative Research Program.*

One element that virtually all TOD guidelines have is a justification for increased transit spending for infrastructure, stated either directly or indirectly. Nearly all cite goals for TOD that are likely their goals for their transit system as a whole as well. For example, nearly all guidelines cite decreased VMTs or decreased car trips as a goal or benefit of TOD, usually accompanied by a goal of reducing congestion increases or curbing emissions and pollution. These goals are the same goals as almost any transit investment in the United States. Some also cite a benefit of TOD as means to decrease overall infrastructure spending. This again may be applied generally as a goal of most transit systems which compete with auto users, especially when considering regional transit investment competing with regional personal-vehicle oriented highway investment.

3.4.2. Land Use and Intensity

Generally, TOD guidelines offer non-specific advice for land use within the TOD, and that non-specific advice is essentially universal, found in any set of guidelines. All guidelines state that development should be mixed-use, and all guidelines discuss the benefits to vertical and horizontal mixed uses. They also discuss that densities should be either "middle" or "high", although some note that these descriptors are relative to the community around the station. This distinction seems apt—while "high" density may exist in a city center a neighborhood TOD would likely only strive for "higher" density if surrounded by existing single family or low density commercial land uses.

Commonly, these land-use guidelines mirror—often directly—compact development guidelines. Sometimes, one may wonder if TOD guidelines set forth are a proxy for compact development guidelines, as is the case with the Florida (See Figure 3.5). However, planners may acknowledge in these cases that compact development cannot reach its full utility potential without access to quality regional transit. It may be possible that the joint discussion of compact development guidelines with TOD guidelines maximizes efficiency of operations and maximizes the results of attempts at either compact development or TOD, essentially rendering these ideas undivorceable in practice.



What Is Compact Development?

"Successful compact development is a land use settlement pattern that features most or all of the following:

- concentrations of population and/or employment;
- medium to high densities appropriate to context;
- a mix of uses;
- interconnected streets;
- innovative and flexible approaches to parking;
- pedestrian-, bicycle-, and transit-friendly design; and
- access and proximity to transit.

Compact development can be built anywhere. It encompasses residential and commercial development and can be adapted to urban, suburban, and rural settings. Single-family houses, townhomes, and apartments all have a place in compact development. Employment centers are also important candidates for compact development."

Excerpt from: Land Use and Driving: The Role Compact Development Can Play in Reducing Greenhouse Gas Emissions

Washington, D.C.: Urban Land Institute, 2010.

Figure 3.5. Compact development is so prominent to Florida's TOD strategy that the concept is specifically defined in the TOD guidelines[32]

Some guidelines state more clear metrics for appropriate land use. For example, Indianapolis's guidelines discuss the benefits of "employment density" as a chief metric over all else in predicting success of a project.[33] Maryland also calls for a calculation of employment and residential densities during the planning process, although doesn't opine about the use of one metric over another.[34] Some, including Chicago's plan, call for affordable housing—either maintenance of existing affordable housing in the TOD, or creation of new, non-market rate housing within the TOD.[35]

3.4.3. Environment

TOD guidelines shine in their discussion of the environment surrounding TODs with discussion of walkability, civil engineering around the station, etc. One universal in all guidelines is that cyclists and pedestrians should receive priority over personal auto users in any TOD, especially

[32] Florida Department of Transportation (FDOT). (2012). Florida Transit Oriented Development Guidebook. *Florida Department of Transportation.*
[33] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.*
[34] Maryland DOT. (2003). Purple Line Transit-Oriented Development Guidelines and Principles. *Maryland DOT.*
[35] Center for Neighborhood Technology (CNT). (2013). Transit-Oriented Development in the Chicago Region: Efficient and Resilient Communities for the 21st Century. 5. *Center for Neighborhood Technology.*

compared to conditions in non-TOD sites surrounding the area. The methods for reaching this condition and for reaching other environment conditions deemed ideal vary from document to document.

Compelling in guidelines are location-specific recommendations, especially for environmental conditions. Even though its guidelines are state-wide, Florida DOT recommends architecture and landscaping particularly for the Florida context.[36] The guidelines note Florida's propinquity for daily storms (often severe), and intense heat. If Florida is to curb its "auto-oriented culture", developers must develop networks of spaces that can be used 12 months of the year, as many (if not most) cannot cope with the extremes of the Florida climate without some sort of protection. While this type of location-specific recommendation was missing from northern examples, one may posit that a TOD in an intense winter climate must provide wind-blocking facilities, snow-removal friendly surfaces, etc. For the Texas Triangle, it may be important to note the intense heat that overwhelms the region in the summer. Additionally, an apt set of guidelines will also need to address Texas's propinquity to flood, severely as was the case in Houston during Hurricane Harvey in 2017. Explicitly acknowledging these realities for the region will only make guidelines more compelling.

As with other TOD planning sections of guidelines, many examples go in-depth to validate and explain their rationale for possibly-controversial suggestions, which may also be important in Texas, as many are averse to government spending that goes against the state's supposed Liberalist roots. Prior to making specific recommendations for sidewalk length, etc., Indianapolis offers a disclaimer that transit-supportive infrastructure is vital to the success of the project, even offering a specific, attainable number for that spending compared to transit infrastructure spending (see Figure 3.6). The document then goes on to explain necessary improvements to things such as sidewalks and pathways, bike routes, and (ideally) a connected street network to connect all locations well to the station area.[37]

[36] Florida Department of Transportation (FDOT). (2012). Florida Transit Oriented Development Guidebook. *Florida Department of Transportation.*
[37] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.*

TRANSIT INFRASTRUCTURE VS. TRANSIT-SUPPORTIVE INFRASTRUCTURE

Transportation infrastructure, whether highways or mass transit, is expensive. Beyond the cost of the transit system itself, leveraging a future transit system by improving access to transit facilities and fostering transit oriented development, requires supplementary investment in transit-supportive infrastructure.

According to the Center for Transit Oriented Development, case studies have shown that investment in transit-supportive infrastructure (i.e., amenities, sidewalks and bikeways, infrastructure enhancements, project development subsidies, etc.) can be $.50 to $1.00 for every $1.00 invested in the transit system itself (i.e., right-of-way acquisition and development, transit vehicles, platforms and stations, storage and maintenance facilities, etc.).

Figure 3.6. Indianapolis offers this specific number for supportive infrastructure spending prior to discussion of infrastructure spending that will be needed[38]

3.5. Strategies for Implementation

After establishing TOD readiness for a particular location, strategies need to be addressed to ensure implementation and adherence of the smart growth goals of cities that consider transit-oriented development. Strategies for implementation vary between regions, as each has its specific needs to attain TOD goals. This section will highlight consistencies in implementation strategies in the plans that have been reviewed as well as highlight detailed strategic plans to ensure the development of TOD.

3.5.1. TOD Zoning

Zoning ordinances also help to incentivize TOD in areas that are considered strong candidates for this type of development. The Chicago Regional Transit Authority (RTA) created the *Zoning and Transit-Oriented Development: A Best Practices Report* which lays out several best practices MPO's and transit agencies can follow in order to incentivize TOD in their region.

[38] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.*

Local and regional planning commissions have created several types of zones in order to indicate where TOD should be located and how it should be developed.

In order to create a TOD, a municipality can create special designations for this type of development. These designations require alterations to current zoning that are focused on TOD. Chicago's RTA uses examples of this that many municipalities use in order to designate TOD. Overlay zoning, or a zone that is placed on top of existing zoning, has the ability to modify current zoning in order to create regulations that support TOD without changing current zoning. Municipalities can control land use without changing what is currently in place.[39]

There are several advantages and disadvantages of this type of implementation strategy. Advantages include the simplicity of overlay zoning for an entire area to encourage compact development, which describes in detail the vision for the zoning designation for TOD. This also allows for changes in standard zoning that allow for flexibility to move toward principles of TOD where there may not have been previous zoning that adhered to those principles. Disadvantages are that the zoning can be too specific, which may inhibit the ability to be creative in innovation in TOD. This specific zoning can also limit land uses for a particular development.

Mixed use zoning ordinances are also supportive to TOD. Indy Connect Regional TOD Strategic Plan includes an assessment Green Street consulting firm to develop specific TOD typologies that would support this type of development in the Indianapolis region. These new TOD typologies more specifically define the type of development that should be in TOD. The new typologies are as follows.

- MU-1 aligns with some Commercial Corridors, and some District Centers.
- MU-2 aligns with Walkable Neighborhood.
- MU-3 aligns with some District Centers, such as Broad Ripple.
- MU-4 aligns with larger District Centers.

[39] Center for Neighborhood Technology (CNT). (2013). Transit-Oriented Development in the Chicago Region: Efficient and Resilient Communities for the 21st Century. 5. *Center for Neighborhood Technology.*

Detailed descriptions are available in the *Indianapolis – Integrated Working Draft Zoning Ordinance Section 05 – Mixed Use Districts* section.[40]

3.5.2. TOD Incentives

Incentives can prove indispensable to eventual TOD implementation. An organization that may be interested in incentives is SANDAG, San Diego's regional planning association. SANDAG has no land use control, which gives local governments the power to determine whether they need—and will implement—compact development. This creates the necessity for some form of incentives in SANDAG's jurisdiction to encourage local plans adhere to the region's Smart Growth Map (explained in 3.6.3. "Smart Growth Maps"). In order to do this, SANDAG has created their own fund, TransNET, which is a sales tax-created fund employed to provide local jurisdictions funding for their Smart Growth-related projects. Local jurisdictions submit proposals in order to receive this funding. To receive funding, there is a competitive process in which SANDAG gives rankings. Local jurisdictions are ranked higher if they adhere to the compact development plan created by SANDAG. The closer they adhere to this plan the more likely they are to receive funding. With no real control of how local jurisdictions create land use plans, SANDAG has created an incentive for TOD projects and other Smart Growth development that still reach the goals of the regional planning association.[41]

Orlando Florida uses similar incentives for developers. In exchange for building developments that follow TOD guidelines, developers can receive expedited administrative and environmental review. Additional incentives include density bonuses and opportunities for mixed use development. Allowing developers to add height and increase the amount of housing on a particular development gives the opportunity for more of the population to live in the TOD zone. This creates larger parts of the population that are more likely to use transit or alternative modes of transportation to driving.[42]

[40] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.*
[41] SANDAG. (2009). Smart Growth Score Card. Designing for Smart Growth: Creating Great Places in the San Diego Region. *SANDAG.*
[42] Florida Department of Transportation (FDOT). (2012). Florida Transit Oriented Development Guidebook. *Florida Department of Transportation.*

3.5.3. Smart Growth Maps

Smart Growth Maps—often generated by regional agencies—can help local planning agencies and developers determine areas that have been identified as having a high likelihood of investment for transit-oriented development. Smart growth designated areas often have similar characteristics as those determined to be strong candidates for transit-oriented development.

Along with a rating system, the DVRPC has created an online database that tracks development projects near rail stations.[43] The "Smart Growth Project Database" indicates projects that track prominent development projects throughout the region. Three types of projects are considered in the database: development near transit, traditional neighborhood development, and conservation subdivisions. The areas in the database that are considered development near transit have some of the attributes of TOD but not all attributes that would apply to TOD development. This database along with the TOD rating system can help planners and developers determine ideal locations for TOD and create development that supports the current and future transit system. Figure 3.7 shows 186 current developments near transit.

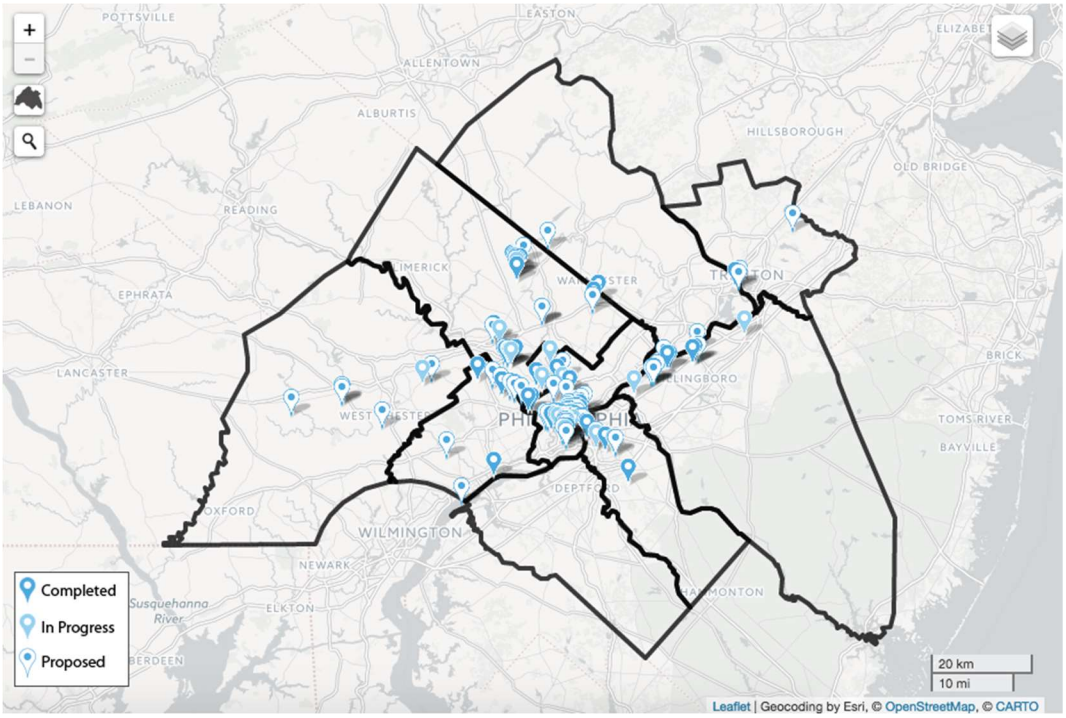


Figure 3.7. Current completed, in progress and proposed development in the DVRPC

[43] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*

SANDAG has also created a Smart Growth Concept Map that identifies districts in which transit-oriented development should develop. Figure 3.8 shows these Smart Growth areas. The Regional TOD strategy uses this map as a foundation to determine transit-oriented districts. SANDAG created a Smart Growth Scorecard which includes 14 questions about land use and proximity to transit, accessibility, and design and aesthetics to decide which developments should be considered for transit-oriented development.[44]

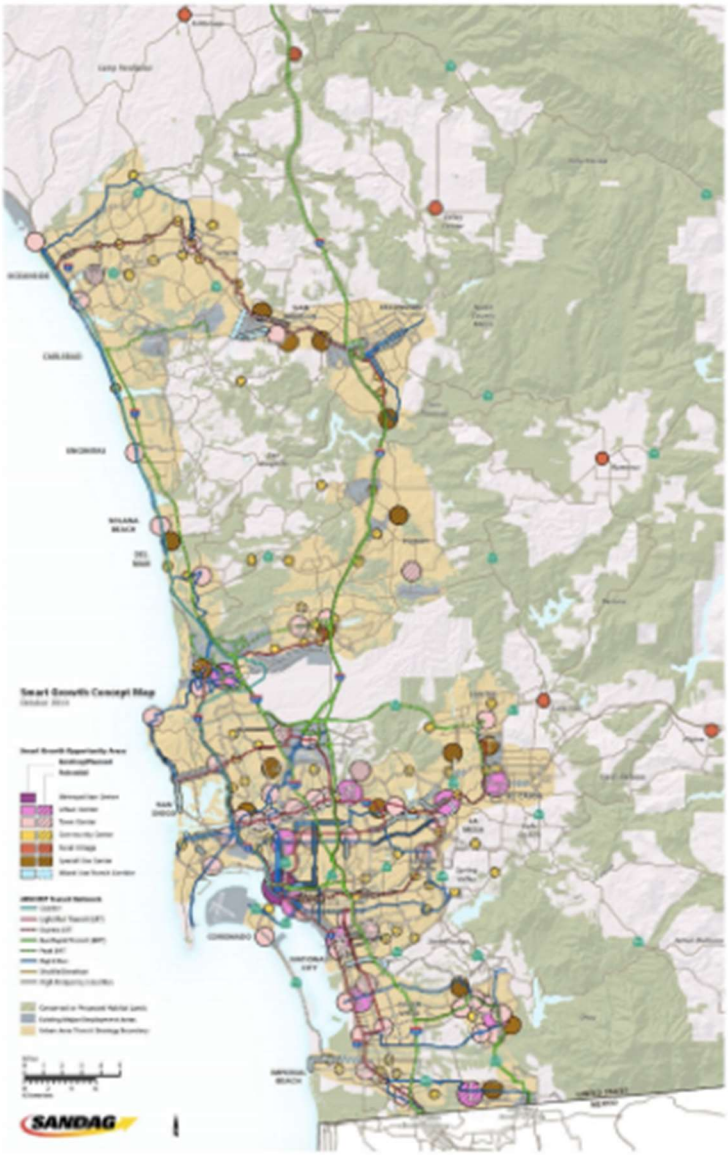


Figure 3.8. SANDAG Smart Growth Concept Map

[44] SANDAG. (2009). Smart Growth Score Card. Designing for Smart Growth: Creating Great Places in the San Diego Region. *SANDAG.*

3.5.4. Joint Development of TOD

The Greater Cleveland Regional Transit Authority: TOD Guidelines define joint-development as "private development on, above, or adjacent to a transit authority's property".[45] This requires a public-private coordination that makes development more attractive to developers. With public investment, developers are more attracted to projects that reach civic goals because of the support that these types of projects receive from municipalities. This also gives the opportunity for value capture on real estate and the benefits of being near transit services.

In the past, joint-development was done through leasing of the land to a private developer for a project that would be mutually beneficial to the developer and transit. At this time, public entities could not sell public land and keep the proceeds. After 1997, the FTA changed these policies on joint development and allowed transit authorities to sell the land and keep the proceeds, with the requirement that the proceeds be used on transit service. Applications for joint development projects are based on a competitive selection process in which project feasibility and land availability were considered. New FTA rules also allow for money received from developers to be put into funds for additional TOD activity. Other forms of joint development include sharing operating and construction costs, which is a cost saving strategy for both station and development projects.

Another component of successful TOD is coordinated joint planning. The transit agency must work with land owners, municipalities and developers as well as stakeholders in order to collaborate on the best method to carry out a station plan. Cleveland RTA set out a step by step process in order to achieve these goals. This process is listed below as a guide for future TOD development from the Greater Cleveland Regional Transit Authority's *Transit Oriented Development Guidelines*.[46]

1. During the station and facility planning efforts RTA will work collaboratively with the stakeholders and local jurisdictions as appropriate adjacent to its transit facilities to proactively promote and

[45] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.*
[46] Ibid.

develop locations, plans and designs that maximize the benefits of the transit linkage. This effort will include community involvement and participation in the planning process.

2. Work collaboratively with adjacent landowners and stakeholders to maximize uses and linkages to transit facilities.
3. Solicit proposals for transit-oriented joint development through a competitive selection process where feasible in terms of the market and availability of land. These solicitations and projects must meet all FTA federal requirements and State, RTA regulations. The attachment lists requirements for the solicitation package.
4. Accept proposals for joint development projects as received. These proposals must meet all applicable joint development requirements including those of RTA, the State of Ohio, and FTA.
5. Request funding for Joint Development activities as part of RTA capital program as appropriate. These activities must be consistent with FTA regulations and requirements.
6. Complete an assessment for RTA owned facilities to maximize development opportunities through adjacent development activities and leasehold interests within RTA facilities. RTA real estate will be viewed as the asset it is in facilitating the goals of this policy.[47]

3.5.5. Measuring Performance of TOD

Methods for transit-oriented development (TOD) are developed to ensure that there is consistency in regional growth among TOD project efforts. This can be developed through a series of criteria to determine locational readiness for TOD in a particular region.

Delaware Valley Rating System

The Delaware Valley Regional Planning Commission (DVRPC) developed a rating system to determine ripeness of a location for TOD. The rating system is divided into two categories:

[47] Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.*

existing TOD orientation and future TOD potential. Among these two categories are 12 criteria that are ranked 1-4 with 1 being the least supportive to TOD and 4 being the most supportive to TOD. Once each criterion is ranked based on a general assessment, the attributes were averaged to create a score for each category.[48]

The "Existing TOD Orientation" category assembles seven attributes that identify ideal station areas based on current land uses and travel patterns in a particular location. The criteria in this category includes: transit service quality, job access, travel time, intensity, car ownership, non-car commuters and Walk Score™. Brief definitions of each category are given below.[49] Detailed descriptions and methods of ranking are on the DVRPC website.

- **Transit Service Quality:** # of transit trips that are accessible by walking in a specific location
- **Job Access:** #of jobs accessible via a 30-minute transit ride from current transit
- **Travel Time:** transit travel times in comparison with driving travel times
- **Intensity**: residential and employment densities
- **Car Ownership**: % of occupied housing units within a station area with ≤ 1 vehicle
- **Non-Car Commuters**: % of station area residents who commute to work by methods other than driving
- **Walk Score™**: # of commercial amenities that can be reached on foot[50]

The "Future TOD Potential" category assembles five attributes that assess real estate market conditions and political climate to determine possible future areas for TOD development. These criteria include: Development Activity, Commercial Market, Residential Market, Available Land, Planning Context.[51]

[48] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*
[49] Ibid.
[50] Ibid.
[51] Ibid.

- **Development Activity:** the number of proposed, in process and built residential multifamily units
- **Commercial Market:** average rent per square foot for office space over the last five years
- **Residential Market:** Rent per square foot for multifamily units
- **Available Land:** identify the presence of vacant and underutilized land that may provide opportunities for TOD within one-quarter mile of stations
- **Planning Context:** measure the degree to which TOD and other transit-supportive measures have been identified as an appropriate strategy for a given station area[52]

[52] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*

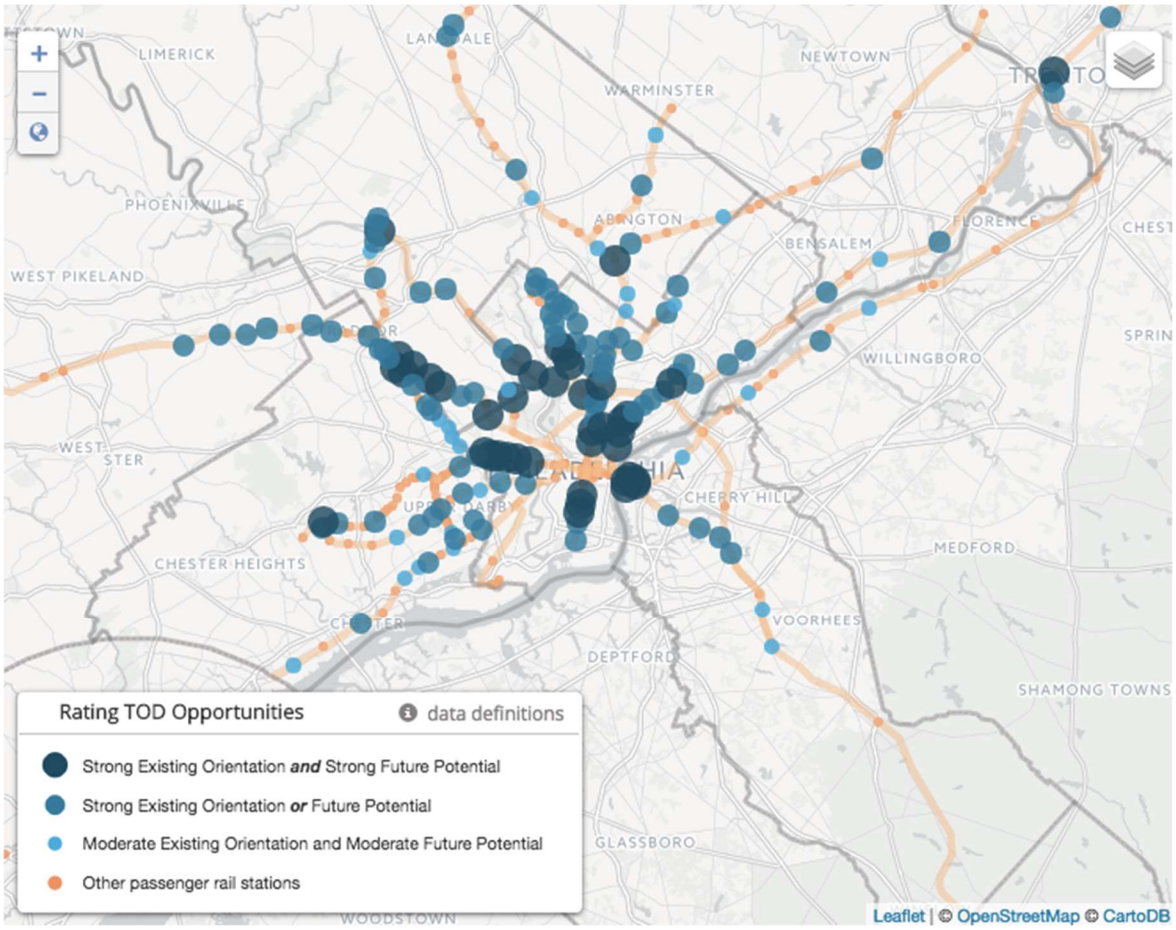


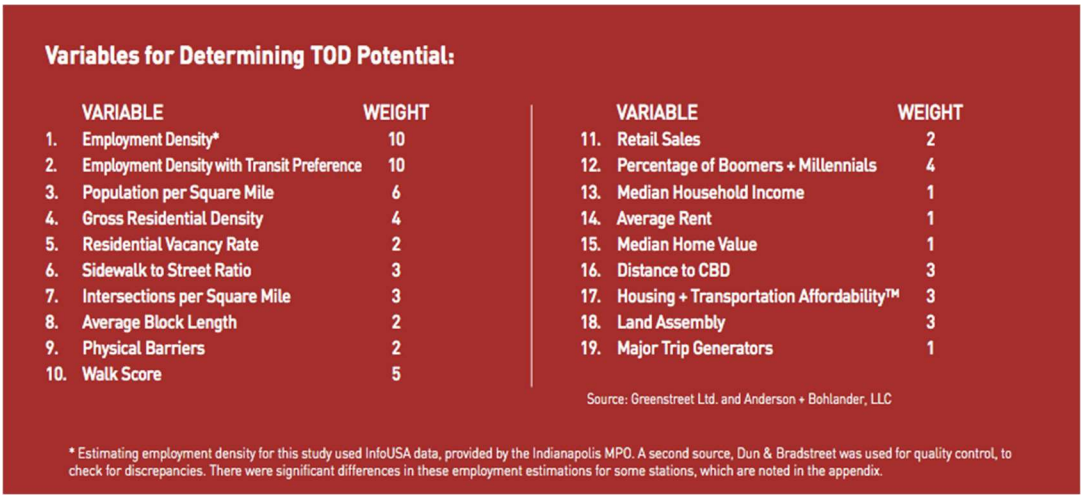
Figure 3.9. DVRPC Regional TOD Opportunity Map

Figure 3.9 shows how the rating system was communicated into an online map. Stations are identified as either strong locations for existing TOD orientation and future potential TOD locations. The rest are either ranked as strong for one but not the other. Orange indicates stations that would not be ideal for either category. This map can help future developers and planning officials to determine patterns for future TOD growth.[53]

With Indy Connect initiative, the Indianapolis Metropolitan Planning Organization identified 19 criteria shown in Figure 3.10 to determine areas that are ideal for TOD. Figure 3.11 shows a "heat map" of the strongest areas for TOD based on the current rail system. Their measurements also consist of two parts that assess physical and market characteristics. Physical characteristics

[53] Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.*

are rated as "TOD Readiness," which uses quantitative measures to assess if a location is ready for TOD. The other category focuses on the current and future real estate market and its ability to support possible TOD development. Each location is ranked in each category on a 1-5 scale and then different weight is given to different variables based on their importance to a composite score. The composite score then correlates with location. The rating system helps to reduce competition for real estate and gives developers options that can achieve the same or similar results in a strong TOD location. Scores of less than 80 are considered to have little potential for TOD and scores of 110 or more are considered areas with high potential for TOD.[54]



Variables for Determining TOD Potential:

	VARIABLE	WEIGHT
1.	Employment Density*	10
2.	Employment Density with Transit Preference	10
3.	Population per Square Mile	6
4.	Gross Residential Density	4
5.	Residential Vacancy Rate	2
6.	Sidewalk to Street Ratio	3
7.	Intersections per Square Mile	3
8.	Average Block Length	2
9.	Physical Barriers	2
10.	Walk Score	5

	VARIABLE	WEIGHT
11.	Retail Sales	2
12.	Percentage of Boomers + Millennials	4
13.	Median Household Income	1
14.	Average Rent	1
15.	Median Home Value	1
16.	Distance to CBD	3
17.	Housing + Transportation Affordability™	3
18.	Land Assembly	3
19.	Major Trip Generators	1

Source: Greenstreet Ltd. and Anderson + Bohlander, LLC

* Estimating employment density for this study used InfoUSA data, provided by the Indianapolis MPO. A second source, Dun & Bradstreet was used for quality control, to check for discrepancies. There were significant differences in these employment estimations for some stations, which are noted in the appendix.

Figure 3.10. Indy Connect Variables for Determining TOD Potential

[54] Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.*

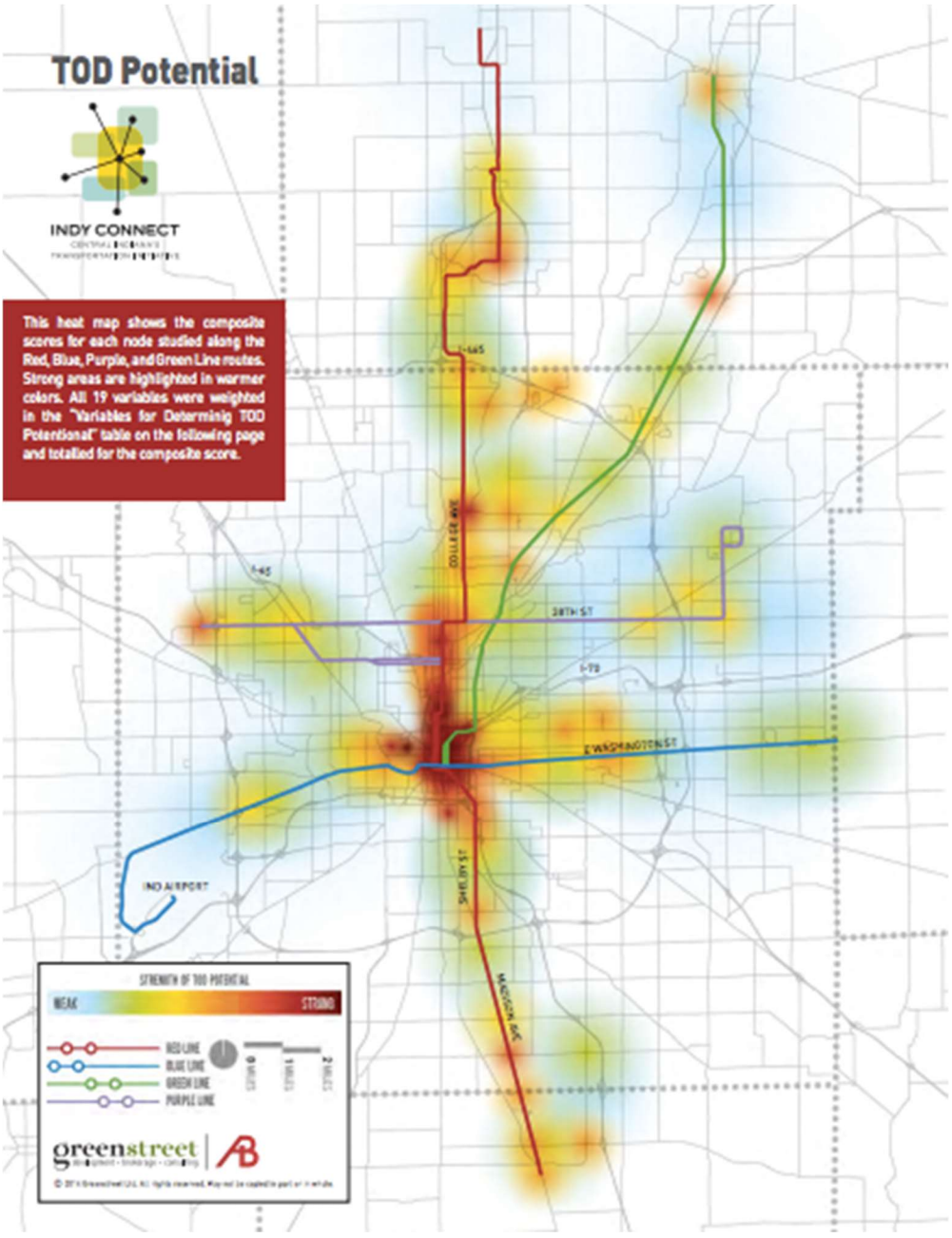


Figure 3.11. Indy Connect TOD Strength and Opportunity Map

The Regional TOD strategic plan for SANDAG also plans to develop a similar online tool that can be updated in order to consider new and proposed projects. The SANDAG rating system will also assess a TOD readiness for regional locations. As a preliminary step, Figure 3.1 shows how locations will be ranked in reference to time. The three time-horizon categories are identified as ready, emerging and future. The time horizons consider when projects are planned to be

completed in the given years. When a project is complete, it is then considered "ready" for possible TOD. Projects that will be completed by 2020 are considered "ready" because development can start now and be projected to be complete when transit projects complete in the same year.[55]

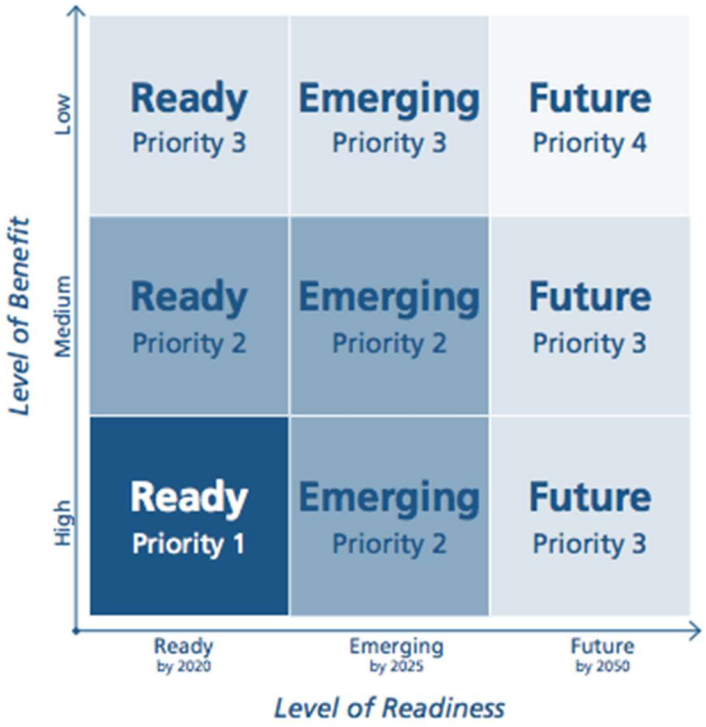


Figure 3.12. TOD Readiness Timeline

3.6. Summary

This analysis of state and regional TOD guidelines and implementation plans reveals important best practices applicable to present and future TOD guidelines in the Texas Triangle megaregion.

In defining TOD within a specific context, guidelines universally clarify the need for density, a mixture of uses, and heightened walkability. Guidelines generally cite benefits of TOD as well, often including an improvement in the environment and public health, reduced infrastructure

[55] SANDAG. (2009). Smart Growth Score Card. Designing for Smart Growth: Creating Great Places in the San Diego Region. *SANDAG.*

spending, and improved transit ridership—although many context-specific benefits are often noted as well, even cautiously, at the state or regional level.

State and regional planning agencies setting forth in development of TOD guidelines should consider many best practices examined in this section. Notably, in Texas it seems apt to establish the merit of TOD (and often public transit more generally) from the onset of the guidelines. It may also be apt to generate TOD guidelines for less-than-flagship projects, especially in a megaregion rife with BRT-lite systems that may be a metropolitan area's best chance at TOD. Finally, TOD guidelines in Texas should certainly consider the climate of Texas—especially the frequency of intense flooding and the oppressive heat experienced in summer months—in developing design principles for a site. Specificity in TOD guidelines—when fully vetted—can be appropriate. While generic guidance or requirements from higher levels of governance is suitable in many contexts, shared cultural characteristics, funding mechanisms, or environmental conditions around a state or region should result in specificity within guidelines.

Texas Triangle planners also benefit from an understanding of best practice in state or regional implementation of TOD plans. Smart growth maps have also seen success in many jurisdictions, driving development and investment in specific areas of a state or region, allowing agencies to direct funding towards specific areas in need of development to improve their overall TOD network (or to improve their overall transportation or development goals). Additionally, joint development—among developers and governmental bodies at the local, regional, or state level—has offered many agencies a source of necessary funding and partnership in seeing TOD sites develop to their fullest potential.

While planning jurisdictions around the Texas Triangle megaregion are diverse with varied needs and varied abilities to develop TOD, appropriate state or regional guidance on TOD would improve the quality and efficiency of TOD development around the megaregion.

Chapter 4. Transit Technologies in the Texas Triangle

4.1. Introduction

The four major cities in the Texas Triangle--Austin, Dallas, Houston, and San Antonio--are experimenting with different rapid transit technologies to cope with their rapid growth. Each of these cities offer standard buses and paratransit service as one may find in virtually any American city. However, each of these four cities has found that these non-rapid forms of public transit are not moving people quickly enough through their rapidly-expanding cities. Standard buses are often unable to compete with personal vehicles in the Texas Triangle, and importantly are not guiding these cities' swift development in meaningful ways. To both improve conditions for non-personal vehicle users and to drive sustainable development at specific nodes or corridors, each of these cities is investing significantly in rapid transit infrastructure. Not surprisingly, these cities' unique selections of rapid transit modalities are as diverse as the cities themselves.

For a list of all counties served by public transit in the Texas Triangle, and the transit providers which operate within these counties, see Appendix B "Public Transit in the Texas Triangle".

4.2. Austin

The capital of the state of Texas is a city encumbered by traffic congestion. While all other major cities in the Texas Triangle have at least 2 (generally) controlled-access beltways forming rings around their cities, Austin does not have any completed beltways, and has no existing plans for a beltway to be completed.

This lack of a beltway has created a reliably linear development pattern in Austin, unique in the Texas Triangle. Development has sprawled north and south along Austin's two main highway corridors--I-35 to its east and Loop One (Mopac) to its west. Generally, this development is driven by low-density residential construction. Many of Austin's jobs have remained downtown, leaving many areas of Austin's central business district without necessary residences. Austin's

downtown has over 86,000 employees[56] and The University of Texas at Austin employs another 21,000,[57] generating significant traffic congestion from north and south to the central business district. The city's main transit provider is Capital Metropolitan Transit Authority, or CapMetro. The Austin metropolitan region has a population of approximately 2 million.

The Austin metropolitan region currently has no plans to construct new rapid transit routes or systems.

4.2.1. Capital Metro MetroRail Commuter Rail

CapMetro's commuter rail service—MetroRail—was commenced in 2010 along an active freight line owned and operated by CapMetro. The agency's first foray into rapid transit in its history, MetroRail was a source of great fanfare, but also of significant nationwide public ire as cost overruns grew dramatically and ridership projections were not met.[58]

The MetroRail service forms the backbone of Austin's transit-oriented development ambitions. Stations proximate to downtown have transit-oriented development plans and have seen transit-oriented development generated, although these TOD sites have seen varying levels of success. Most stations in the northern suburbs of the Austin metropolitan region have seem some development, and development for yet-underdeveloped station areas continues to grow. Ridership in FY2017 was approximately 820,000 boardings over the line's 32 miles of track.[59]

4.2.2. Capital Metro MetroRapid BRT-Lite

In 2014, CapMetro began experimenting with bus rapid transit (BRT), with a pair of decidedly "BRT-lite" routes. The agency noted potential in their two most heavily-ridden standard bus routes and developed a BRT-lite parallel service to augment the standard routes. MetroRapid routes chart courses similar to those of the standard routes on which they are based, but stops are spaced ¼ mile to ½ mile apart.

[56] Pritchard, Caleb. (2017). Austin's Next Mobility Challenge: Free Parking. *Austin Monitor*.
[57] Drake, Sarah, et al. (2012). UT is Austin's Largest Employer. *Austin Business Journal*.
[58] Beyer, Scott. (2016). Austin's Commuter Rail is a Monument to Government Waste. *Forbes*.
[59] Capital Metro. (2017). Monthly Ridership Report: Fiscal Year End 2017. *Capital Metro.*

While not approaching the quality of a full BRT system, MetroRapid utilizes reduced interpretations of several core BRT-specific strategies. MetroRapid buses utilize some dedicated rights-of-way in the central business district and have basic signal preemption technology. These buses also have options for off-board fare collection through the use of CapMetro's mobile app. The stations along MetroRapid routes are branded and significant, offering basic shelter, seating, and real-time departure information. Most importantly, MetroRapid buses have a decidedly high on-peak frequency of service. For more information on BRT-lite systems in the Texas Triangle, see Appendix A.

While no TOD-specific regulations have been enacted around MetroRapid-only stations, transit planners with CapMetro have developed an inventory of TOD-related site conditions around all MetroRapid stations with the goal of attracting semi-planned transit-oriented development along MetroRapid corridors. MetroRapid operates two routes that travel a total of 34.5.miles[60] on Austin's arterial streets, and annual ridership in FY2017 was approximately 3,400,000 boardings, over 4 times the frequency of MetroRail boardings.[61]

4.3. Dallas

The Dallas-Fort Worth Metroplex is the Texas Triangle's largest Metropolitan Statistical Area with over 7 million inhabitants. While the metropolitan region is comprised of several smaller cities which occasionally employ some autonomy over their own public transit systems, the core transit authority in the metropolitan region is Dallas Area Rapid Transit, or DART.

There are several significant hubs of residential and employment activity around the Dallas-Fort Worth metropolitan region, generating a complex web of commute patterns. Notably however, Dallas also has a large population of inner-city residents who also work in the inner-city. Over 900,000 people both live and work in Dallas County, highlighting the importance of intracity rapid transit in the Dallas area.[62]

[60] Federal Transit Administration. (2018). MetroRapid Bus Rapid Transit Project Before-And-After Study. *Federal Transit Administration.*
[61] Capital Metro. (2017). Monthly Ridership Report: Fiscal Year End 2017. *Capital Metro.*
[62] Dallas Chamber. (2017). Commuting Patterns; Getting to Work. *Dallas Economic Development Guide.*

In addition to existing rapid transit systems in the Dallas-Fort Worth area, a 27-mile commuter rail named the TEXRail is under construction and will link Dallas-Fort Worth International Airport and downtown Fort Worth.

4.3.1. Dallas Area Rapid Transit (DART) Light Rail

The DART Light Rail operates 4 routes around the Dallas area, forming the largest light rail network in the United States as measured by track length. The system opened in 1996 and has regularly expanded into far-reaching suburban cities around the metropolitan area. Many of the cities served by DART light rail have generated their own transit-oriented development plans for station areas, although many cities are still planning station areas and hoping to generate transit-oriented development. Researchers at the University of North Texas estimate that around $10.8 billion worth of public projects and privately funded transit-oriented development was constructed between 1999 and 2018 along the light rail line.[63]

There are plans to extend all four of DART's light rail lines by 2030. In FY2017, ridership on the light rail network was 30.1 million passenger trips over 93 miles of tracks.[64]

4.3.2. Trinity Railway Express Commuter Rail

Based on a joint partnership between Dallas Area Rapid Transit and the Fort Worth Transportation Authority, Trinity Railway Express (TRE) forms the transit connection between downtown Dallas and downtown Fort Worth. Originally opened in part in 1996, the heavy rail line finally connected Dallas to Fort Worth in 2001. Several municipalities have introduced TOD plans for their station areas, including Richland Hills.[65] In FY2017 Trinity Railway Express had 2.1 million passenger trips over the line's 34 miles.[66]

[63] Sneider, Julie. (2018). DART's Light Rail System Is About to Get Even Longer. *Progressive Railroading.*
[64] Dallas Area Rapid Transit. (2017). DART Facts. *Dallas Area Rapid Transit.*
[65] URS Urban Design Studio. (2009). Richland Hills Trinity Railway Express (TRE) Station. *Richland Hills.*
[66] Dallas Area Rapid Transit. (2017). DART Facts. *Dallas Area Rapid Transit.*

4.3.3. Denton County Transportation Authority (DCTA) A-train Commuter Rail

The Denton County Transportation Authority's A-train is a commuter rail line operating in Denton County. The A-train overlaps with the DART Light Rail Green Line at two stations along shared tracks before continuing north, acting as a de facto extension of the Green Line. The commuter rail service opened in 2011; contemporary ridership data for the 21-mile line is not publicly available.

4.4. Houston

The Houston metropolitan region is the Texas Triangle's second-largest metropolitan region with a population of nearly 7 million. While Houston's population within its city limits make it the most populated city in the southern United States, Houston is also a city with significant sprawl. Houston is known for its suburban growth, driven in part by loose development restrictions that form a unique part of the identity of the Houston metropolitan area.

Most of the Houston metropolitan region is served by the Metropolitan Transit Authority of Harris County, better known as METRO, although some areas within Harris County are also served by Harris County Transit.

In addition to existing rapid transit systems in the Houston metropolitan area, a 4.7-mile bus rapid transit (BRT) route named the Uptown Line is under construction and will serve Houston's Uptown when it opens in 2019.

4.4.1. METRORail Light Rail

Houston's METRORail is a 23-mile light rail system that operating on 3 lines. The system was opened to riders in 2004. No rail extensions are to this line are currently under construction, however the Uptown Line, originally planned as a light-rail extension, is currently under construction as a bus rapid transit (BRT) line. While Houston has identified several stations with noteworthy potential for TOD development, many stations were built around existing dense

development. Between 2014 and 2016, Houston's METRORail experienced some of the most significant ridership increases of any rail rapid transit system in the country, while most rail systems in the United States were losing ridership.[67] METRORail ridership in calendar year 2016 was over 18 million boardings.[68]

4.5. San Antonio

San Antonio sits in the southwestern corner of the Texas Triangle, with a metropolitan area population of over 2 million. San Antonio is the only major metropolitan region in the Texas Triangle without any form of intracity rail service,[69] making San Antonio one of the largest cities in the United States without rail service. San Antonio's transit operator is VIA Metropolitan Transit.

The San Antonio metropolitan region currently has no plans to construct new rapid transit routes or systems.

4.5.1. VIA Primo BRT-Lite

VIA Primo, a BRT-lite, limited-stop bus is San Antonio's only foray into rapid transit service. The service, which now offers two routes that traverse the San Antonio metropolitan area, commenced in 2012. The service's Primo 100 route offers several reduced interpretations of some core BRT-specific strategies. The Primo 100 route offers significant stop infrastructure with branding and designated seating areas, as well as real-time departure information. However, the service it does not utilize designated rights-of-way. In addition, buses along Primo routes do not utilize a high frequency of service, which is one of the core elements of BRT-lite systems. For more information on BRT-lite systems in the Texas Triangle, see Appendix A. Ridership in FY2016 was roughly 2 million for VIA Primo routes.[70]

[67] Rowlands, DW. (2018). Metrorail is No Longer the Second-Busiest Rapid Transit System in the Country. *Greater-Greater Washington.*
[68] American Public Transportation Authority. (2017). Public Transportation Ridership Report, Fourth Quarter 2016. *American Public Transportation Association.*
[69] Express-News Editorial Board. (2018). No Rail in Transit Plan? No Problem. *My San Antonio.*
[70] My San Antonio. (2016). A Primo Reason for More VIA Funding. *My San Antonio.*

Chapter 5. TOD Typologies in the Texas Triangle

5.1. Methodology

TOD typologies for the Texas Triangle were generated based on three factors: regional location, transit technology, and whether or not the rapid transit station is a "special destination." First, stations were designated based on 4 regional location-based classifications:

1. The urban core of the city,
2. "High urban" which is a node of urban development that may feasibly develop into a regionally-important urban core,
3. "Medium urban" which is a node of urban development which is unlikely to develop into a regionally-important urban core, and
4. Suburban, which is a station lying outside of urban areas.

Note that there are no rapid transit stations in the Texas Triangle that are considered rural.

The station area typologies resulting from these regional locations are as follows:

- Urban Core = Urban Core Typology
- "High Urban" = Town Center Typology
- "Medium Urban" = Neighborhood Center Typology
- Suburban = Suburban Typology
- Special Destination = Special Destination Typology

Applying transit technologies to these typologies is challenging in the Texas Triangle. While most megaregions offer numerous rapid transit technologies that interact, each serving a specific need within the megaregion, rapid transit technologies in the Texas Triangle are not necessarily employed utilizing the highest-and-best use of the technology. Many cities in megaregions utilize a portfolio of specifically-chosen transit technologies to accomplish fundamentally different tasks. For example, while the Washington, D.C. metropolitan region is smaller in population than Houston or Dallas, the region has the following portfolio of rapid transit systems:

- Washington Metro—a high-capacity metro rapid transit, serving Washington, D.C., Northern Virginia, and Central Maryland along several lines, all of which are situated underground while traversing dense urban areas
- DC Streetcar—a growing streetcar network serving medium-density neighborhoods
- MARC Trains—a heavy commuter rail with limited stops between Maryland, Washington, D.C. and West Virginia along several lines
- Virginia Railway Express—a heavy commuter rail from Washington, D.C. to Virginia
- Amtrak—a hybrid service operating both as heavy, limited-stop commuter rail for some passengers, as well as an intercity transit connection to the rest of the northeast megaregion, offering some high-speed technologies
- Metroway—a bus rapid transit route from Pentagon City to Crystal City in Northern Virginia

In stark contrast, Houston merely employs light rail to realize all of its rapid transit goals, and Dallas employs light rail and one commuter rail line. This proves challenging in defining typologies for Texas Triangle TOD sites because the rapid transit technologies being utilized aren't necessarily employed in utility-maximizing manners. For example, while a suburban park-and-ride facility far outside of a CBD would generally be a candidate for a quick and efficient commuter rail line, in Austin some stations of this type utilize BRT-lite (ex: Tech Ridge Station).

In examining how different transit technologies interact with the aforementioned TOD station area typologies, it was found that rail technologies—regardless of specifics of that technology—usually generate the same forms of TOD in the Texas Triangle. As a result, a general rail subcategory of typologies was identified for Urban Core and Town Center station area typologies. This subcategory is contrasted with the BRT subcategory for these station area typologies. For Neighborhood Centers and Suburban Destinations, no significant distinctions were found between rail technologies and BRT technologies in the eventual TOD production at these sites.

Apart from these more standard typologies, stations were also designated Special Designation (without regard to their rapid transit technology) if they formed a special destination for the area

they serve. Generally, these stations experience fluctuating demand, either throughout the day, such as with an airport, or throughout the year, such as with fairgrounds or a stadium. These stations are typically not suitable for standard TOD-style residential or commercial development as a result of the intense land uses that are usually found at these sites, further highlighting the importance of a unique classification.

5.2. Typologies

This process led to the development of the following TOD typologies:

- Urban Core – Rail
- Urban Core – BRT
- Town Center – Rail
- Town Center – BRT
- Neighborhood Center
- Suburban
- Special Destination

Detailed discussion of these typologies follows. In addition, an inventory of all rapid transit systems in the Texas Triangle and their corresponding typologies follows in "5.3. Inventory of Texas Triangle Rapid Transit Station Typologies".

It is important to note that these station area classifications are not intended to be permanent for all station areas. In fact, many station areas may be expected to rise to higher typologies, especially as these areas see development pressure. For example, while a station may currently be Suburban, planners may seek to increase development at a later date to generate a Neighborhood Center.

Typologies of Rapid Transit Stations in the Texas Triangle

TOD Typology	Land Use and Scale	Transit Modes	Connections with Transit	Texas Example
Urban Core(s) ***(Rail-Based)*** 1 in Austin 4 in Dallas 12 in Houston	-The highest density in the metropolitan area. High-rises and some mid-rises. -Highest density of employment in the metropolitan area -Intense mixed-use development horizontally and vertically, with increasing residential options -Key cultural and civic institutions are served by major stations	-Fixed-guideway rail service -Grade-separation at key congestion points (or fully grade-separated throughout the core, if not throughout the network) -Core urban bus routes stop directly at transit stations frequently and utilize dedicated transit lanes	-The vast majority of riders will walk or bike from stations to their destination -Urban environment should envelop transit stations -No park-and-rides and minimal transfers to personal vehicles to reach destinations -Surface parking should be nonexistent around stations	Houston's UH-Downtown
Urban Core(s) ***(BRT-Based)*** 6 in Austin 11 in S Antonio		-Dedicated transit lanes throughout urban core -Core non-BRT bus routes stop directly at transit stations frequently and utilize dedicated transit lanes, but can be passed when stopped		Austin's Republic Square

TOD Typology	Land Use and Scale	Transit Modes	Connections with Transit	Texas Example
Town Center ***(Rail-Based)*** 1 in Austin 4 in Dallas 3 in Houston	-Urban nodes of density surrounding the urban core(s) -Nodes generally radiate ¼-½ mile from stations -Generally mid-rise construction with a focus on residential, but some vertical mixed-use and significant horizontal mixed use	-Fixed-guideway service with direct connections to the CBD and urban core(s) -Bus connections exist, yet minimally disrupt the environment and minimally impede active transportation	-Most riders will walk or bike to their destinations -Surface parking around station should be virtually nonexistent -Park-and-rides and transfer facilities for personal vehicles are secondary or nonexistent	Dallas' Mockingbird
Town Center ***(BRT-Based)*** 3 in Austin 3 in S Antonio		-Service with direct connections to the CBD and urban core(s) utilizing transit lanes at significant congestion points -Local bus connections exist, yet minimally impede active transportation		San Antonio's Ewing Halsell

TOD Typology	Land Use and Scale	Transit Modes	Connections with Transit	Texas Example
Neighborhood Center 33 in Austin 42 in Dallas 21 in Houston 9 in S Antonio	-Nodes of density as the area transitions from urban to suburban, these areas are less connected to the urban core(s) than Town Centers -Generally, higher density areas within residential neighborhoods, although may be employment-intensive -Strong concentration of multi-family with some dense single-family areas -Service-oriented businesses create mixed use, generally horizontally along a "Main Street"	-BRT-based or rail-based, should offer direct connection to the CBD -Commuter bus stops destined for employment centers, likely passing through other neighborhoods on the route -Local buses serve destinations throughout the neighborhood and radiate outwards	-Stops for connecting transit vehicles should keep in mind likely transfer paths -Most transit users will walk or bike to their final destination, although transfers will be common. Some may drive to their final destination. -Minimal infrastructure exists at stations to ensure smooth transitions to neighborhoods -Park and rides may exist, especially on parcels that are zoned for denser development when demand rises	(Dallas') Downtown Plano

TOD Typology	Land Use and Scale	Transit Modes	Connections with Transit	Texas Example
Suburban 5 in Austin 15 in Dallas 3 in Houston	-Park and Ride is the primary use adjacent to stations and should be sized maximally. -Some commercial uses serving transit users are ideal -New construction in the area is encouraged on the outskirts of the park-and-ride	-BRT-based or rail-based, trips may involve connections to the CBD and urban core(s) -Local buses should be timed with other transit modes and should stop adjacent to the station. Buses will radiate outwards -Commuter buses radiating out from the suburbs should utilize the transit station exclusively for suburban trips	-Some will bike to their final destination, few will walk -Protected bike parking is encouraged, as are bike facilities radiating from the station -Traffic patterns are encouraged to highlight kiss-and-ride facilities at station's edge over parking facilities -Parking may be free or priced depending on parking demand and utilization of the transit service. Off-peak use may be priced independently	Austin's Leander Station

TOD Typology	Land Use and Scale	Transit Modes	Connections with Transit	Texas Example
Special Destination 5 in Dallas	-Regionally-significant institutions. Some destinations affect demand in a "pulse" pattern, such as a sports or entertainment venue. Others pulse but are steadier, as with an airport -Land use around the station is likely commercial -Development is dependent upon the destination, and will experience demand pulses with the destination	-BRT-based or rail-based, depending on peaking intensity of demand -Local buses should not serve this destination if it is inefficient in off-peak seasons or times -Event shuttle service may be employed depending on the destination and demand. This may be through the transit provider or a private contractor	-Virtually all will walk to their final destination -Station should open directly onto the destination or should connect positively with the destination, minimally conflicting with vehicles -Station should not be positioned such that it generates a hazard when it is over-capacity -Large parking areas for the destination may be utilized as park-and-ride facilities when the destination is not in use	Dallas' Fair Park

5.3. Inventory of Texas Triangle Rapid Transit Station Typologies

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Organized (roughly) from North to South, West to East				
Austin	BRT	801	Tech Ridge	Suburban
Austin	BRT	801	Chinatown	Neighborhood Center
Austin	BRT	801	Masterson	Neighborhood Center
Austin	BRT	801	Rundberg	Neighborhood Center
Austin	BRT	801	North Lamar Transit Center	Neighborhood Center
Austin	BRT	801	Brentwood	Neighborhood Center
Austin	BRT	801	Triangle	Town Center
Austin	BRT	801	Hyde Park	Neighborhood Center
Austin	BRT	801	Audiorium Shores	Neighborhood Center
Austin	BRT	801	SoCo	Neighborhood Center
Austin	BRT	801	Oltorf	Neighborhood Center
Austin	BRT	801	St. Edward's	Neighborhood Center
Austin	BRT	801	South Congress Transit Center	Neighborhood Center
Austin	BRT	801	Little Texas	Neighborhood Center
Austin	BRT	801	Pleasant Hill	Neighborhood Center
Austin	BRT	801	Southpark Meadows	Neighborhood Center
Austin	BRT	803	Domain	Neighborhood Center
Austin	BRT	803	UT Research Campus	Neighborhood Center
Austin	BRT	803	Crossroads Station	Neighborhood Center
Austin	BRT	803	Ohlen	Neighborhood Center
Austin	BRT	803	Northcross	Neighborhood Center
Austin	BRT	803	Justin	Suburban
Austin	BRT	803	Allandale	Neighborhood Center
Austin	BRT	803	North Loop	Neighborhood Center
Austin	BRT	803	Sunshine	Town Center
Austin	BRT	803	Rosedale	Neighborhood Center
Austin	BRT	803	West 38th	Neighborhood Center
Austin	BRT	803	Barton Springs	Neighborhood Center
Austin	BRT	803	Lamar Square	Neighborhood Center
Austin	BRT	803	Oltorf West	Neighborhood Center
Austin	BRT	803	Bluebonnet	Neighborhood Center
Austin	BRT	803	Brodie Oaks	Neighborhood Center

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Austin	BRT	803	Seaholm	Town Center
Austin	BRT	803	Westgate	Neighborhood Center
Austin	BRT	803 / 801	UT Dean Keaton	Urban Core
Austin	BRT	803 / 801	UT West Mall	Urban Core
Austin	BRT	803 / 801	Museum	Urban Core
Austin	BRT	803 / 801	Capitol	Urban Core
Austin	BRT	803 / 801	Austin History Center	Urban Core
Austin	BRT	803 / 801	Republic Square Park	Urban Core
Austin	CRT	Red Line	Leander	Suburban
Austin	CRT	Red Line	Lakeline	Suburban
Austin	CRT	Red Line	Howard	Suburban
Austin	CRT	Red Line	Kramer	Neighborhood Center
Austin	CRT / BRT	Red Line / 801	Crestview	Town Center
Austin	CRT	Red Line	Highland	Neighborhood Center
Austin	CRT	Red Line	MLK	Neighborhood Center
Austin	CRT	Red Line	Plaza Saltillo	Neighborhood Center
Austin	CRT	Red Line	Downtown	Urban Core

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Organized (roughly) from North to South, West to East				
Dallas	LRT	Orange	DFW Airport Station	Special Destination
Dallas	LRT	Orange	Belt Line	Suburban
Dallas	LRT	Orange	North Lake College	Neighborhood Center
Dallas	LRT	Orange	Irving Convention Center	Special Destination
Dallas	LRT	Orange	Las Colinas Urban Center	Neighborhood Center
Dallas	LRT	Orange	University of Dallas	Suburban
Dallas	LRT	Green	North Carrollton / Frankford	Suburban
Dallas	LRT	Green	Trinity Mills	Suburban
Dallas	LRT	Green	Downtown Carrollton	Neighborhood Center
Dallas	LRT	Green	Farmers Branch	Neighborhood Center
Dallas	LRT	Green	Royal Lane	Neighborhood Center
Dallas	LRT	Green	Walnut Hill / Denton	Neighborhood Center
Dallas	LRT	Green	Deep Ellum	Neighborhood Center
Dallas	LRT	Green	Baylor University Medical Center	Neighborhood Center
Dallas	LRT	Green	Fair Park	Special Destination
Dallas	LRT	Green	MLK Jr.	Suburban
Dallas	LRT	Green	Hatcher	Suburban
Dallas	LRT	Green	Lawnview	Suburban
Dallas	LRT	Green	Lake June	Suburban
Dallas	LRT	Green	Buckner	Neighborhood Center
Dallas	LRT	Orange / Green	Bachman	Neighborhood Center
Dallas	LRT	Orange / Green	Burbank	Neighborhood Center
Dallas	LRT	Orange / Green	Inwood / Love Field	Special Destination
Dallas	LRT	Orange / Green	Southwestern Medical District / Parkland	Town Center
Dallas	LRT	Orange / Green	Market Center	Neighborhood Center
Dallas	LRT / CRT	Orange / Green / TRE	Victory	Neighborhood Center
Dallas	LRT	Orange / Green / Red / Blue	West End	Urban Core

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Dallas	LRT	Orange / Green / Red / Blue	Akard	Urban Core
Dallas	LRT	Orange / Green / Red / Blue	St. Paul	Urban Core
Dallas	LRT	Orange / Green / Red / Blue	Pearl / Arts District	Urban Core
Dallas	LRT	Orange / Red / Blue	Cityplace / Uptown	Neighborhood Center
Dallas	LRT	Orange / Red / Blue	Mockingbird	Neighborhood Center
Dallas	LRT	Orange / Red	Lovers Lane	Neighborhood Center
Dallas	LRT	Orange / Red	Park Lane	Neighborhood Center
Dallas	LRT	Orange / Red	Walnut Hill	Neighborhood Center
Dallas	LRT	Orange / Red	Forest Lane	Neighborhood Center
Dallas	LRT	Orange / Red	LBJ / Central	Neighborhood Center
Dallas	LRT	Orange / Red	Spring Valley	Neighborhood Center
Dallas	LRT	Orange / Red	Arapahao Center	Neighborhood Center
Dallas	LRT	Orange / Red	Galatyn Park	Neighborhood Center
Dallas	LRT	Orange / Red	Bush Turnpike	Neighborhood Center
Dallas	LRT	Orange / Red	Downtown Plano	Neighborhood Center
Dallas	LRT	Orange / Red	Parker Road	Neighborhood Center
Dallas	LRT	Blue	Downtown Rowlett	Suburban
Dallas	LRT	Blue	Downtown Garland	Neighborhood Center

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Dallas	LRT	Blue	Forest / Jupiter	Neighborhood Center
Dallas	LRT	Blue	LBJ / Skillman	Neighborhood Center
Dallas	LRT	Blue	Lake Highlands	Neighborhood Center
Dallas	LRT	Blue	White Rock	Suburban
Dallas	LRT	Blue	Morrell	Neighborhood Center
Dallas	LRT	Blue	Illinois	Neighborhood Center
Dallas	LRT	Blue	Kiest	Neighborhood Center
Dallas	LRT	Blue	VA Medical Center	Neighborhood Center
Dallas	LRT	Blue	Ledbetter	Suburban
Dallas	LRT / CRT	Blue / Red / TRE	Union Station	Town Center
Dallas	LRT	Blue / Red	Convention Center	Neighborhood Center
Dallas	LRT	Blue / Red	Cedars	Suburban
Dallas	LRT	Blue / Red	8th and Corinth	Suburban
Dallas	LRT	Red	Dallas Zoo	Special Destination
Dallas	LRT	Red	Tyler / Vernon	Neighborhood Center
Dallas	LRT	Red	Hampton	Neighborhood Center
Dallas	LRT	Red	Westmoreland	Neighborhood Center
Dallas	CRT	TRE	T & P Station	Neighborhood Center
Dallas	CRT	TRE	Fort Worth ITC	Neighborhood Center
Dallas	CRT	TRE	Richland Hills	Neighborhood Center
Dallas	CRT	TRE	Bell	Neighborhood Center
Dallas	CRT	TRE	Centreport / DFW Airport	Neighborhood Center
Dallas	CRT	TRE	West Irving	Suburban
Dallas	CRT	TRE	Downtown Irving / Heritage Crossing	Neighborhood Center
Dallas	CRT	TRE	Medical / Market Center	Town Center

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Organized (roughly) from North to South, West to East				
Houston	LRT	Red	Northline Transit Center / HCC	Neighborhood Center
Houston	LRT	Red	Melbourne / North Lindale	Neighborhood Center
Houston	LRT	Red	Lindale Park // Graceland Station	Neighborhood Center
Houston	LRT	Red	Cavalcade	Neighborhood Center
Houston	LRT	Red	Moody Park	Neighborhood Center
Houston	LRT	Red	Fulton / North Central // Boundary Station	Neighborhood Center
Houston	LRT	Red	Quitman / Near Northside	Neighborhood Center
Houston	LRT	Red	Burnet Transit Center / Casa de Amigos	Neighborhood Center
Houston	LRT	Red	UH-Downtown	Town Center
Houston	LRT	Red	Preston	Urban Core
Houston	LRT	Red	Central Station Main	Urban Core
Houston	LRT	Red	Main Street Square	Urban Core
Houston	LRT	Red	Bell	Urban Core
Houston	LRT	Red	Downtown Transit Center	Urban Core
Houston	LRT	Red	McGowen	Town Center
Houston	LRT	Red	Ensemble / HCC	Town Center
Houston	LRT	Red	Wheeler Transit Center	Neighborhood Center
Houston	LRT	Red	Museum District	Neighborhood Center
Houston	LRT	Red	Hermann Park / Rice U	Neighborhood Center
Houston	LRT	Red	Memorial Hermann Hospital / Houston Zoo	Urban Core
Houston	LRT	Red	Dryden / TMC	Urban Core
Houston	LRT	Red	TMC Transit Center	Urban Core
Houston	LRT	Red	Smith Lands	Neighborhood Center
Houston	LRT	Red	Reliant Park	Neighborhood Center
Houston	LRT	Red	Fannin South	Suburban
Houston	LRT	Green / Purple	Theater District // Smith Station Pair	Urban Core
Houston	LRT	Green / Purple	Central Station Capitol // Fannin Station	Urban Core
Houston	LRT	Green / Purple	Central Station Rusk // Fannin Station	Urban Core
Houston	LRT	Green / Purple	Convention District // Crawford Station	Urban Core
Houston	LRT	Green / Purple	EaDo / Stadium // Bastrop	Neighborhood Center

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Houston	LRT	Green	Coffee Plant / Second Ward // York	Neighborhood Center
Houston	LRT	Green	Lockwood / Eastwood // Lockwood	Neighborhood Center
Houston	LRT	Green	ALTIC / Howard Hughes	Neighborhood Center
Houston	LRT	Purple	Leeland / Third Ward	Neighborhood Center
Houston	LRT	Purple	Elgin / Third Ward	Neighborhood Center
Houston	LRT	Purple	Robertson Stadium / UH / TSU	Neighborhood Center
Houston	LRT	Purple	UH South / University Oaks // Cullen	Neighborhood Center
Houston	LRT	Purple	MacGregor Park / MLK Jr.	Suburban
Houston	LRT	Purple	Palm Transit Center	Suburban

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
Organized (roughly) from North to South, West to East				
San Antonio	BRT	100	Ewing Halsell Station	Town Center
San Antonio	BRT	100	Medical Center Transit Center	Neighborhood Center
San Antonio	BRT	100	University Hospital Station	Neighborhood Center
San Antonio	BRT	100	Callaghan Station	Neighborhood Center
San Antonio	BRT	100	Crossroads Station	Neighborhood Center
San Antonio	BRT	100	De Chantle Station	Neighborhood Center
San Antonio	BRT	100	Babcock Station	Neighborhood Center
San Antonio	BRT	100	Mary Louise Station	Neighborhood Center
San Antonio	BRT	100	Huisache Station	Neighborhood Center
San Antonio	BRT	100	Centro Plaza	Town Center
San Antonio	BRT	100	Buena Visa & Pecos	Town Center
San Antonio	BRT	100	Dolorosa & Santa Rosa	Urban Core
San Antonio	BRT	100	Dolorosa & S. Main	Urban Core
San Antonio	BRT	100	Market & S. St. Mary's	Urban Core
San Antonio	BRT	100	Market & Alamo	Urban Core
San Antonio	BRT	100	Market / Front of Convention Center	Urban Core
San Antonio	BRT	100	E Houston & Under I-37	Urban Core
San Antonio	BRT	100	Bowie Opposite Blum	Urban Core
San Antonio	BRT	100	Commerce & Navarro	Urban Core
San Antonio	BRT	100	Commerce & Flores	Urban Core

City	Technology	Transit Line	Station Name (During Line Construction)	Typology
San Antonio	BRT	100	Commerce & San Saba	Urban Core
San Antonio	BRT	100	W. Commerce & Frio	Urban Core
San Antonio	BRT	100	Ellis Alley Park & Ride	Neighborhood Center

5.4. TOD Readiness Scores of Texas Triangle Rail Stations

Following typological classifications of rapid transit stations, assessment of rail stations' "TOD readiness" was completed on a 4-point scale. This task was divided into two parts. First, an assessment was performed of "supply-side indicators", which is most aptly applied to indicate a site's readiness for new TOD development activity. These indicators include average block size and percent of land that is vacant. Next, indicators of "demand-side" were assessed. These indicators are most appropriate for analysis of TOD sites after development has been begun, but these indicators may also be used to analyze a station area preceding denser development. Demand-side indicators include population density and employment density. Overall, all 4 points should be considered in an analysis of "readiness"; a TOD site that is largely-vacant, relatively dense, and has short blocks may be the ideal candidate for a developer seeking low risk and a high potential for return.

While the indicators utilized for this scoring system are common, TOD guidelines from around the United States offered little assistance in defining ideal indicator values that could be utilized in the Texas Triangle. Generally, guidelines are not attended to be applied outside of their intended contexts. As city compositions in Texas result in vastly different densities, vacant land amounts, and block sizes than may be found elsewhere in the United States, the values of these indicators needed to be uniquely evaluated.

To capture the uniqueness of the Texas Triangle context, indicators for rapid transit stations were simply compared to indicators of other stations around the Texas Triangle with the same typology. This comparison is fitting, as many developers have projects throughout the megaregion. For each indicator, a station received one point if its value was greater than the average value for its specific typology. With four indicators, there was a maximum potential of 4 points.

Utilizing this ratings system, the stations most ready for development under this system are:

- Cedars (Dallas)
- Central Station Capitol (Houston)
- Central Station Rusk (Houston)
- Cityplace / Uptown (Dallas)
- Deep Ellum (Dallas).
- MacGregor Park / MLK Jr. (Houston)
- Preston Station (Houston)
- Smith Lands (Houston)
- Victory (Dallas)

To confirm the validity of this scoring system, these highest-rated stations were inspected with a closer look. To the trained observer, these stations seem to hold a high potential for TOD development, suggesting validity of this 4-point rating system.

City	Station Name (During Line Construction)	Typology	Points
Dallas	Cedars	Suburban	4
Dallas	Cityplace / Uptown	Neighborhood Center	4
Dallas	Deep Ellum	Neighborhood Center	4
Dallas	Victory	Neighborhood Center	4
Houston	Central Station Capitol // Fannin Station	Urban Core	4
Houston	Central Station Rusk // Fannin Station	Urban Core	4
Houston	Convention District // Crawford Station	Urban Core	4
Houston	MacGregor Park / MLK Jr.	Suburban	4
Houston	Preston	Urban Core	4
Houston	Smith Lands	Neighborhood Center	4
Austin	MLK	Neighborhood Center	3
Dallas	8th and Corinth	Suburban	3
Dallas	Akard	Urban Core	3
Dallas	Belt Line	Suburban	3
Dallas	Convention Center	Neighborhood Center	3
Dallas	Downtown Plano	Neighborhood Center	3
Dallas	Fair Park	Special Destination	3
Dallas	Ledbetter	Suburban	3
Dallas	Lovers Lane	Neighborhood Center	3
Dallas	Market Center	Neighborhood Center	3
Dallas	MLK Jr.	Suburban	3
Dallas	Morrell	Neighborhood Center	3
Dallas	Pearl / Arts District	Urban Core	3
Dallas	St. Paul	Urban Core	3
Dallas	T & P Station	Neighborhood Center	3
Dallas	Union Station	Town Center	3
Dallas	West End	Urban Core	3
Dallas	West Irving	Suburban	3
Houston	ALTIC / Howard Hughes	Neighborhood Center	3

City	Station Name (During Line Construction)	Typology	Points
Houston	Bell	Urban Core	3
Houston	Central Station Main	Urban Core	3
Houston	Coffee Plant / Second Ward // York	Neighborhood Center	3
Houston	Downtown Transit Center	Urban Core	3
Houston	Fannin South	Suburban	3
Houston	Fulton / North Central // Boundary Station	Neighborhood Center	3
Houston	Main Street Square	Urban Core	3
Houston	McGowen	Town Center	3
Houston	Moody Park	Neighborhood Center	3
Houston	Museum District	Neighborhood Center	3
Houston	Quitman / Near Northside	Neighborhood Center	3
Houston	Reliant Park	Neighborhood Center	3
Houston	Theater District // Smith Station Pair	Urban Core	3
Houston	UH South / University Oaks // Cullen	Neighborhood Center	3
Houston	UH-Downtown	Town Center	3
Houston	Palm Transit Center	Suburban	3
Austin	Downtown	Urban Core	2
Austin	Plaza Saltillo	Neighborhood Center	2
Dallas	Baylor University Medical Center	Neighborhood Center	2
Dallas	Bush Turnpike	Neighborhood Center	2
Dallas	Dallas Zoo	Special Destination	2
Dallas	Downtown Carrollton	Neighborhood Center	2
Dallas	Downtown Rowlett	Suburban	2
Dallas	Fort Worth ITC	Neighborhood Center	2
Dallas	Galatyn Park	Neighborhood Center	2
Dallas	Hampton	Neighborhood Center	2
Dallas	Hatcher	Suburban	2
Dallas	Inwood / Love Field	Special Destination	2
Dallas	Kiest	Neighborhood Center	2

City	Station Name (During Line Construction)	Typology	Points
Dallas	Lake June	Suburban	2
Dallas	Lawnview	Suburban	2
Dallas	North Carrollton / Frankford	Suburban	2
Dallas	Park Lane	Neighborhood Center	2
Dallas	Southwestern Medical District / Parkland	Town Center	2
Dallas	Spring Valley	Neighborhood Center	2
Dallas	Trinity Mills	Suburban	2
Dallas	Tyler / Vernon	Neighborhood Center	2
Dallas	Walnut Hill	Neighborhood Center	2
Dallas	Westmoreland	Neighborhood Center	2
Dallas	White Rock	Suburban	2
Houston	Burnet Transit Center / Casa de Amigos	Neighborhood Center	2
Houston	Cavalcade	Neighborhood Center	2
Houston	Dryden / TMC	Urban Core	2
Houston	EaDo / Stadium // Bastrop	Neighborhood Center	2
Houston	Ensemble / HCC	Town Center	2
Houston	Hermann Park / Rice U	Neighborhood Center	2
Houston	Lindale Park // Graceland Station	Neighborhood Center	2
Houston	Lockwood / Eastwood // Lockwood	Neighborhood Center	2
Houston	Melbourne / North Lindale	Neighborhood Center	2
Houston	Robertson Stadium / UH / TSU	Neighborhood Center	2
Houston	TMC Transit Center	Urban Core	2
Houston	Wheeler Transit Center	Neighborhood Center	2
Austin	Highland	Neighborhood Center	1
Austin	Howard	Suburban	1
Austin	Kramer	Neighborhood Center	1
Austin	Lakeline	Suburban	1
Austin	Leander	Suburban	1
Dallas	Bachman	Neighborhood Center	1

City	Station Name (During Line Construction)	Typology	Points
Dallas	Bell	Neighborhood Center	1
Dallas	Buckner	Neighborhood Center	1
Dallas	Burbank	Neighborhood Center	1
Dallas	DFW Airport Station	Special Destination	1
Dallas	Downtown Garland	Neighborhood Center	1
Dallas	Downtown Irving / Heritage Crossing	Neighborhood Center	1
Dallas	Farmers Branch	Neighborhood Center	1
Dallas	Illinois	Neighborhood Center	1
Dallas	Irving Convention Center	Special Destination	1
Dallas	Lake Highlands	Neighborhood Center	1
Dallas	Las Colinas Urban Center	Neighborhood Center	1
Dallas	LBJ / Central	Neighborhood Center	1
Dallas	LBJ / Skillman	Neighborhood Center	1
Dallas	Medical / Market Center	Town Center	1
Dallas	North Lake College	Neighborhood Center	1
Dallas	Parker Road	Neighborhood Center	1
Dallas	Royal Lane	Neighborhood Center	1
Dallas	University of Dallas	Suburban	1
Dallas	VA Medical Center	Neighborhood Center	1
Dallas	Walnut Hill / Denton	Neighborhood Center	1
Houston	Elgin / Third Ward	Neighborhood Center	1
Houston	Leeland / Third Ward	Neighborhood Center	1
Houston	Memorial Hermann Hospital / Houston Zoo	Urban Core	1
Houston	Northline Transit Center / HCC	Neighborhood Center	1
Austin	Crestview	Town Center	0
Dallas	Arapahao Center	Neighborhood Center	0
Dallas	Centreport / DFW Airport	Neighborhood Center	0
Dallas	Forest / Jupiter	Neighborhood Center	0
Dallas	Forest Lane	Neighborhood Center	0

City	Station Name (During Line Construction)	Typology	Points
Dallas	Mockingbird	Neighborhood Center	0
Dallas	Richland Hills	Neighborhood Center	0

Chapter 6. Surveys of Public Agencies and Developers

6.1. Public Agency Survey

The core component of this research, the public agency survey was created utilizing findings of the literature review as well as an understanding of regulations at the national, regional, and local levels. It was distributed to dozens of public agencies around the Texas Triangle megaregion. For a full copy of the public agency survey, see Appendix C "Public Agencies Survey".

6.1.1 Public Agency Survey Methods

The survey provided a general definition of TOD – deliberate development oriented towards transit stations in a manner that supports transit services and enhances community livability through the design of compact, walkable, and mixed-use environments – but also encouraged agencies to utilize their own definitions of TOD if they had adopted a definition. While some agencies' practices reflect the definition above, this survey was also meant to capture practices that focus on compact development and walking- and cycling-friendly designs near transit, even if the practice is not branded "TOD."

The survey consists of 26 questions, divided into five sections: Background Information, Concepts and Perspectives, Current Practices of TOD or Similar Development and Design near Transit, Barriers to TOD Implementation, and Effectiveness of Strategies to Overcome Barriers to the Implementation of TOD. The survey was administered through Typeform and took approximately 30 minutes to complete. In the fall of 2017, the survey was open for one month, and one attempt was made every week, in email or call form, to send the survey to our list of contacts in order to maximize survey responses. In the spring of 2018 the survey was opened for several months and attempts were made via email to contact all who had been identified as possible survey participants that did not complete the survey. In an attempt to secure responses from all large organizations in the Texas Triangle, several employees were contacted at larger organizations from which no response had been received.

When the survey closed, respondents' answers to the survey questions were coded using a database approach. In the database, variables were used (abbreviated expressions) to represent survey questions which usually come in long sentences. For questions allowing multiple selections, each answer was represented by one variable.

The public agency survey was sent to three specific groups within the Texas Triangle. First, it was sent to regional and state offices of planning: metropolitan planning organizations (MPOs), councils of government (COGs), and the relevant state department of transportation, TxDOT. Second, the survey was sent to all registered public transit providers in the Texas Triangle. Third, all municipal planning agencies in the Texas Triangle which had some form of public transit service were sent the survey. Some surveys were sent to multiple contacts for each agency, generating multiple responses from a single organization. In these cases, all responses were coded and given equal weight. Responses were received from a broad array of agencies with jurisdictions large and small from around the Texas Triangle. Public transit was the least-well represented group in the survey, with a lower response rate than any other population.

6.1.2. Public Agency Survey General Findings

At the risk of stating the obvious to those who have lived, worked, or played in the state of Texas, Texas is a pointedly auto-dominated state. Unsurprisingly, one of the key public agency survey findings is that agencies are greatly inhibited in their quest for TOD development by Texas's orientation towards private vehicles. In pursuit of many of the basic elements which allow for TOD development—quality rapid transit, density, etc.—public agencies in Texas report encountering significant barriers, even though internally most planning agencies strongly support the principles which drive TOD development. Surprisingly, reported barriers are often not the result of federal or state laws and regulations, but rather policy decisions at the more local level.

Quality rapid transit is one of the core elements of TOD, yet most jurisdictions in the Texas Triangle do not have access to any rapid transit service. Unsurprisingly, most jurisdictions interviewed have access to a non-rapid bus transportation system as well as a paratransit service. On top of these services, approximately 30% reported having light rail transit, 25% reported

having commuter rail transit, and less than 10% reported having commuter rail transit services. Many of the rail services in the Texas Triangle may be described as commuter rail services utilizing light or heavy rail technology, and many classified their services utilizing both descriptors. In addition to these services, over 10% of respondents reported having bus rapid transit (BRT) service, although all of these services may be more aptly defined as "BRT-lite" (see Appendix A).

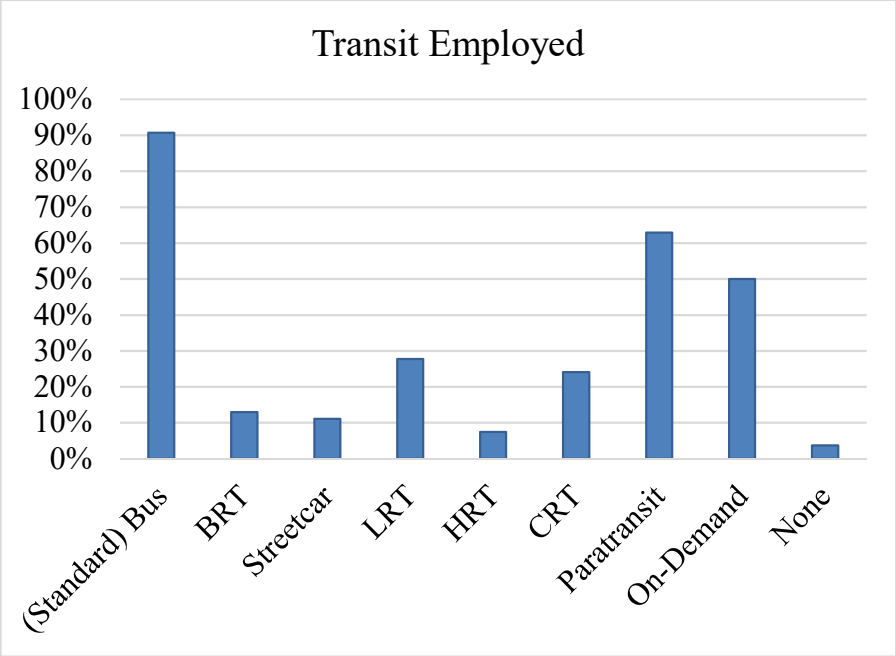


Figure 6.1. Transit employed within the jurisdictions of the respondents of the public agencies survey

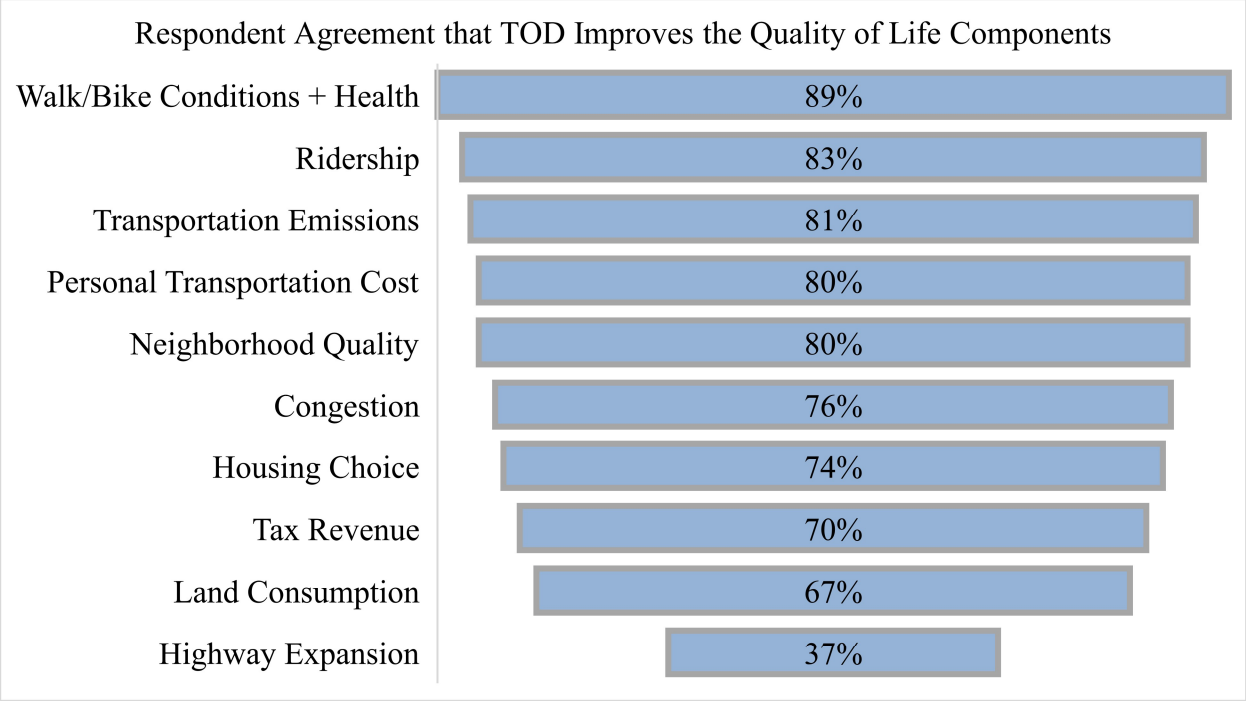


Figure 6.2. Percentage of respondents that either agree or strongly agree that TOD improves specific quality of life components. Respondents could also state that they disagree, somewhat agree, or are unsure that TOD improves the aforementioned quality of life components.

While many public agencies lack access to the quality rapid transit systems they desire, they remain strong proponents of TOD patterns and ideals. Most agencies responding reported that TOD improved several metrics of quality of life, from environmental quality and character to increased tax revenues. Public agencies also foresaw a growth in interest in TOD sites within their jurisdictions. While the vast majority of respondents only believe there is current TOD potential at 0-5 sites within their jurisdictions, over 1/3 of respondents see future TOD potential at 6 or more sites in their jurisdictions.

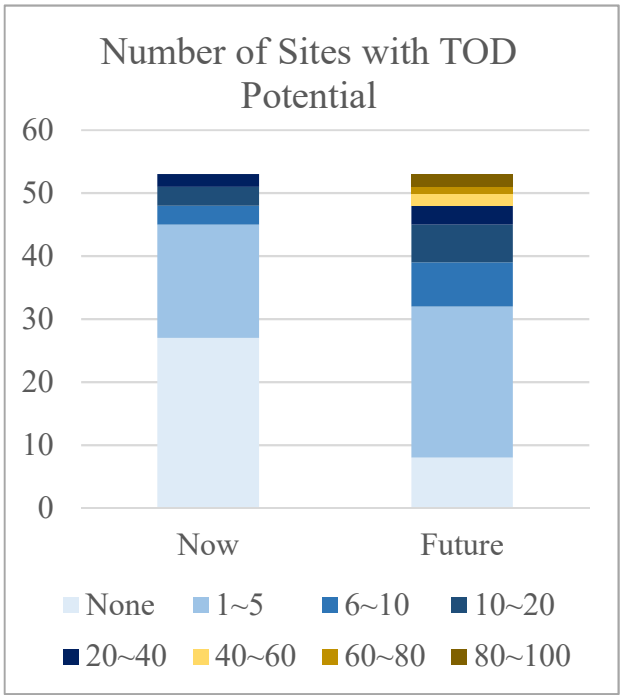


Figure 6.3. Number of sites with TOD potential

Somewhat surprisingly, agencies stated that federal and state regulations were not significant barriers to TOD implementation. Over ¾ of respondents stated that constraints on TOD caused by federal regulations were either "none" or "minimal", and a similar percentage of respondents state that constraints on TOD caused by state regulations were either "none" or "minimal". Transit agencies were most likely to respond that federal and state regulations were impeding TOD, most likely as a result of federal and state funding decisions that are seen as supporting highway capital projects over public transit capital projects.

Rather than seeing federal and state agencies as constraining development, most agencies saw partnerships with these agencies as a valuable tool for TOD development. Most respondents saw state and federal grants as important or very important. While federal grants were more important to agencies than state grants, agencies report partnerships with agencies at the state-level as more important than partnerships with federal agencies. Over ¾ of respondents reported these partnerships as either important or very important to TOD implementation. Agencies also stated that partnerships with regional governance were important, such as with metropolitan planning organizations (MPOs) or councils of government (COGs), both of which can be sources of necessary funding for TOD projects. The most important partnerships of all, though, are rated as the partnerships with transit agencies and developers. The vast majority of agencies surveyed stated that quality partnerships with transit agencies and with developers are either important or very important to the success of a TOD project.

6.1.3. Value Capture Findings

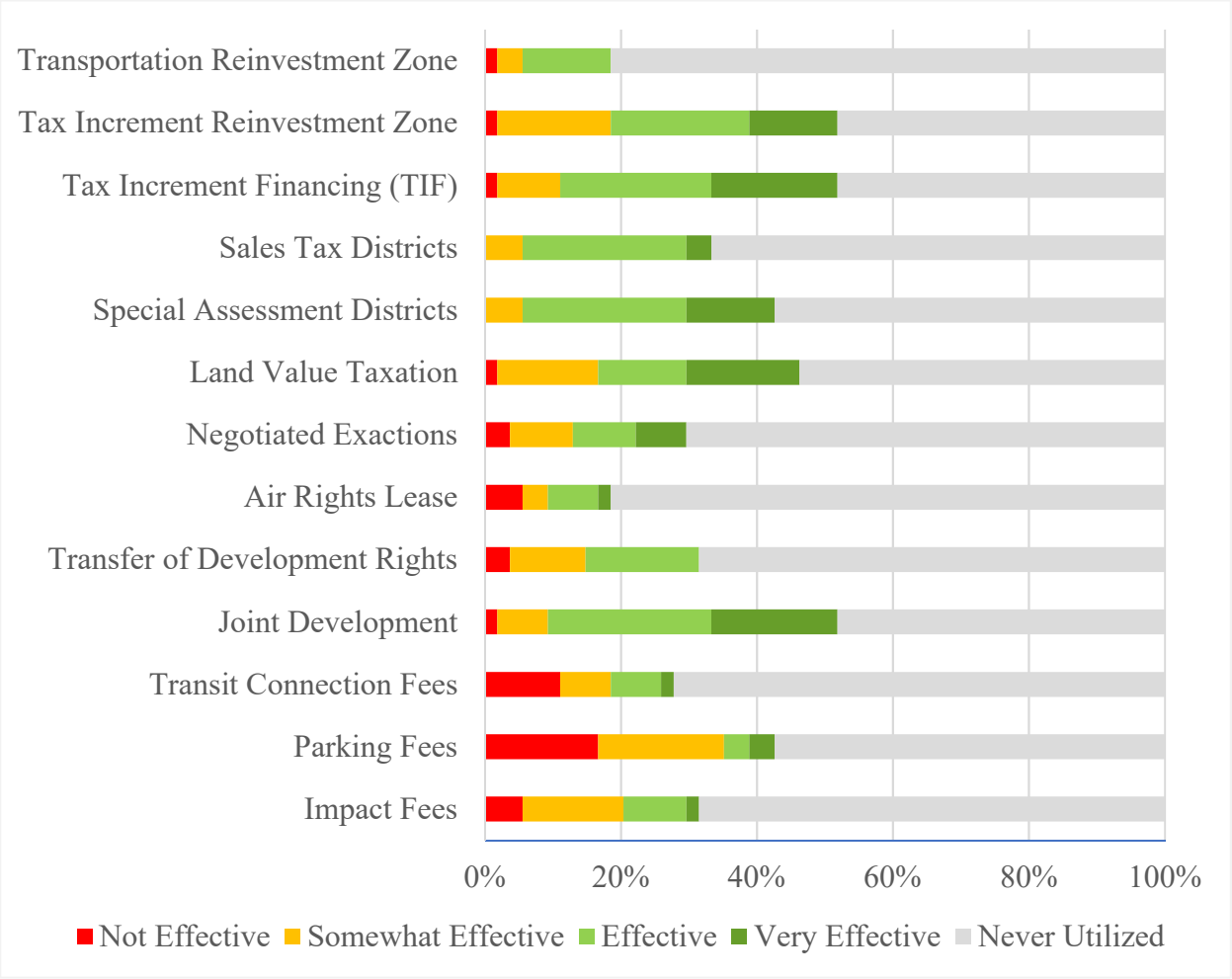


Figure 6.4. Ratings of value capture mechanism effectiveness by survey respondents

One of the most striking findings of the public agency survey was the lack of understanding of different value capture techniques accessible in the state of Texas. Survey respondents 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. Figure 6.4 examines both agencies' ratings of effectiveness of all value capture tools available in the Texas Triangle, as well as their reported usage by surveyed agencies. Joint development and land value taxation measures (including tax increment financing, etc.) are perceived as very effective, and have been utilized considerably.

6.1.4. Planning Tool Effectiveness Findings

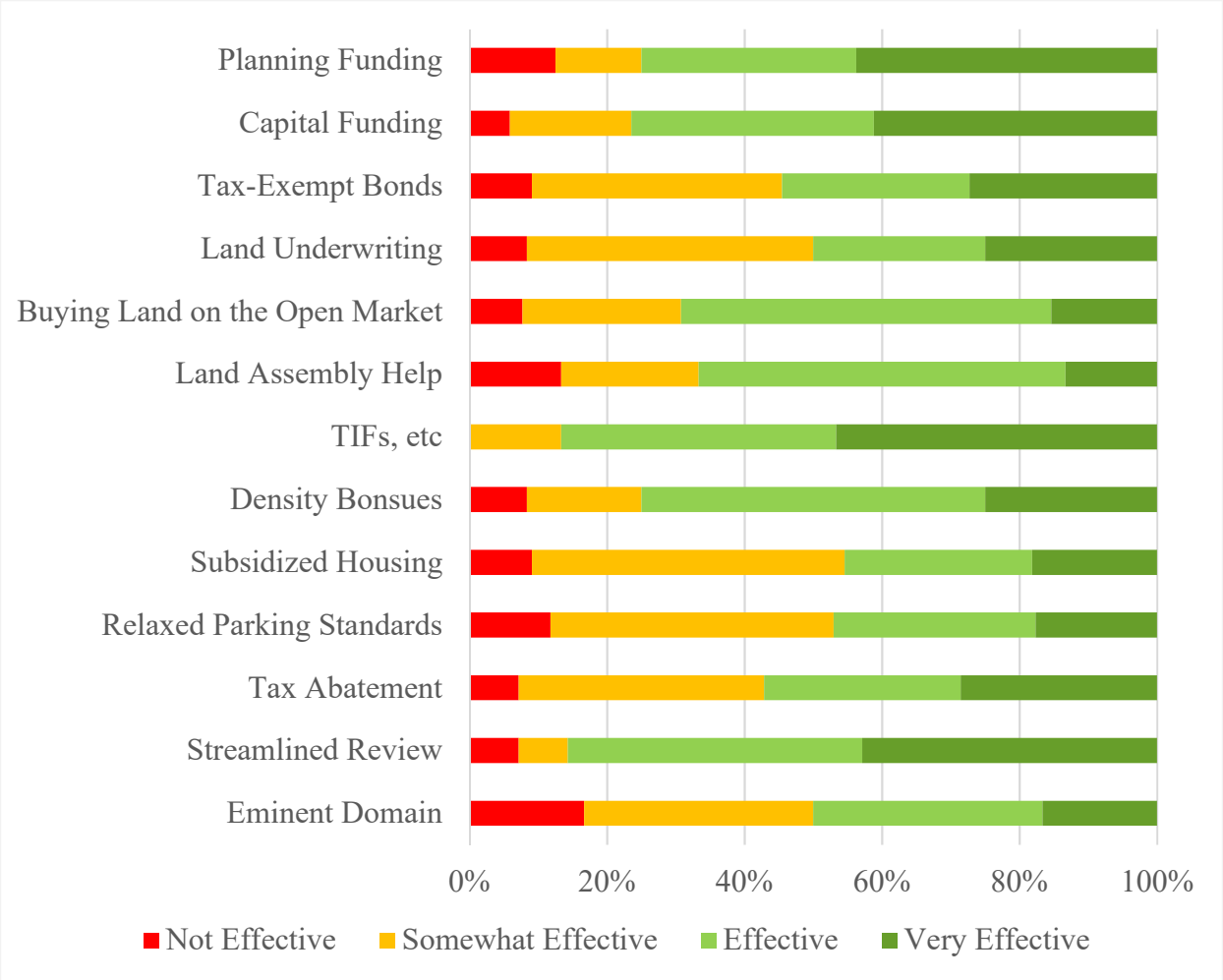


Figure 6.5. Survey respondents' rating of planning tool effectiveness in implementing TOD

Another important area of exploration was public agencies' perceptions of the planning tools available to them. The perceived effectiveness of design qualities was generally what one may expect: generally, planners agree that TOD is enhanced if bikeability and walkability are improved (although, notably, less than 1/5 agree that a reduced block size improves TOD). However, the effectiveness of planning tools such as land assembly help, streamlined review, etc. were also examined. The perceived effectiveness of each tool is shown in Figure 6.5. The most well-received tools are tax increment financing (TIFs) and streamlined review.

6.1.5. Public Agency Survey Conclusion

Most Texas Triangle planning agencies agree that TOD would benefit their communities, but less than 1⁄4 report having even adopted a definition for TOD. Agencies need direction on new and useful value capture mechanisms—especially TIRZs and TRZs—which could fund needed capital projects for station areas and transit lines. Planners also must recognize the value in cooperation—while many agree that partnerships are helpful, many opportunities for collaboration are lost among different agencies. Planners also need access to TOD best practices—while many report successes in utilizing specific tools or methods in TOD development, other agencies which may benefit from those same tools or methods falter without a confident understanding of what may work and what may not work.

6.2. Developer Survey

As a follow-up to the public agency survey, in the spring of 2018 a similar survey was administered to for-profit and nonprofit developers around the Texas Triangle.

6.2.1. Developer Survey Methods

Similar to the public agencies survey, this survey was adapted nominally to gauge and compare developers' opinions and practices with transit-oriented developments to those of the planners with whom they work. With a much larger target population, this survey was administered with convenience sampling. All of the largest developers with operations in the Texas Triangle were contacted, as well as all of the largest trade organizations representing developers in the Texas Triangle. Additionally, dozens of developers in the Texas Triangle that had projects in transit-oriented developments were contacted.

Unfortunately, the survey response rate for developers proved significantly worse than the response rate for public agencies. Dozens of real estate development and investment firms were contacted individually, either by email, on the phone, and in person. In addition, several organizations representing specific developer-related interests (such as the Texas Association of Community Development Corporations) were contacted, many of whom sent survey prompts to

their listservs of members. In spite of these efforts, only 5 responses were recorded, and as a result these findings are not representative of the studied population, even if responses were generated by respondents who had worked in all major metropolitan regions of the Texas Triangle and are either developing or have developed TOD sites. While not representative, these responses informed interviews with developers and public agencies in subsequent phases of research.

6.2.2. Findings

An everlasting criticism of TOD is the paradoxical result of its deployment: while it increases density meaningfully around transit stations, it also increases the cost of living of an area, tending to push away transit-dependent populations who are most likely to supply transit ridership.[71] Nonprofit developers appear to recognize this trend, identifying transit and TOD as a major opportunity for their development of below-market rate apartments. Surveyed nonprofits rate the importance of transit connections in choosing property more highly than for-profit developers, rating importance as a 5 out of 5 versus a 3 out of 5. Conversely, for-profit developers rate the importance of driver-friendliness in choosing a site a 5 out of 5, while nonprofits rate it less. Survey results would suggest that nonprofit developers have a greater appreciation for the "transit" of TOD than for-profit developers.

Most developers, regardless of profit interest, agree on several elements that foster TOD progress. All would like to see increased density around station areas in which they've worked in the Texas Triangle, generally as a way of overcoming prohibitive land costs of station areas. Most also agree that designated staff for TOD and clear guidelines for TOD sites would improve their abilities and interests in developing. Most also agree that partnering both with transit agencies and regional governance (MPOs, COGs, etc.) would yield better TOD progress—however, no surveyed developer has ever partnered with either a transit agency or regional body of government, in spite of seeing the value in that partnership. Not all partnerships are desirable to developers, however: surveyed developers have very low interest in engaging neighborhood groups and in public engagement processes more generally.

[71] Jones, Craig E., and David Ley. (2016). Transit-Oriented Development and Gentrification Along Metro Vancouver's Low-Income SkyTrain Corridor. *The University of Toronto Cities Centre.*

There also exists a consensus among respondents regarding the reasons TOD sites have faltered. First and foremost, developers see the lack of funds for capital improvements at stations as a major detractor for development. In addition, developers also struggle to secure their own funding, citing a lack of lender interest as a very strong detractor to their work. Developers also cite questionable demand for these areas both from residents and commercial tenants. There is no denying that units generally command a premium in TOD, and developers see the lack of interest (or at least lack of sustained interest) in paying that premium as a very strong detractor.

6.2.3. Developer Survey Conclusion

Many developers in the Texas Triangle have a strong interest in developing TOD sites, yet they also recognize several detractors to work at these complicated sites. Recognizing the often-prohibitively high costs of land acquisition, developers are unsure they can see the returns necessary for their investment, especially if they aren't able to build as densely around station areas as they would like. Developers also see opportunities in improving TOD development conditions, most notably in building new partnerships with transit agencies and regional government agencies (MPOs, COGs, etc.). Developers similarly appreciate designated planning staff for TOD, as well as clear guidelines for TOD sites.

While findings of this survey are severely limited by a low response rate, responses to this survey proved vital in guiding interviews of planners and developers in later stages of research.

Chapter 7. Interviews of Austin, TX TOD Stakeholders

7.1 Background

Following the assessment of public agency and developer survey results, interviews were developed for planners, developers, and community groups around the Austin metropolitan region to ground survey results and allow for an examination of Austin's TOD progress at a site-specific level.

Austin proves an excellent metropolitan area in which to take a closer look at TOD practices and stakeholder opinions. First and foremost, Austin has transit technologies which should foster TOD development. The most important of these technologies for TOD is Austin's commuter rail service, MetroRail, augmented by CapMetro's BRT-lite system, MetroRapid. Second, Austin's rail stations are governed by a breadth of land development regulations in several distinct jurisdictions. Third, Austin's rail stations have seen varied development, currently at various stages of completion. Close to Austin's core, Plaza Saltillo has developed significantly around its rail station. Farther north, around Lakeline Station development has occurred, but it is unguided by a station area plan, and is decidedly disjointed in its development patterns. At the northernmost end of the rail line, Leander has seen no transit-oriented development come to fruition, although significant plans have recently been released and some construction is underway.

Figure 7.1. Map of CapMetro MetroRail Red Line[72]

[72] Railfan Guides of the U.S. (2015). Todd's Railfan Guide to Austin, TX Capital MetroRail Commuter Line. *Railfan Guides.*

The following TOD stakeholders around the Austin metropolitan area were interviewed:

- Greg Anderson, Habitat for Humanity
- Shayne Calhoun, Capital Metro
- Jolinda Marshall, Capital Metro
- Anne Milne, City of Austin
- Terry Mitchell, Momark Development
- Alex Tynberg, Tynberg LLC
- Anne-Charlotte Patterson, Crestview Neighborhood Association
- Tom Yantis, City of Leander

The insights gained from these stakeholders fall into five categories: Transportation, Funding, Partnerships, Land Development Codes, and Neighborhood Opposition.

7.2. Methods

These interviews utilized a combination of convenience sampling and snowball sampling. First, several planners and developers in the Austin region were identified as having an interest or stake in TOD and were contacted. One of the first developers that was interviewed contacted the research team to request an interview when he received a survey request. Following each interview, subjects were asked if they would like to share names of others in Austin with whom the research team should speak about TOD in Austin. Interviews were conducted in the City of Austin and in Leander, a suburban city with its own distinct planning practices.

7.3. Transportation

One of the most strongly-held opinions of all interviewed planners and developers was the value of Austin's MetroRail line. Always comparing the investment in the rail line to the investments in highways of the region, these official and unofficial rail advocates see tremendous potential in MetroRail's eventual success if station areas are developed appropriately. All parties also note the expandability of rail in the face of demand, compared to their observations of a lack of expandability of highways. In keeping with this opinion, many are also eagerly looking forward

to the MetroRail's eventual double-tracking nearer to its southern terminus, noting the bottleneck that single-tracking creates.

Developers also note the importance of parking and vehicular access to sites—especially important with for-profit developers. One developer said that he would love to get rid of parking, allowing him to build more cost-effectively and more densely, but also noted that there aren't many places in Austin that have durable demand for residences or commercial spaces without parking, leading him to believe that he wouldn't be able to find tenants for developments without adequate parking. Alex Tynberg of Tynberg LLC, with plans to develop Leander's TOD site, has embraced vehicular access, claiming that easy highway access to the site was a significant attractor to this site. In keeping with survey results of developers, Greg Anderson, nonprofit developer with Habitat for Humanity, would most eagerly do away with parking requirements in dense areas. Greg Anderson would rather utilize sparse spatial and financial resources to build more housing for low-income residents than build expensive parking spaces for his properties, especially those in transit-rich areas.

The most significant disagreement between planners and developers in regard to transportation revolves around the development attractiveness of bus routes. CapMetro's TOD team has developed a TOD tool for both the MetroRail and the MetroRapid service, a BRT-lite service, hoping to attract TOD progress for both systems. They are hopeful that developers will be attracted to the BRT-lite system, stating that the agency's investment in the MetroRapid system should make it clear that routes are permanent fixtures of the corridors they serve. Developers are not in agreement, however, and no interviewed developer would consider developing in a TOD style as a result of a bus route, either with a standard-service route or a BRT-lite route. All developers agree that there is value to good bus services but also note the ease with which one may change a bus route after development has occurred. Terry Mitchell of Momark Development discussed a recent project along the #5 bus route in Austin—a route he describes as one of Austin's most important—in which the bus was rerouted far from his property after development was completed. "Can you imagine," he said, "if I hadn't built a bunch of parking at that site?"

7.4. Funding

One of the most significant challenges for developers of TOD is acquiring financing for the vertical mixed-use that's generally required for TOD sites. While conditions are improving for financing of these types of projects, challenges remain, and this proves as one of the biggest detractors of these sites for developers. In Leander, Alex Tynberg intends on completing vertical mixed-use projects with his own team and his own financing while secondary partners build dense yet homogenous residential or commercial space around the site.

Alex Tynberg also has the benefit of a tax increment financing (TIF) mechanism at the Leander TOD. While all developers and planners agree that TIFs would increase development dramatically around TOD sites, Austin has never utilized a successful value capture mechanism around TOD sites. Leander, however, has instituted a tax increment reinvestment zone (TIRZ), a specialized TIF mechanism, on over 2,000 acres of land around the MetroRail station. Alex Tynberg and Tom Yantis of the City of Leander agree that this is a major attracting feature of the site, aiding developers in the creation of infrastructure such as sewers, roads, sidewalks, etc. The City of Leander hopes that these funds may be utilized to maintain growth momentum as development intensifies.

7.5. Partnerships

Planners of public agencies and developers have a strong interest in fostering relationships amongst themselves, especially when it comes to more complex undertakings such as TOD. From the interested developers' perspectives, planners provide an excellent resource in how transit systems will develop over time, as well as how individual station areas are expected to develop over time. While it is important for any developer to understand how their environment can be expected to change as time progresses, it is especially important for TOD-focusing developers to understand how the specific transit routes into which they are buying will be developed over time. In addition, planners often find themselves cheerleading development at TOD sites. Alex Tynberg noted that his interest in Leander's TOD site was spurred by the anchor projects that the City of Leander fought hard to acquire for their site: campuses of St. David's Hospital and of Austin Community College. Without Leander planners' acquisition of these

anchor properties and their efforts in finding a developer capable of linking the space between these anchor institutions, Leander's station would likely have no development plans.

From public agencies' perspectives, relationships also provide an opportunity to ensure that developers that are interested in the site and willing and able to develop in keeping with TOD design best practices. As Tom Yantis of the City of Leander has examined, "not many developers have developed TOD or know how to develop TOD", even among those who expressed initial interest in TOD sites. In addition, planners also have an interest in acquiring developers who are interested in investing long-term in a site. Tom Yantis noted that full development of a TOD project may take upwards of 25 years, requiring an abnormally strong commitment on the part of the developer.

While neighborhood groups report having a strong interest in working with planners and developers for TOD sites, their interest is often viewed as adversarial to TOD by planners and developers. Neighborhood groups' notable opposition to TOD projects in Austin is examined in 7.7 "Neighborhood Opposition".

7.6 Land Development Codes

All TOD stakeholders in Austin agree that Austin's land development codes are, at the very least, less than ideal when it comes to TOD development. Often full of obtuse hurdles through which developers must jump, the land development codes are also often misaligned to market conditions at TOD sites, and are lacking in flexibility necessary to allow for TOD to progress. Leander's form-based codes offers a corollary to Austin's obtuse land development requirements, but are form-based codes better suited to TOD?

Austin's lack of clear entitlements for developers isn't made clearer with a visit to planning staff, as planners in Austin are siloed, often not in communication with each other. In order to successfully develop TOD in Austin, planners and developers agree that one must be an established developer with access to strong legal assistance and the financial ability to hold properties for a significant amount of time while projects are debated, reworked, and eventually

granted approval. According to Jolinda Marshall of CapMetro, most TOD projects in Austin call for planned unit developments (PUDs), each of which must be intensely adjudicated, forcing out all but established and large developers. As Greg Anderson of Habitat for Humanity states, "We need permissive regulations that capture common benefits and are predictable and calculable." Without this, only the largest, often-national developers may partake in TOD, and according to many planners, they are often disinterested in creative and collaborative TOD.

Austin's TOD land development codes also face sharp criticism from all stakeholders in its lack of alignment with market conditions. Virtually all planners and developers state that densities should be much higher at rail stations around Austin. As land values increase, the likelihood of development being economically feasible decreases if developers are not able to recuperate land investments with higher densities, which is the most important reason why many planners and developers see relatively-low development interest at several rail stations around Austin. In addition to higher densities, planners and developers would also like to have lower parking requirements for transit-rich areas—which they see as providing ridership for transit as well as reducing construction costs—and often would like to see an allowance for smaller residential units than are currently allowed in Austin.

Virtually all planners and developers interviewed would also like to have clear density bonuses present for specific areas of the city around which density should be higher. While planners appreciate density bonuses as a means to improve spaces that can be beneficial to communities—such as with park space or affordable housing, the latter of which cannot be required under Texas regulations—developers also appreciate clear density bonuses as they tend to depoliticize development plans and approval processes, and as a result make investments more predictable. Anne Milne of the City of Austin has found that density bonuses are often out of touch with development interests. For example, she states that the intense development along East Riverside Drive allowed for high densities but didn't utilize worthwhile density bonuses, resulting in very few explicit benefits to the community at large, such as affordable housing.

Finally, developers desire flexibility in development, allowing them to tailor the specifics of their properties to their own readings of the market. For example, Terry Mitchell of Momark

Development sees a high need for more office space and more commuter parking at several station areas around Austin. However, there exists little to no flexibility to tailor development at Austin's rail stations in this way. On the other hand, Alex Tynberg of Tynberg LLC has found that form-based codes in Leander can allow for more flexibility.

Form-based codes are generally a source of agreement for planners and developers. Allowing for predictable expectations for certain elements of development (such as building heights or streetscapes), form-based codes can also allow for flexibility in other regards, such as building use. The combination of predictability and necessary flexibility are what makes form-based codes popular among interviewees. However, Alex Tynberg has found that these too can be problematic. For example, he has found it challenging to appropriately phase development in Leander with the city's form-based codes. Generally, the codes have not allowed for decisions such as the creation of surface parking lots, designed to be adapted later into more useful structures. However, Alex and all will agree that form-based codes that are based on market conditions and allow for flexibility in design and in phasing are an asset to TOD sites.

As a corollary to many intensely-planned TOD sites in Austin, Lakeline Station has gone forth merely with market-driven development. Many developers and planners in Austin find this station a mixed-bag. While it was among the first stations to see development, that development is now be considered by some to be too-low in density, pushing newly market-demanded dense properties farther from the rail station. On the other hand, a well-designed TOD site generally has its densest and most meaningful development directly adjacent to the transit station. With several acres of yet-undeveloped land surrounding this station, in the future it will be interesting to note differences between Lakeline's development speed and quality with that of other, more planned station areas.

7.7 Neighborhood Opposition

Neighborhood groups and their voices which generally fall in opposition of TOD draw ire from developers and planners around Austin. There is strong consensus among developers and

planners that neighborhood groups are the source of what developers and planners see as undesirably-low densities around transit stations.

In addition, neighborhood groups are not seen as representative of any communities which they claim to represent, being seen by many as dominated by older and wealthier residents of neighborhoods who are opposed to changes in their neighborhoods. According to planners and developers, this is no noble cause in a city which doubles in population roughly every 20 years, and results in undue burdens of redevelopment in neighborhoods which are not as strongly connected, unified, and with the financial and political means to fight development as the neighborhood groups which dominate voices of the citizenry of Austin. In addition, neighborhood groups are not seen as representative of the neighborhoods which they claim to represent. For example, the Crestview Neighborhood Association has virtually no attendees of its meetings that live in the Crestview TOD, which is home to thousands of residents. Anne-Charlotte Patterson of the Crestview Neighborhood Association recognizes this as an issue and is attempting to more strongly engage younger demographics (who are often more pro-compact development) with CNA's online presence, in search of a CNA that can more accurately claim to represent the population of Crestview. In spite of this, at one CNA meeting patently-inaccurate comments were made to strong agreement in the room such as "Why would anyone actually take transit in Austin. You aren't going to convince me that anyone's out there waiting in the heat!"

Most planners and developers agree that different approaches should be taken with neighborhood outreach. Anne Milne of the City of Austin would like to see planning staff educate citizens on the issues facing their communities and realistic solutions to those issues in lieu of asking people to voice opinions which may not be productive to solving the issues at hand. All interviewees see some criticisms by community associations as valid—such as those of density-created parking woes (to a certain extent)—but also would like TOD opposition to know that there are clear solutions to many of these problems, such as parking permits for residential streets that are bogged by density.

Chapter 8. Value Capture Practice Applicable to TOD in the Texas Triangle

8.1. Value Capture Techniques

Value Capture is defined as the public recovery of a portion of increased property value created as a result of public infrastructure investment. The most common forms of value capture are: Impact Fees, Joint Development, Land Value Taxation, Naming Rights, Negotiating Exactions, Parking Fees, Special Assessment Districts, Sales Tax District, and Tax Increment Financing. Each form of value capture brings strengths and weaknesses for involved entities and provide multiple avenues for conjunction with public and private sectors.

8.1.1 Impact Fees

Definition: Development exactions often require real estate developers to contribute public facilities, infrastructure, or services (financially or in kind i.e. land donation). The term "impact fee" specifically refers to financial exactions that are standardized rather than negotiated. Depending on its purpose, an impact fee may also be referred to as a capacity or facility fee. Regardless of the name, the principle remains the same: a developer pays a local government or authority money for the development of infrastructure and services that will serve the new development. Typically, impact fees are only assessed for residential development, but other municipalities may issue impact fees for other types of development.[73]

Statutory Provision: Impact fees' terms and conditions are defined within a municipal ordinance and are authorized by Chapter 395 of the Texas Local Government Code (Tex. Loc. Gov't Code Ann. § 395, 2011). State Law standardizes and limits impact fee calculation, providing upfront knowledge of the contribution that will be required from the applicant to mitigate impacts from the development.

[73] Mathur, S., & Smith, A. (2014). Transit Impact Fee-Enabling Statutes and Equity Concerns. *Transportation Research Board*.

Conditions for Application/Application Steps: In the state of Texas, impact fees are currently limited to water, sewer, streets, and drainage. State law requires that impact fees be reviewed and updated at least once every five years.[74] For any Texas municipality to implement impact fees, they would require approval by the State legislature before a municipality could sign an impact fee as a bill into law.

Transit Example: As transportation impact fees are illegal in Texas, the Transportation Sustainability Fee (TSF) of San Francisco was examined. Approved in December 2015, the TSF replaces the old Transit Development Impact Fee (TDIF) with one that covers more types of development. New commercial developments, market-rate residential developments with more than 20 units, and certain large institutions are required to pay the TSF.[75] Affordable housing developments, subsidized middle-income housing, market-rate housing with less than 20 units or less and most nonprofit developments are exempt from the fee. A comprehensive schedule of the fee can be found below in *Figure 8.1* (Section 411A: Transportation sustainability fee, 2016).[76]

[74] Monroy, M. (n.d.). Street Impact Fees- Impact Fees in Texas. *City of Austin.*
[75] City and County of San Francisco Planning Department. (2015). Transportation Sustainability Fee- Fact Sheet. *City and County of San Francisco Planning Department.*
[76] City and County of San Francisco Planning Department. (2015). Transportation Sustainability Fee- Fact Sheet. *City and County of San Francisco Planning Department.*

Land-Use Categories	Transportation Sustainability Fee
Residential, 21-99 units	$7.74 for all gross square feet (GSF) of Residential use in the first 99 dwelling units
Residential, all units above 99 units	$8.74 for all gsf of Residential use in all dwelling units at and above the 100th unit
Non-Residential, except Hospitals and Health Services, 800-99,999 gsf	$18.04 for all gsf of Non-Residential uses less than 100,000 gsf
Non-Residential, except Hospitals and Health Services, all gsf above 99,999 gsf	$19.04 for all gsf of Non-Residential use greater than 99,999 gsf
Hospitals	$18.74 per calculation method set forth in Section 411A.4(d)
Health Services, all gsf above 12,000 gsf	$11.00 for all gsf above 12,000 gsf
Production, Distribution and Repair	$7.61 per gsf

Figure 8.1, TSF Schedule, from San Francisco Planning Code

Key Elements: One key element to note is that fees not only vary by use, but also by intensity within each use, ensuring that the fee is directly proportional to the impact a new development would have on current infrastructure and services. Utilizing rulings of the *Nollan v. California Coastal Commission* and *Dolan v. City of Tigard* Supreme Court cases, rough proportionality must exist between the impact of development and the required impact fee. Affordability is also a key concern for San Francisco, with the allowed exclusions for affordable housing developments. Combined with corrected energy models for utility allowances, this could be a huge incentive for developers to consider affordable housing or mixed income development. The

fee schedule was calculated based on market rents; which, while applicable for San Francisco, may not apply to municipalities in Texas with more rapidly fluctuating rents. While this fee, which is projected to add an additional $430 million in revenue over the next 30 years, can be considered a high-performing example, most impact fees are not without problems.[77]

Value Capture Performance: Impact fees call for those benefiting from a public infrastructure or service to pay for it in proportion to the benefit received. Horizontal inequity results if the benefit accrued to a property is less than the fee paid. Thus, if one impact fee is paid for multiple types of development with varying intensities, some property owners will accrue fewer benefits than others in proportion to the fee paid. Impact fees can also cause vertical inequity by increasing the prices of both new and existing housing. As a result, the cost burden of housing as a proportion of household income increases more for lower income. The following strategies can be undertaken to reduce horizontal inequities.[78]

- Do not exempt from paying the fee the properties that benefit from the transit service funded by the impact fee
- Vary the fee amount by land use type so that the fee varies in proportion to the demand exerted by a land use on the transit system
- Vary the fee amount by the intensity of use, for example, by charging the fee on a per square foot of floor area basis or on a per bedroom basis
- Provide credits to projects that contribute to public transportation projects
- Exempt from paying the fee properties that do not affect the transportation system
- Charge impact fees in proportion to the development's marginal impacts on the transit infrastructure
- The following methods can be used to reduce vertical inequities.
- Exempt affordable housing developments from paying the fee
- Exempt smaller properties, such as small offices and commercial Establishments
- Allow fee payment at a reduced rate, in installments as opposed to a lump sum, or at a later stage in the development process.

[77] City and County of San Francisco Planning Department. (2015). Transportation Sustainability Fee- Fact Sheet. *City and County of San Francisco Planning Department.*
[78] Mathur, S., & Smith, A. (2014). Transit Impact Fee-Enabling Statutes and Equity Concerns. *Transportation Research Board*.

8.1.2. Joint Development

Definition: Joint development occurs when a transit agency collaborates with another agency or private developer to develop property that is owned by the transit agency and located near a transit station. The Federal Transit Administration (FTA) has guidelines for joint development that apply to properties acquired with federal funds. Some transit agencies, however, use the term more broadly to refer to any development project undertaken in partnership with a transit agency.[79]

Statutory Provision: A transit agency typically has guidelines for the review and approval of joint development projects. Transit agencies derive their authority to set these guidelines from Chapter 451 of the Texas Transportation Code.[80]

Conditions for Approval: If a transit agency has design standards for Park n Ride or Transit Center Facilities, as Houston's METRORail does, those standards must be followed. If conditions have been attached to an RFP issued, those conditions must be followed as well. After a developer has been selected, additional conditions may be added on to a project proposal.

Application Steps:

1. Marketing and Solicitation- a transit agency will usually put out a Request for Proposals (RFP) to select developers for a specific project. This RFP may also be preceded or accompanied by a Request for Qualifications (RFQ), intended to help narrow down finalists from a long list of developers
2. Evaluation of Solicited Proposals- Developer proposals are evaluated during this time and may be shortlisted. Transit agency leadership also usually interviews developers. While this process differs with transit agency, the result is that either a developer proposal is selected, or no developer proposals are selected. If the latter occurs, the RFP may be re-issued later.
3. Evaluation of Unsolicited Proposals- unsolicited development proposals may also be considered at a transit agency's discretion

[79] Reconnecting America. (n.d.). Featured Topic: Joint Development. *Reconnecting America.*
[80] State of Texas. (2001). Tex. Transp. Code Ann. § 451. *State of Texas.*

4. Preliminary Negotiation Period- Once a development proposal is selected, the official scope of work for the joint development is negotiated between both parties. This may be updated based on changing needs of the transit agency. Once both parties approve the scope of work, the transit agency will issue the developer(s) an official notice to begin work.
5. Exclusive Feasibility Period- This may be required by some transit agencies. Once both parties approve the scope of work, a feasibility study will be performed to ensure that the project is capable of being implemented. If deemed feasible, the joint development project will commence. The scope of work may also be further altered based on the results of the feasibility study[81]

Transit Example: Plaza Saltillo, a mixed-use site adjacent to Plaza Saltillo Station, broke ground in the summer of 2017. It is a joint development project between the Capital Metropolitan Transportation Authority (CapMetro), Endeavor Real Estate Group, and Columbus Realty Partners. This mixed-use TOD contains 800 apartment units with 18% of units for low-income renters, 140,000 square feet of office space, 110,000 square feet of restaurant and retail space, and 1.4 acres of public space. The site also contains a 4-story office building on the west end of the development, with an option to increase the building height to 8 stories if the developers contributed money for neighborhood affordable housing. After the developers agreed earlier this year, the project received rezoning approval to increase the building height to 8 stories. Construction is expected to take place over 30 months, with 2019 targeted for completion.[82]

Key Elements: The project is expected to net CapMetro $19 million during the first 10 years of its 100-year lease.[83] Given its proximity to the Plaza Saltillo rail station, boosted ridership in the future could brand this joint development project an undeniable success. However, many constituents already see the project as a negative venture of Plaza Saltillo. A scathing news

[81] Harris County Metropolitan Transit Authority. (n.d.). Joint Development Guidelines, Policies and Procedures. *Ride Metro.*
[82] Anderson, Will. (2017). Hundreds of Apartments, Office Tower Cleared to Rise Just East of I-35. *Biz Journal.* Retrieved from https://www.bizjournals.com/austin/news/2017/03/03/hundreds-of-apartments-office-tower-cleared-to.html
[83] Widner, C. (2017). Plaza Saltillo Development Finally Underway. *Curbed Austin.*

article indicated that the Endeavor proposal selected "= cookie cutter, Domain-like, highest rents, token minimal affordable housing, Starbucks." An alternative proposal however, had "a much better mix of affordability teamed with the most respected and successful mixed income housing developers in the City, independent local tenants based on the team's longstanding relationships in the community, a culturally vibrant aesthetic and amenities, overwhelming support from the neighborhoods affected and most consistent with well published Cap Metro, community goals and urban planning best practices, and the best way for Cap Metro to gain clout for future TODs in East Austin."[84]

Value Capture Performance: In order for joint development projects to be successful, there must be a clear policy framework in place to guide joint development activities. Strong local government and transit institutional capacity are needed to successfully plan, implement, and manage joint development projects. All parties involved should also strive to ensure that all agreements are equally beneficial to all partners.[85] Based on the example of Plaza Saltillo, answering the following questions might also determine the performance of joint development projects:

- Does it disrupt the community fabric or change community character?
- Does it displace a neighborhood's current residents with increased rents?
- Does it encourage future TODs?
- Does it increase or decrease residential rates of occupancy?

8.1.3. Transit Connection Fees

Definition: Retailers that want to have their stores inside or at transit stations must pay transit connection fees to a transit agency. Typically, these fees are paid through a lease with an annual base rate with an add-on that is usually a certain percentage of sales.

Statutory Provision: There are no state regulations pertaining to leasing of space within transit stations. Likewise, there are no standardized guidelines for determining the cost of transit

[84] Harrington, K. (2014). The Battle for East Austin's Plaza Saltillo. *Building ATX.*
[85] Friedman, P. (2012). Investment Up in the Air: Air Rights and Transit. *Community Transportation Association of America.*

connection fees. Fees are determined through contracts and negotiation between transit agencies, developers, and retailers.

Conditions for Approval: Any contract approved by both parties must be compliant with the health and safety standards of both retailers and transit agencies. Typically, the transit agency oversees compliance

Application Steps: These differ by contract and transit agency, but transit connection fees are usually phased in through a multi-step implementation process, in which different types of restaurants and retailers are gradually allowed space in transit stations.

Transit Examples: While no known examples of transit connection fees exist in Texas, the MARTA of Atlanta and Chicago's MetRail both have used transit connection fees as a value capture strategy over the last decade. Phase 1 of MARTA's retail program, in place since 2010 at almost all stations, consists of vending machines for snacks and beverages. In this phase, MARTA has charged a minimum guaranteed rent plus a percentage of sales. As of 2015, MARTA decided to move into Phase 2, which involves ATMs, carts, kiosks and newsstands offering beverages, food, magazines, newspapers and sundries. Phase 2 will expand food sales but will limit them to pre-prepared items. In both phases 1 and 2, MARTA is insisting that retailers limit prices to no more than 10 percent above storefront retail prices. As of yet, there has been no decision made about Phase 3.

Chicago's MetRail stations have a variety of retailers paying transit connection fees, including food vendors, CVS stores, sit-down restaurants, Starbucks cafes, and bank offices. Most of these offerings, however, pale in comparison to the MetraMarket at the Ogilvie Transportation Center. MetraMarket is two blocks long and includes boutiques, restaurants, shops, neighborhood service outlets and the 30-vendor upscale Chicago French Market. About 115,000 transit commuters walk by the market twice a day, as do up to 10,000 other pedestrians. Forty thousand of those commuters exit and enter the station through the market twice daily. Metra has leased the space at market rates to the master lessee for 90 years; the lease, like those in Atlanta, includes a base

rate and an add-on as a percentage of sales. Annual rents currently received by Metra are in the low seven figures.[86]

Key Elements: While MARTA was initially concerned about the cleanliness of their system when implementing their retail program, the manager of concessions noted that so far there has been no major litter impacts, stating that riders respect the system's cleanliness. By insisting that retailers limit prices to no more than 10 percent above storefront retail prices, MARTA is allowing selected retailers access inside the system, but is not letting those vendors charge a significant premium to account for transit connection fees paid.

The Ogilvie Transportation Center's MetraMarket and other retail offerings demonstrate a creative use of retail, in which shops aren't isolated behind turnstiles, retail space is integrated into the neighborhood, and the MetraMarket itself is an attraction. Holding festivals and Saturday events, MetraMarket brings in a customer base beyond regular commuters. As a result, Bon Appetit Magazine named MetraMarket one of the five best food halls in the country.

Value Capture Performance: Diligence is required in the negotiation process to ensure that transit connection fees remain a viable value capture strategy and yield benefits to those paying them. Retailers and transit authorities should begin by adopting a "gold standard" for litter prevention, which might include trash receptacles, recycling/compost receptacles, regular sidewalk and floor cleaning, and graffiti prevention and removal. Transit authorities should negotiate leases on a triple-net basis, such that their role is limited to receiving checks and overseeing contract compliance. For example, CBRE is responsible for leasing MetRail's open spaces to developers and retailers. As part of a multi-phase implementation process, it might be best to start with vending machines in stations, food trucks and/or carts in lobbies, passageways and parking lots, or with ATMs, kiosks, and pop-up outlets in stations. Any future stations, station renovations, or enlargements and connections should be designed to accommodate retail facilities. If rider traffic or location justify doing so, eminent domain should be used to make station complexes large enough to offer extensive retail offerings (Ibid).

[86] Black, S. (2015). Retail in Transit Stations. *Commercial Real Estate Development Association.*

8.1.4. Lease (or Sale) of Air Rights

Definition: A lease of air rights occurs when the rights to development above a transit station owned by a transit agency are leased to a private developer for a set period of time. Sometimes, development rights can also be leased below infrastructure owned by a transit agency. These rights can also be sold, generating a higher lump sum for a transit agency.

Statutory Provision: Texas Local Government Code (LGC), Chapter 263, Subchapter C, Sec. 263.102 (State of Texas, 1987) states that public agencies may lease air rights of their property. However, Texas state law generally allows individual public agencies to determine their own regulations forbidding or allowing for leasing of air rights. Leases are determined through contracts and negotiation between a transit agency and a private developer. In some occasions, agencies have sold the air rights of their properties in the state of Texas in lieu of a lease.

Conditions for Application: The value of a lease of air rights is often determined by the fair market value of development rights. Any lease must be in coordination with local communities' land-use and transportation plans.

Application Steps: There is no formal procedure for a lease of air rights. Once a lease of air rights is signed, it remains in effect until the lease is completed or broken.

Transit Example: In the 1980s, DART purchased land that originally housed a power plant and railroad yard. Included in the purchase was a 300-foot wide area between the rail station, running parallel to a highway accessing downtown Dallas, and a 400-foot wide area near the platform for which DART leased air rights to a developer. The location eventually became home to a sports and entertainment arena built and managed by Hillwood Development Corporation. The arena was part of a master planned development that also included a planned light-rail station. Additional development for the site included hotel, office, condominium, rental apartments and retail space. The purchase of air rights by the developer was part of an extensive negotiation between DART and the developer for rail right-of-way that DART had acquired to accommodate future expansion of the light-rail system. In 2000, Hillwood – a company owned by Ross Perot, Jr., – offered to purchase 22,000 square feet of air rights for 32 percent of the property land

value. This was part of a package of land acquisitions needed to implement the master planned development. Negotiators settled on a final purchase price based on 55 percent of property value, netting DART approximately $450,000, which was utilized to support system expansion and operations. DART's renovated Victory Station opened up shortly after the completion of the arena.[87]

Key Elements: Funds from the purchase of air rights above Victory Station were solely used for system expansion and operations, but could also have been allocated towards pedestrian walkways, bike paths, or green spaces. In Virginia, VDOT has allocated income from its leasing of air rights above the East Falls Church and Rosslyn Metro Stations to infrastructure improvements.[88]

Often, the leasing or sale of air rights increases economic development in an area and increases transit ridership as a result of dense construction that offers a seamless connection to transit stations. In this way, air rights leasing can often be a win-win for all parties involved, generating positive externalities for many. DART's success in negotiating a highly-profitable sale of air rights has been attributed to the foresight of acquiring the property for future rail service expansion when it initially came on to the market. One element that should be noted is that DART retained the rail right-of-way needed for future expansion when negotiating the sale of air rights at this location.

Value Capture Performance: Projects in which leases or sales of air rights occur are susceptible to fluctuations of the real estate market. As a result, this value capture technique is most useful in communities and neighborhoods with strong real estate markets. Common real estate market risks can be reduced through the arrangement of a one-time, lump-sum payment rather than a conventional lease agreement. Zoning restrictions, configurations that may impact

[87] Friedman, P. (2012). Investment Up in the Air: Air Rights and Transit. *Community Transportation Association of America.*
[88] Beydoun, S. (2016). Air Rights Project: Utilizing Air Space Above Transportation Facilities. *Fairfax County Government.*

access to transit rights of way, and impacts on existing open spaces and structures, may also affect the size of land, and price of a purchase or lease.[89]

8.1.5. Transfer of Development Rights

Definition: Transfer of development rights is "a voluntary, incentive-based program that allows landowners to sell development rights from their land to a developer or other interested party who then can use these rights to increase the density of development at another designated location."[90] An easement is then placed on the property to prevent further development.[91] It is often used for conservation or to allow for denser development where it would not normally be allowed.

Statutory Provision: Codes which support the transfer of development rights are the exclusive domain of city governments. Many cities, large and small, have enacted regulations in support of the practice. For example, San Marcos supports the process, especially when it supports protection of the Edwards Aquifer.[92] In addition, the Land Development Code of the City of Austin has specific provisions allowing the transfer of development rights. Article 11 of the code aims to protect critical water quality, minimize transfers within watersheds, and allow parkland dedication via a transfer of development rights.[93] The Austin transfer of development rights program encourages the purchase of rights from historic districts or districts of high value, like the Warehouse District, to allow for denser development in other parts of the city.[94]

Austin also allows ad hoc transfers of development rights to allow for development that would normally be forbidden, including the transfer of impervious cover rights to an AISD school, Bowie High School, to allow its expansion.[95]

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[89] Friedman, P. (2012). Investment Up in the Air: Air Rights and Transit. *Community Transportation Association of America.*
[90] Center for Land Use Education. (2005). Planning Implementation Tools Transfer of Development Rights (TDR). *University of Wisconsin Stevens Point.*
[91] Ibid.
[92] Smart Preservation. (2018). San Marcos, Texas. *Smart Preservation.*
[93] City of Austin. (2017). Municipal Codes. *City of Austin Municipal Codes.*
[94] ROMA Design Group, HR & A Advisors, Studio 8 Architects, and Limbacher Godfrey Architects. (2009). Downtown Austin Plan Phase One Downtown Density Bonus Program. *City of Austin.*
[95] Clifton, Jo. (2017). Council OKs Bowie Impervious Cover Swap. *Austin Monitor.*

Conditions for Applications: Transfer of development rights (TDR) is best for when the current land use and development rights in an area planned to become TOD are not well suited to TOD, either because density or land use diversity is not adequate. The finances required for TDR come exclusively from developers, allowing public money to be spent elsewhere.[96]

Application Steps:

1) Have a local TDR program that can solve issues with tax-base transfer from one municipality to another if necessary and can determine appropriate standards.[97] Sometimes this involves a TDR bank.[98]
2) Finds a zone that would be willing to transfer development rights for the sake of its own preservation.
3) Generally, take ownership of a property that requires different development rights.
4) Determine specific benefits of the transfer of development rights, such as additional units per acre that can be built with new rights.[99]
5) File a restrictive covenant on donor property.[100]
6) Occasionally, adjudicate transfer with the city council, which may require approval for a given agreement.[101]

Transit Example: There are many examples of transfers of development rights in Austin for non-TOD purposes, such as the aforementioned transfer of rights to Bowie High School. While no cases are known of Austin using transferred development rights in a TOD, this technique certainly could be applied in the TOD context.

Outside of the Texas Triangle, a notable case of a TOD district using transferred development rights is found in King County, Washington, where the Department of Transportation utilizes a TDR bank. Employing funds allocated by the King County Council for several decades, the bank

[96] Center for Land Use Education. (2005). Planning Implementation Tools Transfer of Development Rights (TDR). *University of Wisconsin Stevens Point.*
[97] Ibid.
[98] Smart Growth America. (2008). Transfer of Development Rights: Property Primer. *Smart Growth America.*
[99] Center for Land Use Education. (2005). Planning Implementation Tools Transfer of Development Rights (TDR). *University of Wisconsin Stevens Point.*
[100] City of Austin. (2017). Municipal Codes. *City of Austin Municipal Codes.*
[101] Clifton, Jo. (2017). Council OKs Bowie Impervious Cover Swap. *Austin Monitor.*

fosters purchases of development rights of rural lands and redirect these development rights to areas that can grow. Eventually, this service evolved into an online bank where buyers and sellers advertise their interests. Often, sellers of development rights utilize conservation easements on their land when sales are finalized.[102]

The King County TDR program has been very successful. More than 141,500 acres of rural/resource land have been protected through this program.[103] The program averages seven transactions and 150 rights transferred per year, becoming the most successful TDR program in the country.[104] In 2013, as Seattle braced for its introduction of rail, this program was shifted to allow for TOD at new station areas. It was hypothesized that revenues from the TDR sales "will fund a $16 million effort to improve transit, pedestrian and bicycling facilities in downtown Seattle's receiving areas"[105]

Value Capture Performance: With a growth in regional lands protected from development, enthusiasm from developers and planners, and substantial revenue generation for infrastructure improvements in areas now supporting compact development, transfers of development rights have the potential to be successful value capture mechanisms for jurisdictions that have both growing areas and areas in need of protection from growth.

8.1.6. Negotiated Exactions

Definition: Negotiated exactions are similar to impact fees in that they are imposed to offset public agencies' financial burdens as a result of new development. Negotiated exactions yield more specific results, however, and are often more explicitly linked to new development. These exactions are generally direct payments for a capital improvement project (such as a transit station), or, more commonly, donations in the form of land (that may be used to build a transit station, park, school, or better streets).[106]

[102] Smart Growth America. (2008). Transfer of Development Rights: Property Primer. *Smart Growth America.*
[103] King County. (2016). Transfer of Development Rights in King County, Washington. *King County.*
[104] Nelson, Arthur C., Rick Pruetz, and Doug Woodruff. (2013). The TDR Handbook: Designing and Implementing Transfer of Development Rights Programs. *Island Press.*160, 161.
[105] Smart Growth America. (2008). Transfer of Development Rights: Property Primer. *Smart Growth America.*
[106] Paterson, Robert, Susan Handy, Kara Kockelman, Chandra Bhat, Jumin Song, Jayanthi Rajamani, Juchul Jung, Kari Banta, Urvi Desai and John Waleski. (2003). Techniques for Mitigating Urban Sprawl. *FHWA, TXDOT.* 147.

Any negotiated exactions must meet two legal precedents: First, there must exist a relationship (nexus) between the exaction requested and the needs to government service provision created by the development. Second, an "appropriate proportionality" must exist between the exaction and the impact imposed by the development. The requirement for a nexus to exist can be a limiting factor for a public agency if the exaction may be seen as excessive.

Statutory Provision: There are no specific state statutory guidelines for negotiating exactions in Texas. However, many cities have enacted their own codes for impact fees and their administration. All exactions in the United States must adhere to rules set forth by the United States Supreme Court in *Nollan v. California Coastal Commission*, which required an "essential nexus" between the exaction and property development.[107]

Conditions for Applications: Decisions for exactions must be determined on a strictly case-by-case basis. The negotiating process is dependent on the specific project, and as a result is highly political. Each process is different, and as a result generalizations of "ideal" conditions for negotiated exactions can be fraught with errors.

Application Steps:

1. A developer requires approval for a project that lies outside of existing zoning regulations. Or, a developer sees value in dedicating part of their property to a public agency for its investment, such as dedication of land to a transit authority to build a transit station. The developer submits an offer for an exaction *or* the planning agency that oversees the project's approval submits an offer to execute an exaction.
2. The relevant public agency examines its needs and desires in relation to the developer's offer and asks for exaction in the form of land or paying for the public facility or improvement, often offering something like a rezoning and refusing to allow it without the exaction.
3. Developer agrees.
4. Developer develops or dedicates exaction.

[107] Welch, Terrence. (2007). Rough Proportionality: Who Pays for Infrastructure? *Texas City Attorneys Association*.

5. Sometimes management or maintenance is transferred to the public sector after construction.

Transit Example: There are several examples of exactions used for public transit, although no examples are known of this type of exaction in Texas. A capital-based exaction for public transit occurred at Potomac Yard in Alexandria, VA. In 2010, a developer, hoping for a rezoning to build a mixed-use project centered around a shopping center, agreed to pay $10 per square foot to fund a planned Washington Metropolitan Area Transit Authority (WMATA) station that was intended to serve Potomac Yard. This exaction totaled $49 million.[108][109]

The Potomac Yard project is under construction, and WMATA is procuring land for its rail line.[110] This project required tremendous collaboration on the part of the developers as well as several public agencies, including the City of Alexandria, the Federal Transit Administration (FTA), WMATA, and the National Park Service.[111]

Value Capture Performance: Negotiated exactions show tremendous potential for TOD, especially as they pertain to land donations to transit authorities. At a large site, the donation of land for a rapid transit station can prove a boon both for the developer of the property and the transit authority, if the density of the project is high enough to provide a significant base of ridership.

8.1.7. Special Assessment / "Public Improvement" Districts

Definition: Special assessment districts—in Texas known as public improvement districts (PIDs)[112]—are a system of taxing properties for a benefit received as a result of public investment. Unlike TIFs, public improvement districts add property taxes in addition to standard tax collection rates, in lieu of the taking of an increment of the standard tax rates, as with a TIF.

[108] Federal Highway Administration (FHWA). (2012). Project Profile: Potomac Yard Metrorail Station. *Federal Highway Administration.*
[109] City of Alexandria. (2017). Potomac Yard Metrorail Station Planning. *City of Alexandria.*
[110] Ibid.
[111] Ibid.
[112] Schneider, Joachim. (2012). Public Private Partnership for Urban Rail Transit. *Springer Science and Business Media*. 312.

This assessment district must be significantly "special", though, clearly seeing a substantial and unique rise in value resulting from the public investment. These districts are established for a defined period of time. Public improvement districts can be established around rapid transit stations or other transportation projects.

Statutory Provision: Public improvement districts find provisions in the Texas Local Government Code (LGC), Chapter 372, Subchapter A, Public Improvement District Assessment Act (State of Texas, 2009). In Austin, public improvement districts of Austin entail public-private partnerships and are not transit-oriented. These districts are the Austin Downtown Public Improvement District, East Sixth Street Public Improvement District, and South Congress Public Improvement District.

Conditions for Applications: PIDs are a property-based value capture method much like tax increment financing (TIF). The Center for Transit-Oriented Development makes an apt comparison of PID and TIF applications: "[Public improvement districts] are likely to be more politically sensitive [than tax increment financing], given that the community must agree to raise local taxes, while a TIF diverts future tax revenues to a particular goal, which is often invisible to the general public. [Public improvement] districts are more appropriate when the piece of infrastructure is important to the community, but the future revenue stream is uncertain. Conversely, a TIF is more suitable when there is certainty in the future revenue."[113] Notably, PIDs may not be ideal for areas heavy in residential properties. Not only are residential property owners more likely to be against PIDs, many are also exempt from their resulting tax increases.[114]

An important element to PIDs is that they are intended to fund projects that are beneficial to a finite group of taxable properties. The Center for Transit-Oriented Development notes that "Streetcar systems are particularly well suited to assessment districts, because they are typically located within a single jurisdiction, usually within a single neighborhood such as the downtown."[115]

[113] Center for Transit-Oriented Development. (2008). Capturing the Value of Transit. *Reconnecting America.*
[114] Ibid.
[115] Center for Transit-Oriented Development. (2008). Capturing the Value of Transit. *Reconnecting America.*

Application Steps:

1) Property owners unite and apply for a public improvement district to fund a specific project for their neighborhood[116]
2) Property owners vote on the PID. Sometimes a majority of owners must agree with the PID, while in other cases ¾ of owners must agree to ratify the PID.[117]
3) Agencies seek match funding, for which there is precedent. For example, FTA matched funding for the New York Avenue Metrorail Station in Washington, D.C.[118]
4) The city council approves the PID
5) The city council approves a Service and Assessment Plan and generates an annual budget
6) The city council adopts the public improvement roll annually[119]
7) After a set amount of time, the PID dissolves

Value Capture Performance: PIDs prove successful if revenues generated from increased property taxation meet funding obligations for planned projects or improvements. PIDs can be a challenging prospect for TOD as TOD development generally provides benefits to all along a rapid transit route. However, for projects that offer a neighborhood a clear set of benefits, and for projects that have strong political support, PIDs can be a robust source of revenue.

8.1.8. Sales Tax District

Definition: Sales tax districts are districts which add an increment to standard sales tax rates to fund public projects. Generally, these districts are much larger than PIDs.

Statutory Provision: The Municipal Sales and Use Tax Act, Texas Tax Code § 321.001, regulates sales tax districts in Texas. Districts may tax at a maximum of 8.25 percent, meaning that all local sales taxes may only equal 2 percent.[120] This often results in public agency competition for state-limited sales tax revenue.

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[116] City of Austin Economic Development Department. (2017). Maintenance & Operations Public Improvement Districts. *City of Austin*.
[117] Center for Transit-Oriented Development. (2008). Capturing the Value of Transit. *Reconnecting America.* 22.
[118] Ibid.
[119] City of Austin Economic Development Department. (2017). Maintenance & Operations Public Improvement Districts. *City of Austin*.
[120] Combs, Susan. (2011). Transit Sales and Use Tax. *Texas Comptroller of Public Accounts*.

Conditions for Applications: Sales tax districts are advisable only for districts with significant sales tax potential, generally entailing substantial retail activity. In addition, the district must be taxing below the state-imposed maximum of 8.25 percent, or public agencies already receiving a portion of that revenue must be willing to negotiate with the agency that desires a part of the sales tax revenue.

Application Steps

1) A new sales tax district (or a new increment in an existing sales tax district) is suggested by a public entity, such as a county commissioner
2) Occasionally, a referendum is required to pass the sales tax district
3) Most sales tax districts have expiration dates, meaning that the district must be re-adjudicated at a later date if successful

Transit Example: While Texas employs many sales tax districts, it has not employed a sales tax district exclusively for the benefit of public transit infrastructure. In Missouri, Kansas City implemented a sales tax district to fund capital expenses, operating expenses, and maintenance expenses of a downtown streetcar system.[121] The sales tax generated in this district for the streetcar's benefit is 1%.[122] Notably, sales taxes in this district have increased far more quickly than sales taxes around the city, suggesting that retail has flourished, possibly in part due to the streetcar's resultant increase in development in downtown Kansas City. Sales tax income grew 58% in the sales tax district between 2016 and 2018, while it grew 18% elsewhere in the city.

[121] KC Streetcar. (2017). Significant Sales Tax Growth in Downtown TDD. *KCATA.*
[122] Ibid.

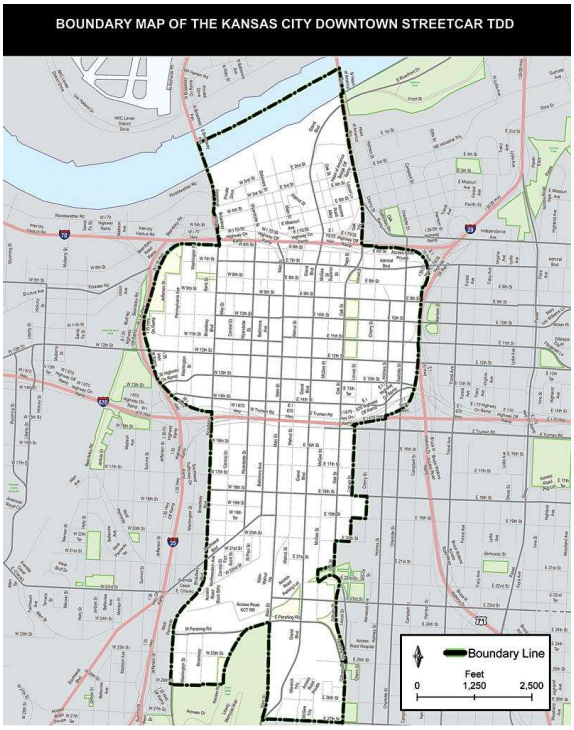


Figure 8.2 KC Streetcar District Boundaries

Value Capture Performance: Sales tax districts prove successful in areas with strong retail performance in which a moderate increase in sales tax rates may not affect sales rates. In addition, areas with an increasing retail tax base may be well-suited for a sales tax district. However, it must be noted that brick-and-mortar retail in the United States is undoubtably in poor health at the moment, and a sales tax district may not be the most stable income generator as a result.

8.1.9. Tax Increment Reinvestment Zones (TIRZ)

Definition: Tax increment reinvestment zones (TIRZs) are areas created by a municipality to bring development that would otherwise not occur to a given area. TIRZs use tax increment financing to set aside future tax revenue increases (an "increment") over the amount tax revenue generated at the onset of the TIRZ. The increment is then used to promote new projects and public improvements within the confines of the reinvestment zone. To generate TIF revenues, Texas municipalities must either create a tax increment reinvestment zone (TIRZ) or a transportation reinvestment zone (TRZ), discussed later.

Statutory Provision: The statutory provision for TIF's are located in the Texas Tax Code, Title 3. Local Taxation Subtitle B. Special Property Tax Provisions Chapter 311, the Tax Increment Financing Act. Because TIFs in Texas are executed using a refinancing zone, the statute for TIRZs also apply to this section. A municipality can create a TIRZ pursuant to Ch. 311, Texas Tax Code. A county does not have the ability to withhold TIRZ revenues of their own volition. However, they can participate in a municipality's TIRZ.

Conditions for Applications:[123]

- The zone is substantially arresting or impairing the sound growth of the municipality or county creating the zone, retarding the provision of housing accommodations, or constituting an economic or social liability, menacing to the public health, safety, morals, or welfare in its present condition and use because of the presence of:
    - "a substantial number of substandard, slum, deteriorated, or deteriorating structures;
    - the predominance of defective or inadequate sidewalk or street layout;
    - faulty lot layout in relation to size, adequacy, accessibility, or usefulness;
    - unsanitary or unsafe conditions;
    - the deterioration of site or other improvements;
    - tax or special assessment delinquency exceeding the fair value of the land;
    - defective or unusual conditions of title;
    - conditions that endanger life or property by fire or other cause; or
    - structures, other than single-family residential structures, less than 10 percent of the square footage of which has been used for commercial, industrial, or residential purposes during the preceding 12 years, if the municipality has a population of 100,000 or more."

[123] City of Houston. (2017). Tax Increment Reinvestment Zones (TIRZ). *City of Houston.*

Application Steps:

1) Municipalities can decide to create a TIRZ if the zone is less than 10% residential, otherwise owners of 50% of the appraised value of the zone can create a petition to request a TIRZ from a municipality.
2) The municipality must decide the lifespan of the TIRZ, noting lost revenues for general obligations throughout the lifetime of the TIRZ
3) All tax collecting bodies note the present assessed values within the TIRZ boundaries. This is to make sure that all increases in revenues above the frozen rate will return to the municipality, allowing for the eventual payment for the public improvement project.
4) A municipality will create a formal zone for the TIRZ. A budget for the TIRZ, suitable for its lifetime, will be created determining the project financing potential.
5) Public agencies will hold a public hearing, giving the public the opportunity to discuss the purpose of the TIRZ and how their tax revenues will be used. Often, this also entails a discussion of the fact that no tax increases within the zone will occur as a result of the TIRZ.

Transit Example in Texas: The Deep Ellum TIRZ District in Dallas has provided significant funding for Deep Ellum's transit connections. Established in 2005, the TIRZ has allowed for "the transformation of the Deep Ellum area into a more diversified, pedestrian friendly, mixed-use neighborhood in the area and improve the urban fabric and connections between Central Expressway and Fair Park."[124] The creation of this TIRZ was to promote the expansion of the DART light rail line, creating a desirable destination for people East of Downtown Dallas.

Key Elements of the Example: Major anchor points for the Deep Ellum TIRZ are lifespan, size, participating jurisdictions, and project summary. The Deep Ellum TIRZ has a lifespan of 22 years, starting in 2005 and ending 2027. The 200-acre district is enforced by the City of Dallas and Dallas County.[125]

[124] Dallas Economic Development. (2017). Deep Ellum TIF District. *City of Dallas Office of Economic Development*.
[125] Ibid.

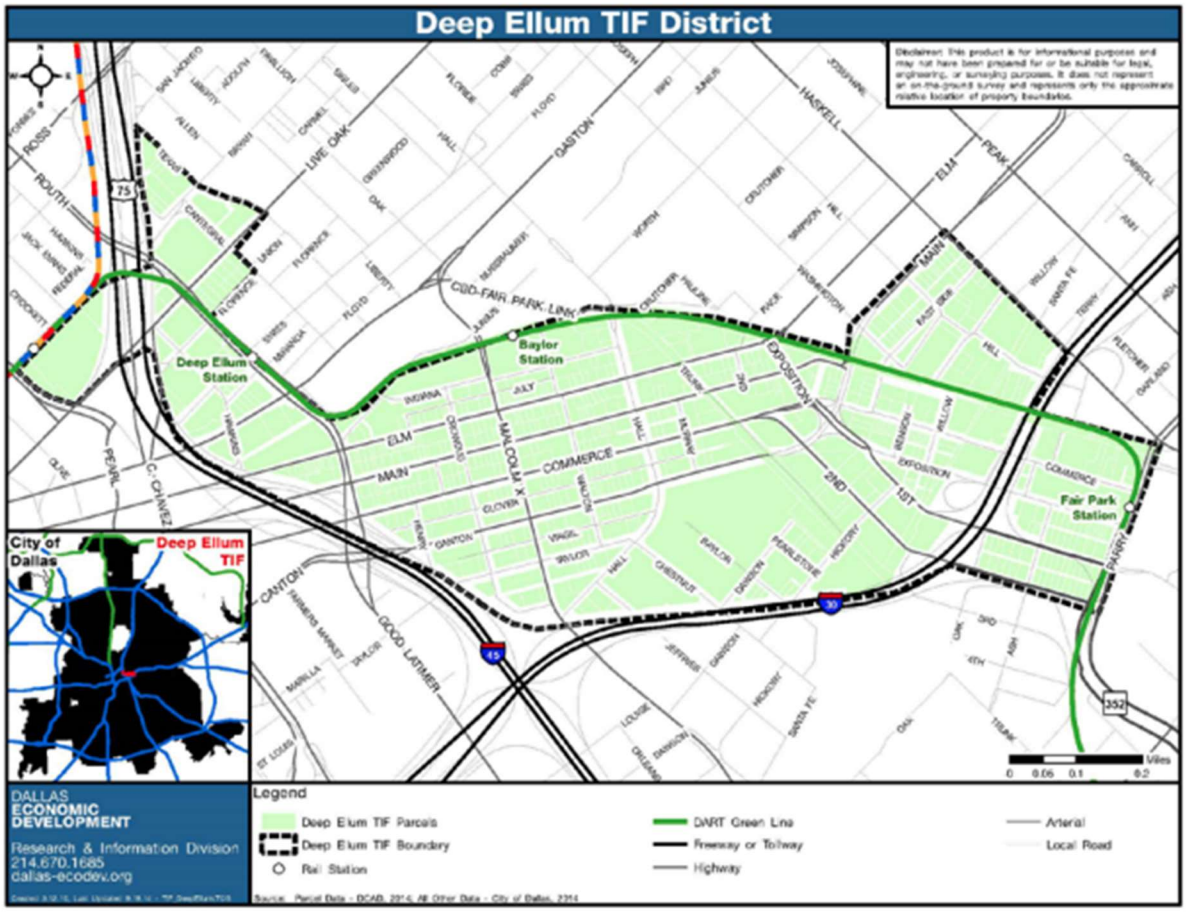
Projects & Potential Projects Within TIF District Utilizing TIF Funding	Units / SF	Approximate Value	TIF Investment
Total	0 res. units; 0 SF retail; 25,116 SF office; 4,040 SF commercial	$79,533,412	$12,587,934
Projects & Potential Projects Within TIF District Not Utilizing TIF Funding	**Units / SF**	**Approximate Value**	**TIF Investment**
Total	761 res. units; 15,000 SF retail; 67,166 SF office	$284,582,528	$0
Total (TIF & Non-TIF)		**$364,115,940**	**$12,587,934**

Figure 8.3. Analysis of Deep Ellum TIF District

Value Capture Performance: TIRZs provide tremendous potential to fund needed capital improvements around transit stations. With flexibility to fund transit routes, station construction, or infrastructure improvement around a station area, which is often necessary to attract TOD development, TIRZs are one of the most useful tools in planners' arsenals to foster TOD.

Financially, the value capture performance of the Deep Ellum TIRZ provides a positive example of a TIRZ's potential. The Deep Ellum TIRZ website states, "To date, in property value increased by $125.9 million within the district, an increase of 66.6% from the base value. This increase of $125.9 million is due to over $82.1 million (65.2%) in new development projects and approximately $43.8 million (34.8%) in property value appreciation."[126]

[126] Dallas Economic Development. (2017). Deep Ellum TIF District. *City of Dallas Office of Economic Development*.



Source: Parcels - DCAD, 2009; Rail - DART, 2009; All Other Data - City of Dallas, 2014

Figure 8.4. Deep Ellum TIF District Map

8.1.10. Transportation Reinvestment Zone (TRZ)

Definition: Transportation reinvestment zones (TRZs) function as a special form of tax increment financing exclusive to the state of Texas. A TRZ forms a designated, contiguous zone around a planned transportation improvement project. Like TIRZs, TRZs use tax increment financing to set aside future tax revenue increases (an "increment") over the amount tax revenue generated at the onset of the TRZ. The increment is then used to promote new projects and public improvements within the confines of the reinvestment zone.

Unlike a TIRZ, though, a TRZ may be used exclusively for transportation-related projects. As a result, TRZs may utilize TxDOT's pass through financing program, unlike TIRZs. Pass-through financing allows communities to seek repayment for investment in state resources. While the

community must fund upfront costs for construction, the state reimburses part of the project costs.[127]

Presently, TRZs can only be utilized to fund highway infrastructure improvements. However, TRZ may be utilized by public transit-related projects in the future. In addition, a municipality may utilize TRZs to fund highway improvements, freeing funds for public transit improvements.

Statutory Provision: SB 1266 allows for the creation of TRZ's. Transportation Code Chapter 222 (amended by SB 1266), permitting municipalities and counties to enter into agreements with TxDOT to establish TRZs and use surplus funds for supporting other transportation projects, which could include on-system transit projects. Furthermore, Code Section 222.105-.111, Texas Legislature- HB 563 expands the TRZ scope to any transportation project with all or some oversight by TxDOT.

Conditions for Applications: A city, county or port authority must make the following determinations in order to set up a zone. The proposed zone must be deemed underdeveloped. The area of the TRZ will 1) promote public safety; 2) facilitate the improvement, development or redevelopment of property; 3) facilitate the movement of traffic; and 4) enhance the local entity's ability to sponsor transportation projects.[128]

Application Steps:

To establish a Transportation Reinvestment Zone:

1. Identify project/needs
2. Define boundaries
3. Hold public hearing
4. Pass the ordinance or order
5. Establish base year for tax collection
6. Determine tax increment through feasibility study for financing portion of project
7. Establish funding mechanism

[127] Texas Department of Transportation (TXDOT). (2018). Pass-Through Financing. *Texas Department of Transportation.*
[128] Texas Department of Transportation. (2017). Transportation Reinvestment Zone. *TXDOT.*

Transit Application in Texas: Transportation reinvestment zones have exclusively been utilized to fund highway projects in Texas, however there may be TRZ opportunities for public transit in the future.

8.2. Transit Impacts on Property Values

While TOD advocates would like to claim that transit always increases property values, researchers have found tremendously mixed results in their pursuit to prove or disprove that claim. Researchers from around the country have examined the question of property value changes examining different radii around stations, different land uses and property characteristics, and different transit technologies. The table below highlights findings of significant literature related to transit impacts on property values in the Texas Triangle.

Author	City	Land Use	Tran-sit	# of Transit Stations	Radius Around Stations	Time Between Station Opened & LU Data	Findings
Lewis & Goodwin (2012)	Houston	Residential	Bus	5	¼ mile	15 to 27 years	Increases in value in low & middle income (for individual model; not for combined); decreases in wealthy neighborhoods.
Pan (2013)	Houston	Residential	Light Rail	16	¼, ½, 1, 2, and 3 miles	3 years	Opening of the light rail does have significant positive impacts on home values within 1 to 3 miles (OLS), negative impact within ¼ mile (OLS and MLR methods).
Pan et al. (2014)	Houston	Residential	Light Rail	16	¼, ½, 1, 2, and 3 miles	6 years	Similar to former Pan study but with 2010 data rather than 2007. Rail has significant positive impacts from 0 to 3 miles around station (MLR method).

Author	City	Land Use	Tran-sit	# of Transit Stations	Radius Around Stations	Time Between Station Opened & LU Data	Findings
Chae (2012)	Dallas	Residential	Light Rail	20	1 mile	2 years before and 2 years after	Significant positive impacts on residential property values in anticipation of & after opening of Green Line. Less impact after.
Nelson et al. (2015)	Dallas	Commercial / Office	Light Rail	60	5 miles	0 to 16 years	The office rent premium around stations gradually decreases but still exists 1.85 miles away.
Campbell (2011)	Houston	Residential	Light Rail	16	1 mile	4 years	Significant inverse relationship between distance to station and % growth values, less significant positive relationship between distance from rail line and % growth values.
Zhang et al. (2017)	Austin	Commercial	Light Rail	9	¼ , ½, ¾ , and 1 mi	5 years	Price effects greater in TOD stations and CBD, price effect increased further away from parks and highway ramps.

Author	City	Land Use	Tran-sit	# of Transit Stations	Radius Around Stations	Time Between Station Opened & LU Data	Findings
Weinstein Clower (1999)	Dallas	Residential, Commercial, Office, Industrial, Vacant	Light Rail	15	¼ mi	2 years before and 2 years after	Greater increase in DART-proximate average property values for retail/office/residential between 1994-1998 than control group, overall increase in all properties compared to control group
Weinstein Clower (2002)	Dallas	Residential, Commercial, Office, Industrial, Vacant	Light Rail	23	¼ mi	6 years	Greater increase in DART-proximate median property values for office, residential, and vacant properties compared to control group between 1997-2001
Carroll et al. (2017)	Dallas	Residential, Commercial, Office, Industrial, Vacant	Light Rail	56	¼ mi	18-19 years	Summarized previous studies from Weinstein and Clower, total property value around DART stations summed to $10.8 billion between 1999-2015

Most researchers concluded that only factoring proximity to the rail station was insufficient. Campbell used the 'distance to the station' independent variable to represent accessibility, and the 'distance to the line' independent variable to represent nuisance qualities. Zhang et. al identified several other factors, in addition to nuisance creation, that might have either a positive or negative impact on property values outside of rail station proximity. Thus, distance to the Austin CBD, proximity with a ½ mile buffer of highway ramps and MetroRapid BRT stations, and distance to parks were also examined. In addition, Zhang et. al ran separate models to factor in whether stations were designated as TOD stations or within the Austin CBD. The B coefficient of the distance to rail line variable indicated a positive relationship with both % of land value growth and % of total property value growth in Campbell's study. This meant that properties in closer proximity to the rail line had less growth in land value and total property value between 2004 and 2010 than did properties further away from the rail line; thereby confirming the presence of a nuisance effect. However, the p value for distance to rail line in the percent of land value growth regression model indicates a statistically insignificant relationship at the 95% confidence interval. However, this does not happen for the percent of total property value growth regression model. Were the % land value growth regression model to have a statistically significant relationship for distance to rail line, one might be able to conclude that the added value of physical improvements to properties could offset the nuisance effect to some degree. Zhang et. al found higher price effects with properties in the CBD and in proximity to TOD stations than in non-TOD and non-CBD areas, partially attributable to heterogeneous station contexts such as land-use factors or walkability.

Statistically significant relationships were also found with the aforementioned control variables. Proximity to BRT stations was shown to have a strong price effect on commercial properties, paving the way for future impact studies on the MetroRapid lines. Proximity to highway ramps confirmed the presence of a nuisance effect, while distance from parks was shown to have a positive relationship with land values, as businesses often prefer to locate further away from parks in denser areas.

Besides the market valuation for 2007 and distance from transit, the Lewis and Goodwin study (2012) also included the market valuation for 1985 as a variable to capture qualities like

neighborhood, landscaping, and house condition, and for a value starting point. It also included distance from the downtown core, presence of other structures on property, and value per property improvements by 1,000 square feet. The literature also explains why variables were not included in the analysis. For example, school districts in Houston matter less because of how extensive the magnet school system is, so Lewis and Goodwin excluded it (2012). Pan (2013) used U.S. Census data and other sources for home size, home age, access to bus stops, population density, employment, distance to the Central Business District, and distance to the medical center. Access to bus stop is ¼ mile. Likewise, Pan et al. (2014) included all of those variables and also distance from access to highway intersections, income, and minority population. Chae (2012) chose to group additional variables as structural (age, size, number of bathrooms, number of bedrooms) or neighborhood (median household value and income, white population percentages, and percentage 65 years and older). Nelson et al. (2015) included variables of size, Floor Area Ratio (FAR), stories, vacancy rate, year built, median household tract income, percent non-Hispanic white, a predetermined compactness index identifying urban form, and again, distance to CBD and highway interchange.

In the Lewis and Goodwin (2015) study, all independent variables were significant besides housing values 0 to 0.25 miles from transit for the combined model. The strongest indicator was value of property improvements by 1,000 square feet for the combined model and that plus other structures on property for the individual assessments. In Pan (2013) and Pan et al. (2014) studies, results were as expected with home size and age among the strongest indicators. The later study showed home size increasing by 1,000 square feet accompanies a 23.3% increase in value and aging by a year decreases value by 0.9% (Pan et al., 2014). Bus stops are believed to have a negative effect on property values in Houston as revealed by both methods in the 2007 study and the MLR model in the 2010 study (Pan et al., 2014). From both methods in 2007 and 2010, it is generally understood that the Texas Medical Center had significant positive effects on property values, but the Central Business District may have significant negative impacts or insignificant results depending on the method. Job and population density also have positive impacts (Pan, 2013; Pan et al., 2014). Interestingly, highway intersections have no impact on property values within 1 mile, but significant positive impact from 1 to 2 miles away. Similar to previous studies, housing age is a strong negative indicator, housing size is a strong positive indicator, and other

desirable structural attributes have strong expected impacts on residential property values and office rent in Dallas (Chae, 2012; Nelson et al., 2015).

In summary, proximity to transit stations tends to impact property values positively, but typically home size, age, and structural variables are stronger indicators. Job density and population density tend to be significantly positive indicators, while close proximity to bus stops and very close proximity to highways can be negative with a nuisance effect. Different cities' employment centers may have different effects on property values--with jobs sectors and diseconomies of scale playing roles.

Chapter 9. Conclusion and Recommendations

The Texas Triangle megaregion is rife with new rapid transit infrastructure investment. New systems—both rail-based and rubber-tire based—were constructed both to offer a needed alternative to personal vehicles and to guide regional development around the Triangle's booming core cities—Austin, Dallas, Houston, and San Antonio.

Unfortunately, many of these infrastructure investments remain underutilized, as evidenced both by often-low ridership figures and by significant underdevelopment around many of the megaregion's 181 rapid transit stations. Better transit-oriented development (TOD) based on national best practices is needed around the megaregion both to drive citizens out of their personal vehicles and guide development in compact, efficient, and sustainable manners. As many states and regional governmental agencies around the country have realized, higher levels of governance have a key role in generating integrated, successful TOD within their jurisdiction—especially important in growing TOD beyond individual sites at transit stations and into networks of TOD throughout a region.

Most Texas Triangle planning agencies—at the state, regional, and local level—agree that TOD would benefit their communities, but less than 1⁄4 report having even adopted a definition for TOD. Generally, surveyed and interviewed public agency planners in the Texas Triangle wish their jurisdictions were better equipped to implement TOD. Surveyed and interviewed developers and planners agree that demand often exists to construct around rapid transit investments, but both parties agree that TOD plans for station areas need to be better suited to market conditions for progress to boom—generally entailing significantly higher density than is allowed now, as well as abilities for developers to be flexible with their development.

Of all identified issues plaguing TOD progress in the Texas Triangle, the most pressing is the lack of funding for capital projects related to transit infrastructure and infrastructure more generally that surrounds transit stations. 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.

State and regional planning agencies hold the key to disseminating best practices for all of these areas of issue—with rapid transit technologies, land use strategies, value capture mechanisms, and more—and would likely see great success in generating TOD guidelines for their large-scale jurisdictions. These guidelines should be generic enough to apply to a breadth of station typologies suited to local interests, but specific enough to provide guidance to relevant local agencies. In addition, state and regional agencies can deliberately utilize funds in manners that are clearly supportive of TOD development. Regional smart growth maps that utilize the principles of TOD networks, often published by regional planning agencies, are an excellent start in disseminating how funds will be utilized, and where planners and developers from around the region should concentrate their interests.

With an increase in quality partnerships, valuable TOD-specific development codes, and improvements in demonstrated state and regional investment, the case of TOD in the Texas Triangle megaregion is a case of tremendous and yet-unrealized potential.

Appendix A: Texans and the Very Fancy City Bus: An Analysis of Potential and Actual Ridership of U.S. BRT-Lite Systems

Summary

Several midsized Texas cities are placing their bets on BRT-lite systems—but are Texans leaving their cars (and transit *démodé)* to ride on city buses which happen to have some characteristics of BRT systems? An analysis was performed of all BRT-lite systems in the Continental United States for which data was publicly available. It was found that while Texans in midsized cities are as likely to utilize transit as citizens of similar cities in other states, they are far less likely to use their BRT-lite systems than those of other states. This may be because Texas BRT-lite systems are overly saturated with residences surrounding their stops and lacking in access to destinations (employment, retail, etc.). Alternatively, it also may be because the denser areas of these Texas cities where BRT-lite has been placed do not have transit-dependent populations.

1. Introduction

In the 2000s, American cities began adopting Bus Rapid Transit (BRT) systems, especially popular among midsized cities without significant rail networks. Transit operators generally promised bus systems that would be cost-effective alternatives to light rail with many similar operating characteristics. However, several of these systems never achieved full "BRT" status. Best practices highlight several "basics"[129] of BRT systems[130]:

- **Dedicated Rights-of-Way**
  - Buses flow independently of congestion caused by other road users
- **Busway Alignment**
  - Buses travel in the center of the roadway or in bus-only corridors
- **Off-Board Fare Collection**
  - Allowing for quick, all-door boarding

[129] Institute for Transportation & Development Policy. (2017). The BRT Standard. *Institute for Transportation & Development Policy.*

[130] Adapted from the ITDP publication of "BRT Basics" to include an element regarding frequency of service and additional descriptions of the elements, all based upon the ITDP's own BRT Scorecard.

- **Intersection Treatments**
    - Bus priority at intersections
- **Platform-Level Boarding**
    - At-level boarding allows for quicker and more accessible boarding at each station
- **High Frequency**
    - At least 4 buses per hour at all times of the day

1.1 BRT-Lite System Characteristics

Of BRT systems in the United States, there are generally two types. First, there are systems faithful to the original definition of BRT. Second, there are systems with some key BRT characteristics that may be considered BRT-lite. Some cities, recognizing that they may benefit from true BRT implementation in the future, have redacted their self-imposed classifications as BRT-lite, instead referring to these systems as "express buses". However, all of the studied systems have at some point been called "BRT".

All BRT-Lite systems share the following characteristics[131]:

- **Some Dedicated Rights-of-Way**
    - Transit lanes at select points along the route
- **Options for Off-Board Fare Collection**
    - All-door entry allowed for prepaid customers, but cash is still accepted at the front of the bus
- **Intersection Treatments**
    - Buses communicate with signals to allow for occasional extended green signals and may have some transit priority signals along routes
- **Branded and Significant Bus Stop Infrastructure**
    - Shelter and real-time departure information at recognizable bus stops
- **High On-Peak Frequency**
    - At least 4 buses per hour on-peak, and service at some level 7 days per week

[131] Based upon research findings of this project.

1.2. BRT-Lite Systems in Texas

Several midsized cities in Texas have placed their bets on BRT-lite, converting or augmenting their most significant transit lines with branded BRT-lite systems.

The first city to complete its system was San Antonio with its VIA Primo service, commenced with Route 100, which remains the only bus with BRT characteristics in San Antonio. With service beginning in 2012, the route connects the South Texas Medical Center—one of San Antonio's most significant employment centers—to Downtown San Antonio. VIA Primo is notable as having the most extensive station infrastructure of any BRT-lite system in Texas.

In 2014, Austin's CapMetro introduced its BRT-lite system, which now has two routes—the MetroRapid 801 and MetroRapid 803. The combination of these two routes forms Texas's most significant BRT-lite system by a significant margin. The MetroRapid 801 runs from the south of Austin to the north along a spine of activity, while the MetroRapid 803 runs from the southwest of the city to The Domain, a major hub of activity in the northwest.

El Paso introduced its BRT-lite system – the Sun Metro Brio – in 2014 as well. While the Brio network only contains one corridor—its original "Mesa Corridor" which runs from downtown for 8.6 miles to the city's west side, the system is notable for being the most invested in branding and a unique ridership experience. The system has always had named 4 corridors planned, and 2 more corridors are currently under construction.

This study examines whether or not these systems live up to their potential when compared to other BRT-lite systems of the Continental United States.

2. Related Studies

2.1 *Direct Ridership Model of Bus Rapid Transit in Los Angeles County*

The first related study forms the root of this research. Robert Cervero, with *Direct Ridership Model of Bus Rapid Transit in Los Angeles County* (June 2009), sets forth to estimate station- and corridor-specific ridership utilizing a variety of functions.[132] Cervero argues that direct models—which utilize station-specific or corridor-specific data to generate ridership estimates—are both easier to accomplish and more accurate than the utilization of mode choice results of large scale surveys. While research preceding this study had been completed on many modes of transit around the country and world, this was the first research examining bus rapid transit through this lens.

Cervero examined a wide variety of attributes of specific stations around Los Angeles BRT and BRT-lite systems in search of an appropriate model. The first variables were BRT service attributes, such as frequency of vehicles, presence of dedicated lanes, and number of perpendicular transit options. Second, Cervero examined ½ mile buffers around stations to examine location and neighborhood attributes. The attributes examined included densities of population and employment, as well as street connectivity. Finally, Cervero examined bus stop attributes, which included elements such as parking presence at the station, number of benches, etc.

Cervero found that the best predictors for BRT ridership were the following:

1. Service intensity
2. Level of intermodal connectivity
3. Surrounding population densities
4. Surrounding employment density *only* in presence of exclusive BRT lanes

For this research on BRT-lite systems, service intensity was held constant—roughly 4 buses per hour, with service 7 days per week. No BRT-lite systems utilize exclusive BRT lanes apart from

[132] Cervero, R., Murakami, J., & Miller, M. A. (2009). Direct Ridership Model of Bus Rapid Transit in Los Angeles County. *Transportation Research Record.*

occasional transit lanes in central business districts or other congested areas of their routes. As a result, employment density would not be a valid indicator for this research, according to Cervero. Intermodal connectivity is an untested element of these systems, however, and it would be interesting to examine further. Generally, BRT-lite systems in midsized cities are not augmenting significant rail lines or other significant perpendicular infrastructure, although some systems examined may have those characteristics.

Cervero's findings indicate that the most significant indicator that could be used to compare similarly-operating BRT-lite systems across state lines is population density at ½ mile buffers around stations, validating this research's approach to comparing BRT-lite systems across state lines.

2.2. *Bus Rapid Transit (BRT): An Efficient and Competitive Mode of Public Transport*

With Cervero's 2013 work, *Bus Rapid Transit (BRT): An Efficient and Competitive Mode of Public Transport*, the breadth of options available in implementing BRT is discussed.[133] BRT-lite characteristics are discussed and defined, as are characteristics of the highest-performing BRT systems.

Cervero discusses the value of low-quality BRT systems but reiterates the importance of dedicated rights-of-way. An ideal BRT-lite system, according to Cervero, serves lower-density suburban areas that cannot support rail systems. The value of BRT-lite, according to Cervero, is that it can transition from designated rights-of-way downtown and in urban areas to operating as a feeder service in areas where those designated rights-of-way are infeasible or not valuable. Despite this, Cervero does not define BRT-lite systems as requiring designated rights-of-way. According to Cervero, the following are differentiators between "full-service BRT" and BRT-lite:

[133] Cervero, R. (2013), Bus Rapid Transit (BRT): An Efficient and Competitive Mode of Public Transport. *Berkeley Institute of Urban and Regional Development.*

	High-End BRT/ Full-Service	Low-End BRT/ BRT "Lite"/ Moderate-Service
Running Ways	Exclusive Transit-ways; Dedicated Bus Lanes; Some grade separation	Mixed Traffic
Stations/Stops	Enhance Shelters to large temperature-controlled transit centers	Stops, sometimes with shelter, seating, lighting, and passenger information
Service Design	Frequent services; integrated local and express services; timed transfers	More traditional service designs
Fare Collection	Off-vehicle collection; smart cards; multi-door loading	More traditional fare media
Technology	Automated Vehicle Location (AVL); passenger information systems; traffic signal preferences; vehicle docking/guidance systems	More limited technological applications

Table 2.1. – Differences Between BRT Systems

While this research proved valuable in defining BRT-lite as seen in the United States, it was very clear that BRT-lite systems in the United States have a higher minimum quality than BRT-lite systems around the world. In researching all BRT-lite systems in the United States, it was clear that the vast majority have, for example, high-quality shelters and unique branding, even if those aren't necessarily present in BRT-lite systems around the world. Discussion of BRT-lite characteristics ("Introduction") are of the higher-level minimums as seen in United States BRT-lite systems.

3. Study Method

As was discussed in the Cervero reading on direct ridership modeling, the most apt indicator of estimated ridership of BRT is population density in a ½ mile buffer around BRT stations. Therefore, to evaluate ridership of Texas BRT-lite systems, there was a three-step process:

1. Identify all BRT-lite systems in the United States and attain stop and ridership information for both the BRT network and the transit network as a whole
2. Utilize buffers in TransCAD to attain demographics within ½ mile buffers of BRT stations

3. Utilize buffers in TransCAD to attain demographics within 1 mile of all transit stops in the transit agency's area
4. Compare population over ridership for all BRT networks and all transit networks

The first step was to identify all BRT-lite systems in operation in the Continental United States. This list only includes systems which are primarily intracity systems, as the characteristics for intercity, primarily park-and-ride based BRT (such as Denver's Flatiron Flyer) would be very different. While many are partially under construction or nearly completed, the following are all BRT-lite systems in the United States which have been operating for at least one year:

1. Austin, TX's Capital Metro MetroRapid
2. El Paso, TX's Sun Metro Brio
3. San Antonio, TX's VIA Primo
4. Albany, NY's CTA BusPlus
5. Cincinnati, OH's Metro Metro*Plus*
6. Chicago, IL's CTA Jeffrey Jump
7. Kansas City, MO's KCATA Metro Area Express*
8. Los Angeles, CA's Metro Metro Rapid (704, 720, 733, 744, 745, 754)
9. Minneapolis, MN's Metro Transit A-Line
10. Orlando, FL's Lynx Lymmo
11. Reno, NV's RTC Rapid
12. San Bernardino, CA's RTA San Bernardino Express*
13. Santa Clara, CA's VTA Rapid 522

** denotes a transit system without publicly available route and stop data, which therefore was not analyzed in this research.*

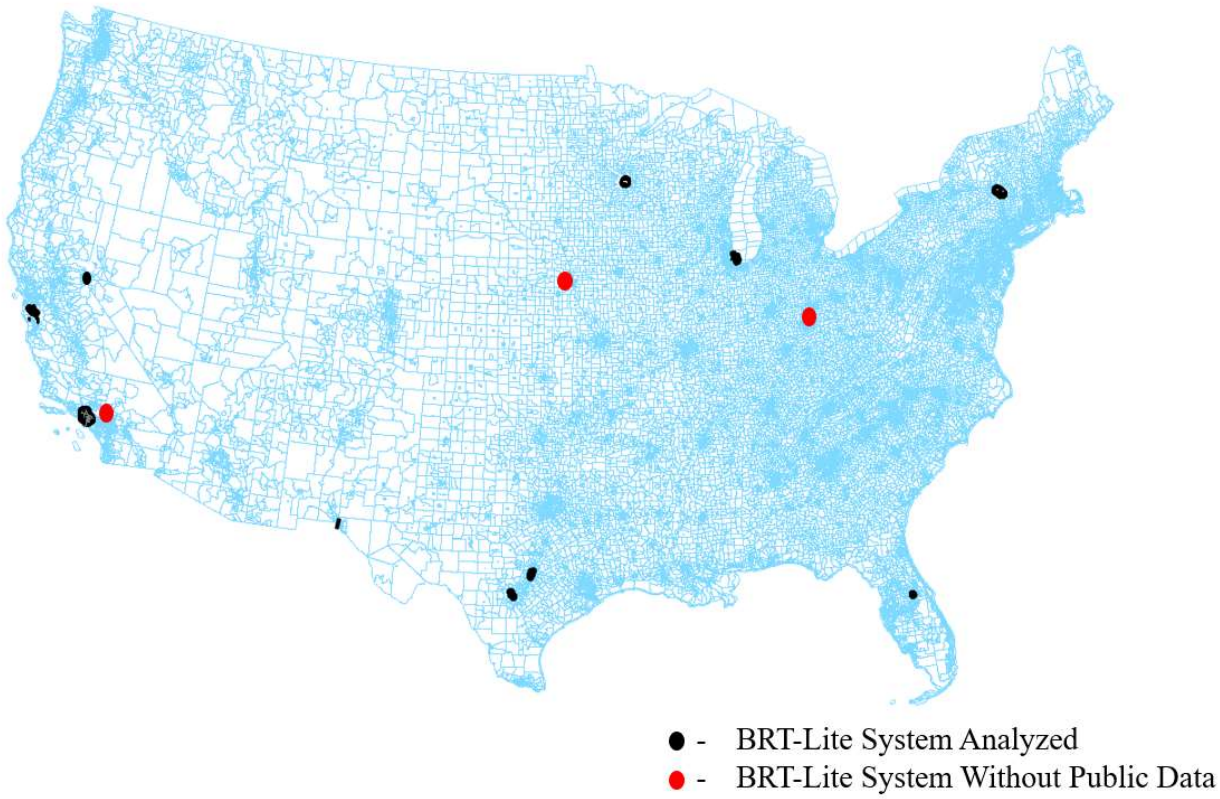


Figure 3.1. – BRT-Lite Systems Operating > 1 Year

All of these bus networks have similar operating characteristics—4-6 buses per hour at peak times, and service 7 days per week. These networks are also all in midsized cities, save for Chicago and Los Angeles. Therefore, while these systems were analyzed for population density and ridership, they were not part of the comparison to midsized Texas cities' population density and ridership.

The second step was to attain the TransCAD data necessary for these comparisons. Nearly all of the route and stop data was sourced directly from official websites. Some came from MPO data, others from municipalities, and others still came from the transit agencies themselves. El Paso, TX did not publish GIS data on transit stops and routes, so that data was attained on a third-party website and verified using official transit maps.

Buffers of ½ mile were run against the US Census Bureau's census tract Shapefile for all BRT station areas. That data was then compiled. Buffers of 1 mile were then run around transit agencies stops as a whole, and that data was then compiled as well.

Once this data was compiled, ridership data was needed. While some transit agencies published this data clearly, others did not. However, all ridership information necessary was able to be found through a combination of official documents, press releases, and news articles (both in favor of and opposed to these BRT-lite systems).

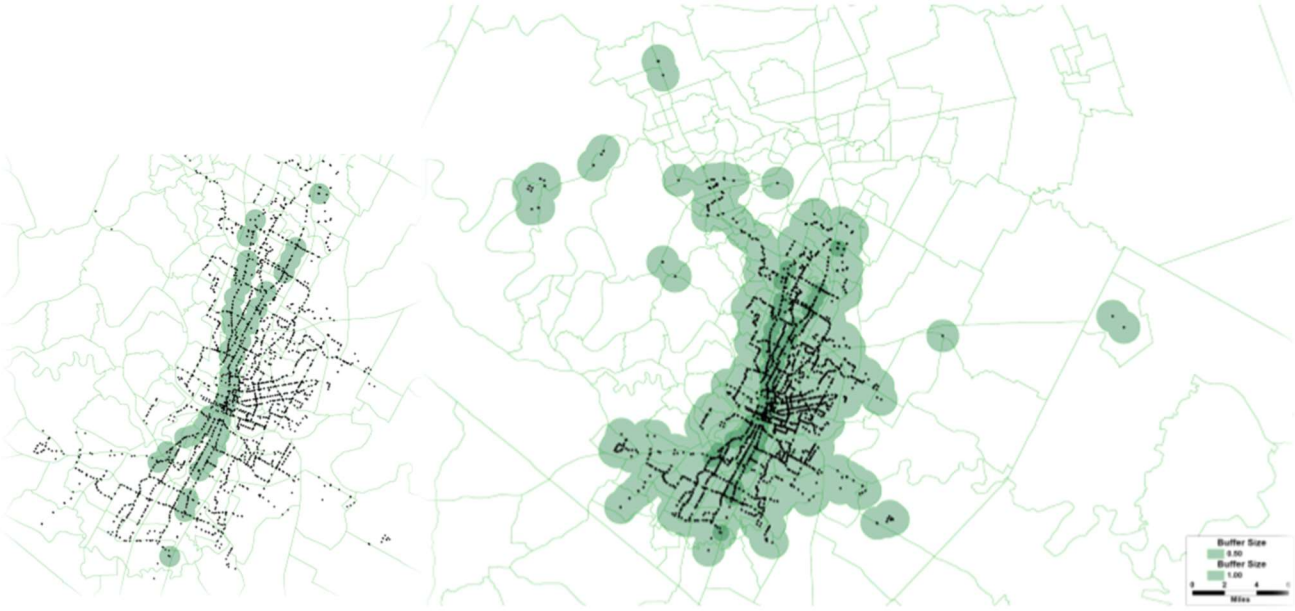


Figure 3.2. – Side-By-Side Comparison of Austin BRT Buffers and General Transit Buffers

4. Findings

4.1 Demographics

The first phase of the study that was analyzed was the demographic data of BRT station areas versus the demographic data of the transit agency's jurisdiction as a whole. Somewhat surprisingly, there were no notable points of distinction in age or race between BRT areas and the transit areas as a whole. This may be the result of homogenous populations of the cities, dispersed evenly, or (more likely) is the result of the transit corridor traversing a broad range of neighborhoods in the city. Table 4.1 shows highlights of the demographic data from the Austin, TX buffers:

Table 4.1. – Demographics of BRT and Overall Transit Buffers of Austin, Texas

	% White	% Black	% Asian	% Hispanic	Age (Med)	% Own
Austin BRT	75.5%	4.6%	5.8%	28.9%	31.03	32.1%
Austin Overall	69.3%	8.8%	5.2%	33.8%	32.67	44.8%

Only one city had dramatically different demographics around its BRT system versus its transit network as a whole – Albany, NY, as seen in Table 4.2.

Table 4.2. – Demographics of BRT and Overall Transit Buffers of Albany, New York

	% White	% Black	% Asian	% Hispanic	Age (Med)	% Own
Albany BRT	55.2%	29.4%	4.4%	10.1%	34.02	32.09%
Albany Overall	79.3%	11.6%	3.6%	5.4%	37.96	56.58%

When viewed as a whole, the demographic comparisons of the BRT areas to the transit areas overall provided no true insights into the planning or performance of BRT-lite systems.

4.2. Population

Of more consequence was the data on population density surrounding BRT stations. Somewhat surprisingly, BRT-lite systems are quite regularly placed along corridors that are, in fact, significantly denser than the city's transit area overall. The most significant BRT density advantage over the city's transit area overall is in Albany, NY, which has 4.06x denser surroundings of its BRT than it has in other urban areas of the city. The lowest by far is Chicago, which is not surprising as the Jeffrey Jump BRT line is merely one, relatively-small line in the extremely-dense Chicago metropolitan area.

Table 4.3. – Density Surrounding BRT and Overall Transit Area

	Pop / Acre	BRT Density Advantage
Albany BRT	4482.00	4.057117284
Albany Overall	1104.72	
Austin BRT	5292.50	1.885371508
Austin Overall	2807.14	
Chicago BRT	10349.00	1.053119449
Chicago Overall	9827.00	
El Paso BRT	5293.09	1.94488562
El Paso Overall	2721.54	
Los Angeles BRT	15642.63	1.984865167
Los Angeles Overall	7880.95	
Minneapolis BRT	4965.18	2.283852364
Minneapolis Overall	2174.04	
Orlando BRT	4318.56	2.113823414
Orlando Overall	2043.01	
Reno BRT	5503.95	2.159384845
Reno Overall	2548.85	
San Antonio BRT	4757.57	1.695303177
San Antonio Overall	2806.33	
Santa Clara BRT	9771.43	1.987612889
Santa Clara Overall	4916.16	

4.3. Ridership

Finally, the ridership of BRT systems and transit systems as a whole were calculated in consideration of the population living within the buffer zones. Chicago and Los Angeles were not included in these calculations, as they are unlike the other cities in the list and comparisons merely on the basis of population involving cities of such different scale would not be apt. First, somewhat surprisingly, the data clearly shows that Texans in midsized cities living in transit-served areas are nearly as likely to use transit as those living in midsized cities in other states. Of the buffered population in other states, there are 25.30 rides per person. In Texas, that number is 28.86—very similar, and somewhat unexpected.

Second, the core of this research was to compare BRT-lite ridership in Texas to that of other states. In other states, there are 39.77 rides per person on BRT-lite routes. In Texas, that number is 21.05, which is dramatically lower. San Antonio's score is higher than average in Texas, although it is a park-and-ride heavy service, and as a result its score in this comparison may be abnormally high. Austin's score is also higher than the average, although remains considerably lower than the average for BRT-lite services around the country.

Table 4.4. – Annual Ridership for BRT and Overall Transit Area

	Annual Ridership	Rides / Population
Albany BRT	1,900,000	25.59
Albany Overall	17,000,000	28.03
Austin BRT	3,422,588	27.34
Austin Overall	27,354,704	35.83
Chicago BRT	3,296,024	34.69
Chicago Overall	479,400,000	145.99
El Paso BRT	624,000	6.367
El Paso Overall	16,580,000	25.05
Los Angeles BRT	22,523,179	15.09
Los Angeles Overall	397,491,365	51.15
Minneapolis BRT	1,570,670	30.71
Minneapolis Overall	81,927,422	34.52
Orlando BRT	1,213,502	76.46
Orlando Overall	24,892,887	18.91
Reno BRT	1,262,587	54.23
Reno Overall	7,794,621	26.61
San Antonio BRT	1,787,400	29.44
San Antonio Overall	38,094,452	25.69
Santa Clara BRT	2,239,001	11.88
Santa Clara Overall	38,189,131	18.39

4.4. Discussion + Future Research

When accounting for population surrounding transit lines, Texans in midsized cities living in transit-served areas are nearly as likely to use transit as those living near transit in midsized cities in other states. However, Texans are far less likely to use nearby BRT-lite than citizens of other cities that have implemented similar systems.

There are several possible roots of this finding. The first possibility is that Texas BRT-lite systems may be poorer connectors to destinations than other BRT-lite systems. An additional analysis could be completed to test for density of employment, retail, etc. It's important to note that research has shown that employment data is not an apt predictor of BRT performance when there isn't a dedicated lane for the BRT system—however, this information could still be insightful outside of attempts to predict BRT-lite success.

Another, more plausible root of this finding is that midsized Texas cities may be less likely to have transit users in denser areas of the city. While racial and age demographics were similar for BRT-serving areas and overall transit-serving areas for Texas cities, an additional analysis could be completed to test for income. Texas is one of just a few states that bars requirements for construction of affordable housing in new development, and as a result new construction appearing alongside these transit lines may have an inordinately high number of relatively-wealthier citizens who do not rely on transit.

Conclusion

BRT-lite systems are an excellent bridge between the ultra-high investment of rail systems and the generally-low quality and image of standard city buses. These systems generally move more people more quickly and in greater comfort than standard city buses and are far more adaptable and inexpensive than rail systems. However, BRT-lite systems may have trouble attractive non-transit dependent populations--especially in Texas--and their success may dwindle if transit-dependent populations are not protected along BRT-lite corridors. More research is necessary into opinions of Texans regarding BRT-lite buses.

Appendix B: Public Transit in the Texas Triangle

Transit agencies registered to operate in the Texas Triangle, organized by operating counties.

1. Atascosa
    a. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
    b. Seguin, CCSCT (Community Council of South Central Texas)
2. Austin
    a. Columbus, CVT (Colorado Valley Transit)
3. Bandera
    a. Hondo, MCPT (Medina County Public Transportation)
    b. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
4. Bastrop
    a. Austin, CARTS (Capital Area Rural Transportation System)
5. Bell
    a. Killeen, The HOP (Hill Country Transit District, HCTD)
6. Bexar
    a. SAIA (San Antonio International Airport), Ground Transportation
    b. San Antonio, VIA (VIA Metropolitan Transit)
7. Brazoria
    a. Galveston, Connect Transportation (Gulf Coast Center, CT)
8. Brazos
    a. Bryan, The District
    b. College Station, TAMU (Texas A & M University Transit Services)
9. Burleson
    a. Bryan, The District
10. Caldwell
    a. Austin, CARTS (Capital Area Rural Transportation System)
11. Chambers
    a. Anahuac, FUMC (First United Methodist Church)
12. Collin
    a. Allen, TAPS Public Transit
    b. McKinney, TAPS Public Transit
13. Colorado
    a. Columbus, CVT (Colorado Valley Transit)

14. Comal
    a. Hondo, MCPT (Medina County Public Transportation)
    b. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
    c. San Marcos, ASA (Austin San Antonio Intermunicipal Commuter Rail District)
15. Cooke
    a. Sherman, TAPS (Texoma Council of Governments, Texoma Area Paratransit System)
16. Coryell
    a. San Saba, Central Texas Hop
17. Dallas
    a. Balch Springs STAR Transit
    b. Dallas, DART (Dallas Area Rapid Transit Authority);M-Line (McKinney Avenue Transit Authority); TRE (Trinity Railway Express); DDPWT (City of Dallas Department of Public Works & Transportation)
    c. DFWIA (Dallas/Fort Worth International Airport), Ground Transportation
    d. DLFA (Dallas Love Field Airport), Ground Transportation
    e. Garland, Mobility Dallas (MB)
    f. Grand Prairie, GPT (City of Grand Prairie Transportation Department, Grand Prairie Transit, Grand Connection)
    g. Irving, LCP (Las Colinas People Mover)
    h. Mesquite, STAR Transit
    i. Seagoville, STAR Transit
    j.
18. Delta
    a. Texarkana, TRAX (Arkansas-Texas Council of Governments)
19. Denton
    a. Denton, Commuter Express; DCTA Connect; SPAN Transportation (Services Program for Aging Needs); DCTA (Denton County Transportation Authority); Rail DCTA
    b. Lewisville, LDAR (City of Lewisville Dial-a-Ride)
20. Ellis
    a. Corsicana, CTS (Community Transit Service)
21. Falls
    a. Waco, Waco Transit System
22. Fayette
    a. Austin, CARTS (Capital Area Rural Transportation System)
23. Fort Bend
    a. Stafford, FBSC (Fort Bend Senior Citizens)

24. Freestone
    a. Waco, Waco Transit System
25. Galveston
    a. Galveston, Connect Transportation (Gulf Coast Center, CT); Island Transit (IT); Ferry (run by TXDOT)
    b. Houston, Commute Solutions (CS)
    c. Texas City, Connect Transit
26. Gonzales
    a. Victoria, R Transit (Golden Crescent Regional Planning Commission)
27. Grayson
    a. Denison, TAPS Public Transit
    b. Sherman, TAPS Public Transit
28. Grimes
    a. Bryan, The District
29. Guadalupe
    a. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
    b. Seguin, CCSCT (Community Council of South Central Texas)
30. Hardin
    a. Nederland, SETT (Southeast Texas Regional Planning Commission, South East Texas Transit)
31. Harris
    a. Baytown, HCLF (Harris County Lynchburg Ferry)
    b. Bryan, The District
    c. GBIA (George Bush Intercontinental Airport), Ground Transportation
    d. Houston, Metro (Metropolitan Transit Authority of Harris County, MTAHC); RUSS (Rice University Shuttle System); TrekExpress (TrekExpress to Greenway Plaza); Uptown Shuttle (Uptown Houston Improvement District, US); BATP (Bay Area Transportation Partnership); Commute Solutions (CS); Houston Transtar (HT)
    e. WPHA (William P. Hobby Airport), Ground Transportation
32. Hays
    a. Austin, CARTS (Capital Area Rural Transportation System)
    b. San Marcos, ASA (Austin San Antonio Intermunicipal Commuter Rail District); San Marcos, CAT; SMT (San Marcos Transit); TxTram (Texas State-San Marcos TxTram Shuttle System)
33. Henderson
    a. Kilgore, ETRTD (East Texas Council of Governments, East Texas Rural Transit District)

34. Hill
    a. Waco, Waco Transit System
    b. Whitney, WDAR (Whitney Dial-a-Ride)
35. Hood
    a. Glen Rose, Hood County Committee on Aging; TTS (The Transit System)
36. Houston
    a. Bryan, The District
37. Hunt
    a. Greenville, The Connection (Hunt County Committee on Aging, HCCOA); Senior Center Resources and Public Transit
38. Jefferson
    a. Beaumont, BMT (Beaumont Municipal Transit System)
    b. Nederland, SETT (Southeast Texas Regional Planning Commission, South East Texas Transit)
    c. Port Arthur, PAT (Port Arthur Transit)
39. Johnson
    a. Cleburne, Cletran (City of Cleburne Cletran & City County Transportation)
40. Kaufman
    a. Combine, STAR Transit
    b. Cottonwood, STAR Transit
    c. Crandall, STAR Transit
    d. Elmo, STAR Transit
    e. Forney, STAR Transit
    f. Grays Prairie, STAR Transit
    g. Kaufman, STAR Transit
    h. Kemp STAR Transit
    i. Mabank, STAR Transit
    j. Oak Grove, STAR Transit
    k. Oak Ridge, STAR Transit
    l. Post Oak Bend, STAR Transit
    m. Rosser, STAR Transit
    n. Scurry, STAR Transit
    o. Talty, STAR Transit
    p. Terrell, STAR Transit
41. Kendall
    a. Hondo, MCPT (Medina County Public Transportation)
    b. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
42. Lavaca
    a. Victoria, R Transit (Golden Crescent Regional Planning Commission)

43. Lee
    a. Austin, CARTS (Capital Area Rural Transportation System)
44. Leon
    a. Bryan, The District
    b. Waco, Waco Transit System
45. Liberty
    a. Bryan, The District
46. Limestone
    a. Waco, Waco Transit System
47. Madison
    a. Bryan, The District
48. McLennan
    a. Waco, Waco Transit System
49. Medina
    a. Hondo, MCPT (Medina County Public Transportation)
    b. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
50. Milam
    a. San Saba, Central Texas Hop
51. Montgomery
    a. Bryan, The District
    b. The Woodlands, TCE and TCE (Woodlands Town Center Improvement District, Town Center Express)
52. Navarro
    a. Corsicana, CTS (Community Transit Service); Navarro County Senior Citizens Services
53. Orange
    a. Nederland, SETT (Southeast Texas Regional Planning Commission, South East Texas Transit)
    b. Orange, OCT (Orange County Transportation, Holiday Transit Service)
54. Parker
    a. Mineral Wells,PTS (Public Transit Services, Palo Pinto County Transportation Council)

55. Rockwall
    a. Fate, STAR Transit
    b. Glen Hill, STAR Transit
    c. Greenville, The Connection (Hunt County Committee on Aging, HCCOA)
    d. Heath, STAR Transit
    e. McClendon-Chisolm, STAR Transit
    f. Mobile City, STAR Transit
    g. Rockwall, STAR Transit
    h. Royse City, STAR Transit
56. San Jacinto
    a. Bryan, The District
57. Somervell
    a. Glen Rose, Somervell County Committee on Aging; TTS (The Transit System)
58. Tarrant
    a. Arlington, Handitran (City of Arlington)
    b. Dallas, TRE (Trinity Railway Express)
    c. DFWIA (Dallas/Fort Worth International Airport), Ground Transportation
    d. Fort Worth, The T (Fort Worth Transportation Authority, Northeast Transportation Service, NETS, FWTA); FWTA (Fort Worth Light Rail Project)
    e. Grand Prairie, GPT (City of Grand Prairie Transportation Department, Grand Prairie Transit, Grand Connection)
    f. Watauga, WSCP (City of Watauga Senior Citizens Program)
59. Travis
    a. ABIA (Austin-Bergstrom International Airport), Ground Transportation
    b. Austin,Capital Metro (Capital Metropolitan Transportation Authority, CMTA); CARTS (Capital Area Rural Transportation System); ACPRT (Austin Citizens for Personal Rapid Transit); ASACR (Austin-San Antonio Commuter Rail Feasibility Study); CATC (Capital Area Transportation Coalition); ASG (Capital Metropolitan Transportation Authority All Systems Go! Project); CMTA (Cellular Mass Transit for Austin); LRNA (Light Rail Now! Austin)
    c. San Marcos, ASA (Austin San Antonio Intermunicipal Commuter Rail District)
60. Walker
    a. Bryan, The District
61. Waller
    a. Columbus, CVT (Colorado Valley Transit)
62. Washington
    a. Bryan, The District
63. Wharton
    a. Columbus, CVT (Colorado Valley Transit)

64. Williamson
    a. Austin, CARTS (Capital Area Rural Transportation System); Capital Metro (Capital Metropolitan Transportation Authority, CMTA)
    b. San Marcos, ASA (Austin San Antonio Intermunicipal Commuter Rail District)
65. Wilson
    a. San Antonio, ART (Alamo Area Council of Governments, Alamo Regional Transit)
    b. Seguin, CCSCT (Community Council of South Central Texas)
66. Wise
    a. Decatur, Wise County Committee on Aging
    b. Sherman, TAPS (Texoma Council of Governments, Texoma Area Paratransit System)

Appendix C: Public Agency Survey

The following survey was sent via Typeform to public agencies around the Texas Triangle.

Thank you for taking the time to visit our survey!

We are graduate students at **The University of Texas at Austin** working on a research project funded by a **USDOT University Transportation Center.** We are working to build an understanding of **Transit Oriented Development (TOD)** planning and practice throughout Texas. A general definition of TOD is: deliberate development oriented towards transit stations in a manner that supports transit services and enhances community livability through the design of compact, walkable, and mixed-use environments. While some agencies' practices reflect the definition above, we are also interested in practices that focus on compact development and walking- and cycling-friendly designs near transit, even if the practice is not branded "TOD."

We highly value your knowledge and perspectives on TOD (or similar practices by your agency) and warmly invite you to participate in this research by completing this survey. We believe that our findings will be valuable to your agency as well. As a token for our appreciation, we will provide you with a copy of our study findings upon this project's completion. The following questionnaire requires approximately 25 minutes to complete.

Please note that this survey must be completed in one sitting, and we will not receive any answers unless the survey is completed in its entirety.

Sincerely,

Brendan Goodrich (b.goodrich@utexas.edu)
Aysha Minot (aleminot@utexas.edu)
Caleb Roberts (crob93@utexas.edu)

Cooperative Mobility for Competitive Megaregions
A Tier-1 USDOT University Transportation Center

Let's start with **Section 1** to learn some **background information**.

1 Please provide the **name** of your agency or office/department *

2 What **category** does your organization fall under? *

Oops! Please make a selection

3 What is the approximate **population** of your jurisdiction? *

Oops! Please make a selection

4 What type(s) of **public transit** are **available** in your jurisdiction? *

- [ ] Bus
- [ ] Bus Rapid Transit (BRT)
- [ ] Streetcar
- [ ] Light Rail
- [ ] Heavy Rail
- [ ] Commuter Rail
- [ ] Paratransit
- [ ] On-Demand
- [ ] None
- [ ] Other

5 How many **employees** does your agency, office or department have? *

Oops! Please make a selection ▼

Awesome! Now we'll start **Section 2: Concepts and Perspectives**.

6 How would you rate the **importance** of public transit in comparison to all transportation services of your community?

1 = (not important)
2 = (somewhat important)
3 = (important)
4 = (very important)
5 = (extremely important) *

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7 Has your agency incorporated the following **planning and development/design ideas** into its current and / or proposed practices?

a. Transit Oriented Development (TOD) *

Yes No Don't Know

b. Compact Development *

Yes No Don't Know

c. Mixed Use Development *

Yes No Don't Know

d. Traditional Neighborhood Development (TND) *

Yes No Don't Know

e. Smart Growth *

Yes No Don't Know

f. Job-Housing Balance *

Yes No Don't Know

g. Joint Development (JD) *

Yes No Don't Know

h. Pedestrian Friendly Design *

- Yes
- No
- Don't Know

i. Transit Value Capture *

- Yes
- No
- Don't Know

j. Other (please describe or leave this line blank)

---

8 Do you **agree** with the following statements on TOD, regardless of whether or not there are transit services in your jurisdiction?

a. TOD increases transit ridership *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

b. TOD increases tax revenue *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

c. TOD improves neighborhood quality *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

d. TOD increases walking / biking and personal health *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

e. TOD increases housing choice *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

f. TOD reduces congestion *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree

- Don't know

g. TOD reduces transportation emissions *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

h. TOD reduces personal transportation costs *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

i. TOD reduces public expenditures in highways *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

j. TOD reduces land consumption *

- 1 - Strongly disagree
- 2 - Disagree

- 3 - Agree
- 4 - Strongly agree
- Don't know

---

9 Has your agency adopted its own **definition** of TOD? *

Yes No Don't Know

---

10 A general **definition** of TOD is: **deliberate development** oriented **towards transit** stations in a manner that supports transit services and enhances community livability through the design of compact, walkable, and mixed-use environments.

Based on either your agency's TOD definition or the general definition of TOD…

a. How many TODs exist in your jurisdiction? *

Oops! Please make a selection ▼

b. How many potential sites are there for future TODs in your jurisdiction? *

Oops! Please make a selection ▼

Thanks for that great information! Now we'll complete **Section 3** to examine **current practices of TOD or similar development and design near transit.**

---

11 Which of the following **practices** has your agency adopted? *

- Formal TOD programs or plans
- Transit-based development programs or plans similar to TOD although not branded as TOD
- TOD ordinance for transit station areas
- Required affordable housing inclusion in projects near transit stations
- Required urban design review for projects near transit stations

☐ Form-based coding for transit station areas ☐ None of the above ☐ Other

---

12 Which of the following **agencies or parties** has your agency partnered with to plan for or implement TOD programs or projects? *

☐ Federal agencies such as HUD, EPA, DOT, etc.

☐ State agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc.

☐ Metropolitan Planning Organizations (MPOs) ☐ Council of Governments (COGs)

☐ Transit agencies ☐ Neighborhood associations

☐ Non-governmental organizations (NGOs) / Non-profit organizations (NPOs)

☐ Professionals/consulting firms ☐ Private developers ☐ None of the above ☐ Other

---

13 Please rate the effectiveness of the following **value capture techniques** to finance transit infrastructure or development projects around transit

a. Impact fees *

○ 1 - Not effective

○ 2 - Somewhat effective

○ 3 - Effective

○ 4 - Very effective

○ Never used

b. Parking fees *

○ 1 - Not effective

○ 2 - Somewhat effective

○ 3 - Effective

○ 4 - Very effective

○ Never used

c. Transit connection fees *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

d. Joint development *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

e. Transfer of development rights *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

f. Lease of air rights *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective

- 4 - Very effective
- Never used

g. Negotiated exactions *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

h. Land value taxation *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

i. Special assessment districts *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

j. Sales tax district *

- 1 - Not effective

- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

k. Tax increment financing (TIF) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

l. Tax increment reinvestment zone (TIRZ) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

m. Transportation reinvestment zone (TRZ) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

14 Please rate the importance of the following **organizational and marketing activities** to the success of implementing TOD programs or projects.

a. Assign designated staff for TOD related tasks. *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Never used

b. Establish policies and guidelines for transit-supportive land uses *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Never used

c. Invite representatives of other agencies to join project reviews *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Never used

d. Engage the public for TOD implementation *

- 1 - Not important

- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Never used

e. Publicize TOD programs or projects in public media *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Never used

f. Any other activities? Please describe (or leave this section blank)

---

15 Which of the following **tactics** has your agency used for planning, design, and development near transit? *

- Increased density
- Increased land use mixture
- Improved walkability by adding sidewalks, footbridges, etc.
- Enhanced transfer between transit and connecting modes
- Reduced block size
- Added bike paths or lanes
- Enhanced streetscape characteristics
- Provided bike parking facilities
- Other

16 Please rate the importance of the following factors that your agency considers when determining the "**readiness**" for development near transit

a. Close to rail stations *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

b. Close to BRT stations or stops *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

c. Close to bus stops *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

d. Availability of developable land *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

e. Site engineering conditions *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

f. Travel time to downtown *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

g. Population density of nearby neighborhood *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

h. Job density of nearby blocks *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

i. Car ownership of nearby communities *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

j. Income of nearby communities *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

k. Needs for affordable housing *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important

- 2 - Somewhat important
- 3 - Important
- 4 - Very important

l. Real estate market conditions *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

m. Political support for transit *

How much does this factor influence the "readiness" for development near transit for your agency?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

n. Any other factors? _
If not, please leave this line blank._

Almost done! Thanks again for providing us with such useful information. Now on to **Section 4: Barriers to TOD Implementation.**

17 To what degree has each of the following **statutory or regulatory factors** been an **impediment** to the success of implementing TOD programs or projects

a. Constraints from federal laws or regulations *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

b. Constraints from state laws or regulations *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

c. Constraints from zoning/subdivision ordinances *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

d. Constraints from building codes *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

e. Constraints from agency-specific regulations or bylaws *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

f. Any other statutory or regulatory factors? _
If not, please leave this line blank._

---

18 To what degree has each of the following **political factors** been an **impediment** to the success of implementing TOD programs or projects?

a. Concerns of housing affordability *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

b. Concerns of increased property taxes *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

c. Concerns of increased traffic congestion resulting from density *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

d. Safety concerns resulting from increased traffic *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

e. Concerns of crowdedness in local schools *

How much has this been an impediment to TOD projects or planning?

- 1 - None

- 2 - Minimal
- 3 - Moderate
- 4 - Major

f. Concerns of changed neighborhood character *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

g. Lack of general support for public transit *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

h. Lack of coordination among various levels of agencies *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

i. Any other political factors? _

If not, please leave this line blank._

19 To what degree has each of the following **financial and market factors** been an **impediment** to the success of implementing TOD programs or projects

a. Lack of funds for capital programs in station areas *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

b. Lack of interest from private developers *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

c. Lack of lender / investor interest and support *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

d. Lack of personnel with TOD expertise *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

e. Any other financial or market factors? _
If not, please leave this line blank._

---

20 To what degree has each of the following **site conditions** been an **impediment** to the success of implementing TOD programs or projects

a. Lack of developable land in station areas *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

b. Inadequate transit services *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal

- 3 - Moderate
- 4 - Major

c. Auto-oriented land use *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

d. Poor location of transit stations *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

e. Lack of coordination among stakeholders *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

f. Any other site factors? _

If not, please leave this line blank._

You've reached the last section! Now we'll start **Section 5: Effectiveness of Strategies to Overcome Barriers to the Implentation of TOD or the like.**

21 Please rate the degree to which the following practices are effective to the **success of implementing** TOD programs or projects.

a. State-level TOD strategies, policies, or guidelines *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

b. Regional TOD strategies, policies, or guidelines *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

c. Locally adopted formal TOD programs or plans *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective

- 4 - Very effective
- Never used

d. TOD ordinance for transit station areas *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

e. Required affordable housing inclusion in projects near transit stations *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

f. Required urban design review for projects near transit stations *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

g. Form-based coding for transit stations *

- 1 - Not effective

- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

h. Transit value capture *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

i. Other (please describe or leave this line blank)

---

22 Please rate the importance of **partnering with the following agencies or parties** to the success of implementing TOD programs or projects.

a. Federal agencies such as HUD, EPA, DOT, etc. *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

b. State agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc. *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

c. Metropolitan Planning Organizations (MPOs) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

d. Council of Governments (COGs) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

e. Transit agencies *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

f. Neighborhood associations *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

g. Non-governmental organizations (NGOs) / Non-profit organizations (NPOs) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

h. Professionals/consulting firms *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

i. Private developers *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important

- 2 - Somewhat important
- 3 - Important
- 4 - Very important

j. Any other agencies?
(please describe or leave this line blank)

23 Please rate the importance of the following **funding sources to the success of implementing** TOD programs or projects.

a. Grants from federal agencies (HUD, EPA, DOT, etc) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

b. Grants from state agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc. *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

c. Funding from MPOs *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

d. Funding from COGs *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

e. Funding from private donations *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important

f. Any other funding sources?
(please describe or leave this line blank)

24 Please rate the **effectiveness** of the **following tools** to the successful implementation of TOD programs or projects.

a. Eminent domain *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

b. Streamlined review *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

c. Tax abatement *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

d. Relaxed parking standards *

- 1 - Not effective

- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

e. Subsidized housing *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

f. Zoning / density bonuses *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

g. Tax increment financing (TIF, TIRZ, or TRZ) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

h. Land assembly help *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

i. Buying land on the open market *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

j. Underwriting land costs *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

k. Tax-exempt bonds *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

l. Capital funding *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

m. Planning funding *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

n. Any other tools?
If not, leave this question blank.

25 As we reach the end of this survey, is there anything else you would like us to know about the topics of this survey?

If not, please leave this line blank ***but continue forward to complete the survey.***

26 Please enter your email address if we can contact you with any follow-up questions.

If not, please leave this section blank and **continue forward to complete the survey**.

Submit

Never submit passwords! - Report abuse

Appendix D: Public Agency Survey Respondents

Response #	Agency Name	Agency Type	Date Completed
1	Abilene MPO	Region or State	11/16/2017
2	Alamo Area MPO	Region or State	10/30/2017
3	Brazos Valley COGs	Region or State	10/27/2017
4	Bryan-College Station MPO	Region or State	11/15/2017
5	Capital Metro	Transit	11/14/2017
6	City of Arlington Community Development and Planning - 1	City	completed offline
7	City of Arlington Strategic Planning, Community Development and Planning - 2	City	11/2/2017
8	City of Austin Planning and Zoning	City	11/16/2017
9	City of Bastrop Planning and Development	City	10/26/2017
10	City of Baytown Planning and Development Services	City	2/2/2018
11	City of Carrollton	City	11/6/2017
12	City of Dallas Planning and Urban Design - 1	City	11/1/2017
13	City of Dallas Planning and Urban Design - 2	City	10/27/2017
14	City of Forney Community Development	City	10/27/2017
15	City of Fort Worth Transportation and Public Works	City	11/20/2017
16	City of Garland - 1	City	10/27/2017

17	City of Garland Planning and Community Development - 2	City	10/26/2017
18	City of Harker Heights - 1	City	10/26/2017
19	City of Harker Heights - 2	City	10/26/2017
20	City of Harker Heights Planning and Development - 3	City	10/26/2017
21	City of Irving - 1	City	10/27/2017
22	City of Irving Planning and Community Development - 2	City	10/26/2017
23	City of Marble Falls Development Services	City	11/6/2017
24	City of Richardson - 1	City	11/14/2017
25	City of Richardson - 2	City	11/14/2017
26	City of Round Rock Planning and Development Services - 1	City	10/26/2017
27	City of Round Rock Planning and Development Services - 2	City	10/31/2017
28	City of Rowlett Community Development	City	10/27/2017
29	City of San Antonio Planning Department - 1	City	11/2/2017
30	City of San Antonio Planning Department - 2	City	completed offline
31	City of Temple	City	10/31/2017
32	City of Victoria	Region or State	10/27/2017
33	Farmers Branch Planning Department	City	11/7/2017
34	Fort Worth Transportation Authority	Transit	11/20/2017

35	GoBus	Transit	10/30/2017
36	Golden Crescent Regional Planning Commission	Region or State	10/27/2017
37	Heart of Texas COGs	Transit	10/27/2017
38	Hidalgo County MPO	Region or State	10/31/2017
39	Houston-Galveston Area Council - 1	Region or State	11/17/2017
40	Houston-Galveston Area Council - 2	Region or State	11/15/2017
41	LRGVDC - Valley Metro	Transit	10/26/2017
42	North Central Texas COGs - 1	Region or State	11/15/2017
43	North Central Texas COGs - 2	Region or State	11/15/2017
44	REAL, Inc.	Transit	10/26/2017
45	San Angelo MPO	Region or State	11/14/2017
46	STAR Transit	Transit	10/30/2017
47	Sun Metro	City	12/27/2017
48	Texarkana MPO	Region or State	11/17/2017
49	Texas Department of Transportation (TxDOT) - Dallas District	Region or State	10/27/2017
50	Tyler Area MPO	Region or State	11/14/2017
51	VIA Metropolitan Transit Special Projects and Project Development Dept.	Transit	11/17/2017
52	Waco MPO	Region or State	11/2/2017
53	City of Houston	City	completed offline
54	Capital Area MPO	Region or State	2/27/2018

Appendix E: Developer Survey

The following survey was sent via Typeform to developers around the Texas Triangle.

Thank you for taking the time to visit our survey!

We are graduate students at **The University of Texas at Austin** working on a research project funded by a **USDOT University Transportation Center.** We are working to build an understanding of **Transit Oriented Development (TOD)** planning and practice throughout Texas. A general definition of TOD is: deliberate development oriented towards transit stations in a manner that supports transit services and enhances community livability through the design of compact, walkable, and mixed-use environments. While some agencies' practices reflect the definition above, we are also interested in practices that focus on compact development and walking- and cycling-friendly designs near transit, even if the practice is not branded "TOD."

We highly value your knowledge and perspectives on TOD (or similar practices) and warmly invite you to participate in this research by completing this survey. We believe that our findings will be valuable to your company as well. As a token for our appreciation, we will provide you with a copy of our study findings upon this project's completion. The following questionnaire requires approximately 25 minutes to complete.

Please note that this survey must be completed in one sitting, and we will not receive any answers unless the survey is completed in its entirety.

Sincerely,

Brendan Goodrich (b.goodrich@utexas.edu)

Cooperative Mobility for Competitive Megaregions
A Tier-1 USDOT University Transportation Center

Let's start with **Section 1** to learn some **background information**.

1 Please provide the **name** of your company *

2 Is your company for-profit or non-profit?

○ For-Profit ○ Non-Profit ○ Other

3 How would you describe your (primary) work?

- ○ Developer
- ○ Investor
- ○ Architecture / Design Firm
- ○ Other

---

4 In which **metropolitan areas** in Texas have you developed (regardless of development type)?
*

- ☐ Dallas / Ft. Worth / Arlington
- ☐ Houston
- ☐ San Antonio
- ☐ Austin / Round Rock / San Marcos
- ☐ McAllen
- ☐ El Paso
- ☐ Corpus Christi
- ☐ Brownsville / Harlingen
- ☐ Killen / Temple / Fort Hood
- ☐ Beaumont / Port Arthur
- ☐ Lubbock
- ☐ Laredo
- ☐ Amarillo
- ☐ Waco
- ☐ College Station / Bryan
- ☐ Other

---

5 In which **metropolitan areas** in Texas have you developed or **considered** developing as **Transit-Oriented Development**?
*

- ☐ Dallas / Ft. Worth / Arlington

- [ ] Houston
- [ ] San Antonio
- [ ] Austin / Round Rock / San Marcos
- [ ] McAllen
- [ ] El Paso
- [ ] Corpus Christi
- [ ] Brownsville / Harlingen
- [ ] Killen / Temple / Fort Hood
- [ ] Beaumont / Port Arthur
- [ ] Lubbock
- [ ] Laredo
- [ ] Amarillo
- [ ] Waco
- [ ] College Station / Bryan
- [ ] Other

---

6 What sites have you **developed as TOD?**
Feel free to describe this site (or sites) with an address, intersection, station name, etc.
If none, please leave this section blank.

At the end of this survey (Q. 29), we'll ask you to share any specific memories from this project (or projects).

---

7 What sites have you **considered developing as TOD?**
Feel free to describe this site (or sites) with an address, intersection, station name, etc.
If none, please leave this section blank.

At the end of this survey (Q. 29), we'll ask you to share any specific memories from this project (or projects).

8 What type(s) of **public transit** do you consider as **value-increasing** when developing land? *

- [ ] Bus
- [ ] Bus Rapid Transit (BRT)
- [ ] Streetcar
- [ ] Light Rail
- [ ] Heavy Rail
- [ ] Commuter Rail
- [ ] Paratransit
- [ ] On-Demand
- [ ] None
- [ ] Other

9 How many **employees** does your company have? *

Oops! Please make a selection ▾

Awesome! Now we'll start **Section 2: Concepts and Perspectives**.

As we move along, if you'd like, please feel free to take note of anything that you'd like to expand on with text at the end. Our goal is to understand you, and we'd love your help in growing that understanding!

10 In choosing projects to develop, how would you rate the **importance of public transit** (buses, rail, etc.)?
1 = (not important)
2 = (somewhat important)
3 = (important)
4 = (very important)
5 = (extremely important) *

1 2 3 4 5

---

11 In choosing projects to develop, how would you rate the **importance of a driver-friendly environment** (easy parking throughout the community, highway access, etc.)?
1 = (not important)
2 = (somewhat important)
3 = (important)
4 = (very important)
5 = (extremely important) *

1 2 3 4 5

---

12 Has your company incorporated the following **planning and development/design ideas** into the decision-making process for developing a site?

a. Transit Oriented Development (TOD) *

Yes No Don't Know

b. Compact Development *

Yes No Don't Know

c. Mixed Use Development *

Yes No Don't Know

d. Traditional Neighborhood Development (TND) *

Yes No Don't Know

e. Smart Growth *

Yes No Don't Know

f. Job-Housing Balance *

Yes No Don't Know

g. Joint Development (JD) *

Yes No Don't Know

h. Pedestrian Friendly Design *

Yes No Don't Know

i. Transit Value Capture *

Yes No Don't Know

j. Other (please describe or leave this line blank)

13 Do you **agree** with the following statements on TOD?

a. TOD increases transit ridership *

1 - Strongly disagree

- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

b. TOD increases tax revenue *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

c. TOD improves neighborhood quality *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

d. TOD increases walking / biking and personal health *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

e. TOD increases housing choice *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

f. TOD reduces congestion *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

g. TOD reduces transportation emissions *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

h. TOD reduces personal transportation costs *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

i. TOD reduces public expenditures in highways *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

j. TOD reduces land consumption *

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Agree
- 4 - Strongly agree
- Don't know

---

14 A general **definition** of TOD is: **deliberate development oriented towards transit** stations in a manner that supports transit services and enhances community livability through the design of compact, walkable, and mixed-use environments.

Based on the general definition of TOD…

a. How many TODs have been *discussed* as possible development sites for your company? *

Oops! Please make a selection ▾

b. How many TODs have been *strongly considered* as viable development sites for your company? *

Oops! Please make a selection ▾

c. How many TODs are in the process of being developed by your company?
If none, please state "0". *

d. How many TODs has your company developed?
If none, please state "0". *

Thanks for that great information! Now we'll complete **Section 3** to examine **current practices of TOD or similar development and design near transit.**

15 Which of the following **planning practices** have you encountered related to TOD development? *

- [ ] Formal TOD programs or plans
- [ ] Transit-based development programs or plans similar to TOD although not branded as TOD
- [ ] TOD ordinance for transit station areas
- [ ] Required affordable housing inclusion in projects near transit stations
- [ ] Required urban design review for projects near transit stations
- [ ] Form-based coding for transit station areas
- [ ] None of the above
- [ ] Other

16 Which of the following **agencies or parties has your company worked with** to plan for or implement TOD programs or projects? *

- [ ] Federal agencies such as HUD, EPA, DOT, etc.
- [ ] State agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc.
- [ ] Metropolitan Planning Organizations (MPOs)
- [ ] Council of Governments (COGs)
- [ ] Transit agencies
- [ ] Neighborhood associations
- [ ] Non-governmental organizations (NGOs) / Non-profit organizations (NPOs)

- [ ] Professionals/consulting firms
- [ ] None of the above
- [ ] Other

---

17 Which of the following **agencies or parties would you be interested in working with** to plan for or implement TOD programs or projects? *

- [ ] Federal agencies such as HUD, EPA, DOT, etc.
- [ ] State agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc.
- [ ] Metropolitan Planning Organizations (MPOs)
- [ ] Council of Governments (COGs)
- [ ] Transit agencies
- [ ] Neighborhood associations
- [ ] Non-governmental organizations (NGOs) / Non-profit organizations (NPOs)
- [ ] Professionals/consulting firms
- [ ] None of the above
- [ ] Other

---

18 Please rate the effectiveness of the following **value capture techniques** to finance transit infrastructure or development projects around transit. **Please rate from your perspective as a developer.**

a. Impact fees *

- ○ 1 - Not effective
- ○ 2 - Somewhat effective
- ○ 3 - Effective
- ○ 4 - Very effective
- ○ Unsure

b. Parking fees *

- ○ 1 - Not effective
- ○ 2 - Somewhat effective
- ○ 3 - Effective
- ○ 4 - Very effective

- Unsure

c. Transit connection fees *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

d. Joint development *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

e. Transfer of development rights *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

f. Lease of air rights *

- 1 - Not effective
- 2 - Somewhat effective

- 3 - Effective
- 4 - Very effective
- Unsure

g. Negotiated exactions *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

h. Land value taxation *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

i. Special assessment districts *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

j. Sales tax district *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

k. Tax increment financing (TIF) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

l. Tax increment reinvestment zone (TIRZ) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

m. Transportation reinvestment zone (TRZ) *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Unsure

19 Please rate the importance of the following **public agency organizational and marketing activities** to the success of implementing TOD programs or projects **from your perspective as a developer.**

a. Designated planning staff at public agencies for TOD related tasks. *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Unsure

b. Established policies and guidelines for transit-supportive land uses *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Unsure

c. Inviting representatives of other agencies or developers to review projects *

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- Unsure

d. Engaging the public for TOD implementation *

- ○ 1 - Not important
- ○ 2 - Somewhat important
- ○ 3 - Important
- ○ 4 - Very important
- ○ Unsure

e. Publicized TOD programs or projects in public media *

- ○ 1 - Not important
- ○ 2 - Somewhat important
- ○ 3 - Important
- ○ 4 - Very important
- ○ Unsure

f. Any other activities? Please describe (or leave this section blank)

---

20 Which of the following **tactics have you seen utilized** in Texas to encourage planning, design, and development near transit? *

- ☐ Increased density
- ☐ Increased land use mixture
- ☐ Improved walkability by adding sidewalks, footbridges, etc.
- ☐ Enhanced transfer between transit and connecting modes
- ☐ Reduced block size
- ☐ Added bike paths or lanes
- ☐ Enhanced streetscape characteristics
- ☐ Provided bike parking facilities
- ☐ Other

21 Which of the following **tactics would you like to see** utilized in Texas to encourage planning, design, and development near transit? *

- [ ] Increased density
- [ ] Increased land use mixture
- [ ] Improved walkability by adding sidewalks, footbridges, etc.
- [ ] Enhanced transfer between transit and connecting modes
- [ ] Reduced block size
- [ ] Added bike paths or lanes
- [ ] Enhanced streetscape characteristics
- [ ] Provided bike parking facilities
- [ ] Other

22 Please rate the importance of the following factors that your company considers when **determining your interest in developing a site near transit.**

a. Close to rail stations *

How does this factor influence your interest in developing a site?

- ○ 1 - Greatly Decreases Interest
- ○ 2 - Somewhat Decreases Interest
- ○ 3 - No Impact
- ○ 4 - Somewhat Increases Interest
- ○ 5 - Greatly Increases Interest

b. Close to BRT stations or stops *

How does this factor influence your interest in developing a site?

- ○ 1 - Greatly Decreases Interest

- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

c. Close to bus stops *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

d. Avialability of easily developable land *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

e. Agreeable site engineering conditions *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact

- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

f. Good travel time to downtown *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

g. Relatively high population density of nearby neighborhood *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

h. Job density of nearby blocks *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

i. Relatively low car ownership of nearby communities *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

j. Relatively high income of nearby communities *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

k. Requirement for (or strong incentives to build) affordable housing *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

l. Strong real estate market conditions *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

m. Strong political support for transit *

How does this factor influence your interest in developing a site?

- 1 - Greatly Decreases Interest
- 2 - Somewhat Decreases Interest
- 3 - No Impact
- 4 - Somewhat Increases Interest
- 5 - Greatly Increases Interest

n. Any other factors?

If not, please leave this line blank.

Almost done! Thanks again for providing us with such useful information. Now on to **Section 4: Barriers to TOD Implementation.**

---

23 In your opinion, to what degree has each of the following **statutory or regulatory factors** been an **impediment** to the success of **TOD programs or projects? Please consider these factors only as they apply to TOD specifically.**

a. Constraints from federal laws or regulations *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

b. Constraints from state laws or regulations *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

c. Constraints from zoning/subdivision ordinances *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

d. Constraints from building codes *

How much has this been an impediment to TOD projects or planning?

- 1 - None

- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

e. Constraints from agency-specific regulations or bylaws *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

f. Any other statutory or regulatory factors?

If not, please leave this line blank.

---

24 To what degree has each of the following **political factors** been an **impediment** to the success of implementing TOD programs or projects? **Please consider these factors only as they apply to TOD specifically.**

a. Concerns of housing affordability *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate

- 4 - Major
- 5 - Unsure

b. Community concerns of increased property taxes *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

c. Community concerns of increased traffic congestion resulting from density *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

d. Community safety concerns resulting from increased traffic *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

e. Concerns of crowdedness in local schools *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

f. Concerns of changed neighborhood character resulting from TOD projects *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

g. Lack of general support for public transit *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

h. Lack of coordination among various levels of agencies *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

i. Any other political factors?

If not, please leave this line blank.

---

25 To what degree has each of the following **financial and market factors** been an **impediment** to the success of implementing TOD programs or projects? **Please consider these factors only as they apply to TOD specifically.**

a. Lack of funds for capital programs in station areas *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

b. Lack of overall interest from the development community *

How much has this been an impediment to TOD projects or planning?

- 1 - None

- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

c. Lack of lender / investor interest and support *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

d. Lack of developer and builder experience and understanding of TOD *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

e. Lack of residential interest in living in a TOD. *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate

- 4 - Major
- 5 - Unsure

f. Lack of residential interest in paying a necessary premium to live in a TOD (including increased costs for parking). *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

g. Lack of commercial interest in locating in a TOD. *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

h. Lack of commercial interest in paying a necessary premium to locate in a TOD (including increased costs for parking). *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major

- 5 - Unsure

i. Any other financial or market factors?

If not, please leave this line blank.

---

26 To what degree has each of the following **site conditions** been an **impediment** to the success of implementing TOD programs or projects

a. Lack of developable land in station areas *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

b. Inadequate transit services *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

c. Auto-oriented land use *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

d. Poor location of transit stations *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

e. Lack of coordination among stakeholders *

How much has this been an impediment to TOD projects or planning?

- 1 - None
- 2 - Minimal
- 3 - Moderate
- 4 - Major
- 5 - Unsure

f. Any other site factors?

If not, please leave this line blank.

You've reached the last section! Now we'll start **Section 5: Implementation of TOD Programs or Projects.**

27 Please rate the degree to which the following practices are effective to the **success of implementing** TOD programs or projects.

a. State-level TOD strategies, policies, or guidelines, making clear the path to developing a successful TOD site. *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

b. Regional TOD strategies, policies, or guidelines, making clear the path to developing a successful TOD site. *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

c. Locally-adopted formal TOD programs or plans, making clear the path to developing a successful TOD site. *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective

- 4 - Very effective
- Never used

d. TOD ordinance for transit station areas, distinguishing zoning requirements for station areas (generally involving increased density and reduced parking requirements). *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

e. Required affordable housing inclusion in projects near transit stations *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

f. Required urban design review for projects near transit stations *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

g. Form-based coding for transit station areas *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

h. Transit value capture *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- Never used

i. Other (please describe or leave this line blank)

28 Please rate the importance of **partnering with the following agencies or parties** to the success of implementing TOD programs or projects.

a. Federal agencies such as HUD, EPA, DOT, etc. *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

b. State agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc. *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

c. Metropolitan Planning Organizations (MPOs) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

d. Council of Governments (COGs) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

e. Transit agencies *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

f. Neighborhood associations *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

g. Non-governmental organizations (NGOs) / Non-profit organizations (NPOs) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

h. Professionals/consulting firms *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important

- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

i. Any other agencies?
(please describe or leave this line blank)

29 Please rate the importance of the following **funding sources to the success of implementing** TOD programs or projects. These funding sources may fund developers' work, or may fund work by a municipal agency in improving infrastructure.

a. Grants from federal agencies (HUD, EPA, DOT, etc) *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

b. Grants from state agencies such as Texas Department of Housing & Community Affairs, TxDOT, etc. *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important

- 4 - Very important
- 5 - Unsure

c. Funding from MPOs *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

d. Funding from COGs *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

e. Funding from private donations *

How important is partnering with these agencies or parties to the success of TOD programs or projects?

- 1 - Not important
- 2 - Somewhat important
- 3 - Important
- 4 - Very important
- 5 - Unsure

f. Any other funding sources?
(please describe or leave this line blank)

30 Please rate the **effectiveness** of the **following tools** to the successful implementation of TOD programs or projects.

a. Eminent domain *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

b. Streamlined review *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

c. Tax abatement *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective

- 4 - Very effective
- 5 - Never used

d. Relaxed parking standards *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

e. Subsidized housing *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

f. Zoning / density bonuses *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

g. Tax increment financing (TIF, TIRZ, or TRZ) *

- 1 - Not effective

- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

h. Land assembly help *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

i. Buying land on the open market *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

j. Underwriting land costs *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

k. Tax-exempt bonds *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

l. Capital funding *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

m. Planning funding *

- 1 - Not effective
- 2 - Somewhat effective
- 3 - Effective
- 4 - Very effective
- 5 - Never used

n. Any other tools?
If not, leave this question blank.

31 As we reach the end of this survey, is there anything you'd like to tell us about your experiences with specific transit-oriented development sites?

You may also email b.goodrich@utexas.edu if you'd prefer to email an answer to this

question.

If not, please leave this line blank ***but continue forward to complete the survey.***

32 Is there anything else you would like us to know about the topics of this survey?

You may also email b.goodrich@utexas.edu if you'd prefer to email an answer to this question.

If not, please leave this line blank ***but continue forward to complete the survey.***

33 Please enter your email address if we can contact you with any follow-up questions.

If not, please leave this section blank and **continue forward to complete the survey**.

Submit

Never submit passwords! - Report abuse

Appendix F: Developer Survey Respondents

Response #	Agency Name	Agency Type	Notes	Date Completed
1	New Hope Housing, Inc.	Non-Profit Developer		3/8/2018
2	Western Securities	For-Profit Developer		3/12/2018
3	Accessible Housing Austin!	Non-Profit Developer		3/13/2018
4	Travis County	Government	Taken in error	3/13/2018
5	AREA Real Estate, LLC	For-Profit Investor		3/14/2018
6	City of Huntsville	Municipality	Taken in error	3/19/2018
7	Proyecto Azteca	Non-Profit Developer		4/3/2018

References

Alamo Economic Development Corporation. (2017). Alamo TIRZ. *Alamo EDC*. Retrieved from https://alamoedc.org/about-alamo-edc/incentives/alamo-tirz/

American Public Transportation Authority. (2017). Public Transportation Ridership Report, Fourth Quarter 2016. *American Public Transportation Association.* Retrieved from http://www.apta.com/resources/statistics/Documents/Ridership/2016-q4-ridership-APTA.pdf

Anderson, Greg. Interview. April 2017.

Anderson, Will. (2017). Hundreds of Apartments, Office Tower Cleared to Rise Just East of I-35. *Biz Journal.* Retrieved from https://www.bizjournals.com/austin/news/2017/03/03/hundreds-of-apartments-office-tower-cleared-to.html

Bailey, W. Scott. (2016). San Antonio, VIA to Get Helping Hand from Feds on Future Transportation Development. *Biz Journals.* Retrieved from http://www.bizjournals.com/sanantonio/news/2016/04/06/san-antonio-via-to-get-helping-hand-from-feds-on.html.

Beydoun, S. (2016). Air Rights Project: Utilizing Air Space Above Transportation Facilities. *Fairfax County Government.* Retrieved from https://www.fairfaxcounty.gov/bosclerk/board-committees/meetings/2016/fact-sheet-air-rights.pdf

Beyer, Scott. (2016). Austin's Commuter Rail is a Monument to Government Waste. *Forbes*. Retrieved from https://www.forbes.com/sites/scottbeyer/2016/07/29/austins-commuter-rail-is-a-monument-to-government-waste/#1d485f031f18

Black, S. (2015). Retail in Transit Stations. *Commercial Real Estate Development Association.* Retrieved from http://www.naiop.org/en/Magazine/2016/Summer-2016/Business-Trends/~/link.aspx?_id=CD806E9FE415477880EA760B93C421C0&_z=z

Bureau of Economic Analysis (BEA). (2016). Dallas-Fort Worth-Arlington Personal Income Statistics. *U.S. Department of Commerce.* Retrieved from https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=19100&areatype=MSA&geotype=4

Business Wire. (2008). Dallas Creates First Tax Increment Financing District Dedicated to Multi-Station TOD. *Business Wire.* Retrieved from http://www.businesswire.com/news/home/20081219005076/en/Dallas-Creates-Tax-Increment-Financing-District-Dedicated

California DOT. (2002) Statewide Transit-Oriented Development Study: Factors for Success in California. *California DOT.* Retrieved from http://www.dot.ca.gov/hq/MassTrans/Docs-Pdfs/TOD-Study-Final-Rpt.pdf.

Campbell, Elizabeth Cochrane. (2011). Light Rail Impacts on Property Values: Analyzing Houston's METRORail. 1-23. *The University of Texas at Austin Texas ScholarWorks.* Retrieved from https://repositories.lib.utexas.edu/handle/2152/ETD-UT-2011-05-3208.

Capital District Transportation Authority. (2017). Route Performance Remains Strong. *Capital District Transportation Authority.* Retrieved from https://www.cdta.org/news/annual-rpr-released

Capital Metro. (2017). Monthly Ridership Report: Fiscal Year End 2017. *Capital Metro.* Retrieved from https://www.capmetro.org/uploadedFiles/New2016/About_Capital_Metro/Data_and_Statistics/2017-09-Monthly-Ridership-Web-Report.pdf

Capital Metro. (2018, January). Monthly Ridership Report. *Capital Metro.* Retrieved from https://capmetro.org/uploadedFiles/New2016/About_Capital_Metro/Data_and_Statistics/2018-01-Monthly-Ridership-Web-Report.pdf

Capital Metropolitan Transportation Authority. "Riding Capital Metro - Capital Metro Transit - Austin, Texas". 2011.

Carroll, Michael C., Christopher Carlyle, and Michael Seman. (2017). The Economic and Fiscal Impacts of Development Near DART Stations. 1-19. *Mass Transit Magazine.* Retrieved from http://www.masstransitmag.com/press_release/12334182/the-economic-and-fiscal-impacts-of-development-near-dart-stations

Center for Land Use Education. (2005). Planning Implementation Tools Transfer of Development Rights (TDR). *University of Wisconsin Stevens Point.* Retrieved from https://www.uwsp.edu/cnr-ap/clue/Documents/PlanImplementation/Transfer_of_Development_Rights.pdf

Center for Neighborhood Technology (CNT). (2013). Transit-Oriented Development in the Chicago Region: Efficient and Resilient Communities for the 21st Century. 5. *Center for Neighborhood Technology.* Retrieved from https://www.cnt.org/publications/transit-oriented-development-in-the-chicago-region-efficient-and-resilient-communities

Center for Transit-Oriented Development (CTOD). (2011). Planning for TOD at the Regional Scale: The Big Picture. *Center for Transit-Oriented Development.* Retrieved from http://ctod.org/pdfs/tod204.pdf

Center for Transit-Oriented Development. (2008). Capturing the Value of Transit. *Reconnecting America.* Retrieved from http://www.reconnectingamerica.org/assets/Uploads/ctodvalcapture110508v2.pdf.

Center for Transportation Studies. (2009). Value Capture for Transportation Finance: Report to the Minnesota Legislature. *University of Minnesota*. Retrieved from www.cts.umn.edu/Publications/ResearchReports/pdfdownload.pl?id=1160.

Cervero, R. (2013), Bus Rapid Transit (BRT): An Efficient and Competitive Mode of Public Transport. *Berkeley Institute of Urban and Regional Development.* Retrieved from https://iurd.berkeley.edu/wp/2013-01.pdf

Cervero, R. et al. (2014). BRT TOD: Leveraging Transit Oriented Development With Bus Rapid Transit Investments. 36, 127 - 136. *Transport Policy.* Retrieved from https://www.sciencedirect.com/science/article/pii/S0967070X14001802

Cervero, R., Murakami, J., & Miller, M. A. (2009). Direct Ridership Model of Bus Rapid Transit in Los Angeles County. *Transportation Research Record.* Retrieved from https://trrjournalonline.trb.org/doi/abs/10.3141/2145-01

Chae, Yumi. (2012). The Impact of Light Rail Transit on Residential Value: Empirical Analysis of DART Green Line in Dallas. *University of Texas Community and Regional Planning Master's Report,* 1-35. Retrieved from https://repositories.lib.utexas.edu/handle/2152/ETD-UT-2012-05-5503

Chicago Transit Authority. (2018). Annual Ridership Report. *Chicago Transit Authority.* Retrieved from https://www.transitchicago.com/ridership/

Chicago Transit Authority. (2018). Open Data from the CTA. *Chicago Transit Authority.* Retrieved from https://www.transitchicago.com/data/

City and County of San Francisco Planning Department. (2015). Transportation Sustainability Fee- Fact Sheet. *City and County of San Francisco Planning Department.* Retrieved from http://default.sfplanning.org/plans-and-programs/emerging_issues/tsp/tsp_TSF_Fact_Sheet_072115.pdf

City Data. (2017). Dallas Economy. *Advameg, Inc.* Retrieved from http://www.city-data.com/us-cities/The-South/Dallas-Economy.html

City of Alexandria. (2017). Potomac Yard Metrorail Station Planning. *City of Alexandria.* Retrieved from https://www.alexandriava.gov/potomacyard/default.aspx?id=56902#RezoningandDevelopmentSpecialUsePermits

City of Austin Economic Development Department. (2017). Maintenance & Operations Public Improvement Districts. *City of Austin*. Retrieved from http://www.austintexas.gov/department/maintenance-and-operations-m-o-public-improvement-districts-pids

City of Austin. (2017). Municipal Codes. *City of Austin Municipal Codes.* Retrieved from https://library.municode.com/tx/austin/codes/code_of_ordinances?nodeId=TIT25LADE_CH25-9WAWA_ART3WAWACAREFE_DIV1GEPR_S25-9-311AP

City of Dallas. (2006). Forward Dallas! (sic) Comprehensive Plan. *Dallas City Hall.* Retrieved from http://dallascityhall.com/departments/pnv/strategic-planning/Pages/comprehensive-plan.aspx

City of Dallas. (2015). The GrowSouth Plan. *GrowSouth*. Retrieved from http://www.dallasgrowsouth.com/category/growsouthplan/

City of Garland. (2016). Downtown Redevelopment Phase II Program Status Update. *Garland Police.* Retrieved from www.garlandpolice.com/civicax/filebank/blobdload.aspx?BlobID=27045.

City of Houston Planning Department. (n.d.). City of Houston, Texas, Ordinance 2015-639. *City of Houston.* Retrieved from http://www.houstontx.gov/planning/DevelopRegs/docs_pdfs/Ord_2015-639.pdf

City of Houston. (2017). Tax Increment Reinvestment Zones (TIRZ). *City of Houston.* Retrieved from http://www.houstontx.gov/ecodev/tirz.html

City of Plano. (2012). Plano History. *City of Plano.* Retrieved from https://www.plano.gov/documentcenter/view/7498

City of Plano. (2015). Plano Tomorrow Comprehensive Plan. *City of Plano.* Retrieved from http://www.planotomorrow.org

City of Plano. (2016). Plano Financial Report. *City of Plano.* Retrieved from http://www.plano.gov/ArchiveCenter/ViewFile/Item/5469

City of Plano. (2017). Downtown Plano - Vision and Strategy. *City of Plano.* Retrieved from https://www.plano.gov/documentcenter/view/2977

City of San Antonio. (2017). One-Stop Zoning Map. *Geographic Information Services of the City of San Antonio*. Retrieved from gis.sanantonio.gov/PDS/onestop/index.html

Clifton, Jo. (2017). Council OKs Bowie Impervious Cover Swap. *Austin Monitor.* Retrieved from https://www.austinmonitor.com/stories/2017/04/council-oks-bowie-impervious-cover-swap/

Combs, Susan. (2011). Transit Sales and Use Tax. *Texas Comptroller of Public Accounts*. Retrieved from http://www.htasa.org/ATD/ATD_Tax.pdf

Dallas Area Rapid Transit. (1989). DART TOD Policy. *Dallas Area Rapid Transit.* Retrieved from http://www.dart.org/economicdevelopment/DARTTODPolicy.pdf

Dallas Area Rapid Transit. (2008). DART TOD Guidelines. *Dallas Area Rapid Transit.* Retrieved from http://www.dart.org/economicdevelopment/DARTTODGuidelines2008.pdf

Dallas Area Rapid Transit. (2013). Downtown Plano Station DART Fact Sheet. *Dallas Area Rapid Transit.* Retrieved from https://www.dart.org/about/economicdevelopment/factsheets/DowntownPlano.pdf

Dallas Area Rapid Transit. (2017). About DART. *Dallas Area Rapid Transit.* Retrieved from http://www.dart.org/about/aboutdart.asp

Dallas Area Rapid Transit. (2017). Cedars Station Fact Sheet. *Dallas Area Rapid Transit.* Retrieved from http://www.dart.org/about/tod.asp

Dallas Area Rapid Transit. (2017). DART Facts. *Dallas Area Rapid Transit.* Retrieved from https://www.dart.org/about/dartfacts.asp

Dallas Area Rapid Transit. (2017). DART Reference Book. *Dallas Area Rapid Transit.* Retrieved from http://www.dart.org/about/dartreferencebookmar17.pdf

Dallas Chamber. (2017). Commuting Patterns; Getting to Work. *Dallas Economic Development Guide.* Retrieved from https://www.dallaschamber.org/wp-content/uploads/2016/03/Access-Commuting-Patterns.pdf

Dallas City Attorney. (2015). Dallas Development Code, Chapter 51. *Dallas City Attorney.* Retrieved from http://www.dallascityattorney.com/51/51TOC.html

Dallas City Attorney. (2017). Dallas Development Code, ARTICLE 317. PD 317. Cedars Area Special Purpose District. *Dallas City Attorney.* Retrieved from http://www.dallascityattorney.com/51P/Articles%20Supp%2046/ARTICLE%20317.pdf

Dallas Economic Development. (2017). Deep Ellum TIF District. *City of Dallas Office of Economic Development*. Retrieved from https://www.dallasecodev.org/367/Deep-Ellum-TIF-District

Dallas Office of Economic Development. (2012). Steering Opportunity: Discovering New Ways to Implement Your Project in a Challenging Investment Climate - Dallas. *City of Dallas.* Retrieved from https://www.txplanning.org/media/files/page/Karl_Stundins.pdf

Dallas Office of Economic Development. (2017). South Side PD. *City of Dallas.* Retrieved from https://www.dallasecodev.org/438/South-Side-PID

Dallas Office of Economic Development. (2017). TOD TIF District. *City of Dallas.* Retrieved from https://www.dallasecodev.org/440/TOD-TIF-District

Data USA. (2015). Dallas-Fort Worth-Arlington, TX Metro Area. *Data USA.* Retrieved from https://datausa.io/profile/geo/dallas-fort-worth-arlington-tx-metro-area/#demographics

Davila, Vianna. (2015). Bexar County Regional Population Expected to Keep Booming: Much New Development Expected Along I-35 Corridor," *My San Antonio*. Retrieved from http://www.mysanantonio.com/150years/article/Bexar-County-regional-population-expected-to-6529803.php

Davila, Vianna. (2016). New Development Could Start on the South Side. *San Antonio Express-News.* Retrieved from www.expressnews.com/news/local/article/New-development-could-start-on-the-South-Side-6790717.php

Delaware Valley Regional Planning Commission (DVRPC). (2007). On Track: Progress Toward Transit-Oriented Development in the Delaware Valley. *Delaware Valley Regional Planning Commission.* Retrieved from https://www.dvrpc.org/Products/07030/

Drake, Sarah, et al. (2012). UT is Austin's Largest Employer. *Austin Business Journal*. Retrieved from https://www.bizjournals.com/austin/news/2012/06/08/ut-is-austins-largest-employer.html

Drubin, Dee-Ann. (2016). US Average Fuel Economy at Record High of 24.8 Mpg. *Phys.org - News and Articles on Science and Technology*. Retrieved from https://www.phys.org/news/2016-11-average-fuel-economy-high-mpg.html.

Express-News Editorial Board. (2018). No Rail in Transit Plan? No Problem. *My San Antonio.* Retrieved from https://www.mysanantonio.com/opinion/editorials/article/No-rail-in-transit-plan-No-problem-12886208.php

Federal Highway Administration (FHWA). (2012). Project Profile: Potomac Yard Metrorail Station. *Federal Highway Administration.* Retrieved from https://www.fhwa.dot.gov/ipd/project_profiles/va_potomac_metrorail_station.aspx

Federal Transit Administration. (2018). MetroRapid Bus Rapid Transit Project Before-And-After Study. *Federal Transit Administration.* Retrieved from https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/funding/grant-programs/capital-investments/115406/2018-texas-austin-metrorapid-brt.pdf

Florida Department of Transportation (FDOT). (2012). Florida Transit Oriented Development Guidebook. *Florida Department of Transportation.* Retrieved from http://www.fltod.com/Florida%20TOD%20Guidebook-sm.pdf

Friedman, P. (2012). Investment Up in the Air: Air Rights and Transit. *Community Transportation Association of America.* Retrieved from http://web1.ctaa.org/webmodules/webarticles/articlefiles/RAIL_30_AirRights.pdf

Garland Economic Development Partnership. (2012). Incentives. *City of Garland.* Retrieved from https://www.garlandtexas.org/select-garland/incentives/index.html. Accessed 22 Oct. 2017.

Gateway Planning. (2011). Verano-Texas A&M San Antonio, Texas. *Gateway Planning*. Retrieved from https://www.gatewayplanning.com/universities.php?page=154

Grand Boulevard Initiative. (2016). Transit Ridership. *Grand Boulevard Initiative* Retrieved from https://grandboulevard.net/

Greater Cleveland Regional Transit Authority. (2007). Transit Oriented Development Guidelines. *Reconnecting America.* Retrieved from http://www.reconnectingamerica.org/resource-center/browse-research/2007/cleveland-transit-oriented-development-guidelines/

Harrington, K. (2014). The Battle for East Austin's Plaza Saltillo. *Building ATX.* Retrieved from http://buildingatx.com/2014/05/the-battle-for-east-austins-plaza-saltillo/

Harris County Metropolitan Transit Authority. (2017). Transit Centers. *Ride Metro.* Retrieved from http://www.ridemetro.org/Pages/TransitCenter.aspx

Harris County Metropolitan Transit Authority. (n.d.). Joint Development Guidelines, Policies and Procedures. *Ride Metro.* Retrieved from https://www.ridemetro.org/Pages/JointDevelopmentGuidelines.aspx

Harris County Metropolitan Transit Authority. (n.d.). METRORail Green Line Map & Schedules. *Ride Metro.* Retrieved from https://www.ridemetro.org/Pages/GreenLine.aspx.

Indy Connect. (2015). Transit Oriented Development Strategic Plan. *Indy Connect.* Retrieved from https://issuu.com/indyconnect/docs/tod_strategic_plan_april_2015_01_pl

InMotion. (2013). Transit Oriented Development Along DART Rail: 1994-2015. *Dallas Area Rapid Transit.* Retrieved from https://www.dart.org/about/inmotion/spring13/DARTRailTOD.pdf

Institute for Transportation & Development Policy. (2017). The BRT Standard. *Institute for Transportation & Development Policy.* Retrieved from https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/

Jillella, S.S.K.; Matan, A.; Newman, P. (2015). Participatory Sustainability Approach to Value Capture-Based Urban Rail Financing in India through Deliberated Stakeholder Engagement. *Sustainability.* Retrieved from http://www.mdpi.com/2071-1050/7/7/8091

Jones, Craig E., and David Ley. (2016). Transit-Oriented Development and Gentrification Along Metro Vancouver's Low-Income SkyTrain Corridor. *The University of Toronto Cities Centre.* Retrieved from http://neighbourhoodchange.ca/documents/2015/07/vancouvers-skytrain-corridor.pdf

Kain, J. F. and Quigley, J. (1970). Measuring the Value of Housing Quality. *Journal of the American Statistical Association*. Retrieved from https://www.jstor.org/stable/2284565

Kain, Joohn F Zvi Li. (1999). Secrets of Success: Assessing the Large Increases in Transit Ridership Achieved by Houston and San Diego Transit Providers. *Transportation Research*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0965856499000099

KC Streetcar. (2017). Significant Sales Tax Growth in Downtown TDD. *KCATA.* Retrieved from http://kcstreetcar.org/significant-sales-tax-growth-downtown-tdd/

Kerr, Drew. (2017). Rail Lines Set Records as Metro Transit Ridership Tops 81.9 Million in 2017. *Metro Transit.* Retrieved from https://www.metrotransit.org/rail-lines-set-records-as-metro-transit-ridership-tops-819-million-in-2017

King County. (2016). Transfer of Development Rights in King County, Washington. *King County.* Retrieved from http://www.kingcounty.gov/services/environment/stewardship/sustainable-building/transfer-development-rights.aspx

Lee, Hyung-Woo, Ki-Chan Kim, and Ju Lee. (2006). Review of Maglev Train Technologies. *IEEE Transactions on Magnetics*. Retrieved from https://ieeexplore.ieee.org/document/1644911/

Lewis, Carol Abel, and Gwendolyn C. Goodwin. (2012). Impact of Bus Transit Centers on Values of Nearby Single-Family Residential Land in Houston. *Transportation Research Record: Journal of the Transportation Research Board.*

Lloyd B. Potter and Hoque, Nazrul. (2014). Texas Population Projections, 2010 to 2050. *Office of the State Demographer.* Retrieved from http://demographics.texas.gov/Resources/Publications/2014/2014-11_ProjectionBrief.pdf

Los Angeles Metro Developer. (2018). Download GIS Data. *Metro.* Retrieved from https://developer.metro.net/introduction/gis-data/download-gis-data/

Los Angeles Metro. (2018). Interactive Estimated Ridership Stats. *Metro.* Retrieved from https://www.metro.net/news/ridership-statistics/

Lynx. (2018). FY2017 Fixed Route Ridership. *Lynx.* Retrieved from https://www.golynx.com/core/fileparse.php/97315/urlt/05-24-2018-Oversight-Committee-Pkg-Rev1.pdf

Lynx. (2018). GIS Mapping. *Lynx.* Retrieved from https://www.golynx.com/corporate-info/what-we-are-working-on/gis-mapping.stml

Marshall, Jolinda. Interview. April 2017.

Maryland DOT. (2003). Purple Line Transit-Oriented Development Guidelines and Principles. *Maryland DOT.* Retrieved from http://www.mdot.maryland.gov/Office_of_Planning_and_Capital_Programming/Plans_Programs_Reports/Historical_Documents/Purple_Line_TOD_Guidelines.pdf

Massachusetts Bay Transportation Authority (MBTA). (2008). Forest Hills Improvement Initiative: A Partnership for Building a Better Community. *Massachusetts Bay Transportation Authority.* Retrieved from https://www.old.mbta.com/uploadedfiles/About_the_T/T_Projects/T_Projects_List/Forest%20Hills%20U%20&%20D%20Guidelines%202008-09-23sm.pdf

Massachusetts Bay Transportation Authority Real Estate. (n.d.). Forest Hills, Parcel V & W. *MBTA Realty.* Retrieved from www.mbtarealty.com/wp-content/uploads/projects/1299/Forest-Hills-Parcel-V-W-1.pdf.

Massachusetts Bay Transportation Authority Real Estate. (n.d.). Transit-Oriented Development. *MBTA Realty.* Retrieved from https://www.mbtarealty.com/transit-oriented-development/

Mathur, S., & Smith, A. (2014). Transit Impact Fee-Enabling Statutes and Equity Concerns. *Transportation Research Board*. Retrieved from http://trrjournalonline.trb.org/doi/pdf/10.3141/2346-02

Matthews Southwest. (2017). Artist Tenants. *Southside Dallas.* Retrieved from http://www.southsidedallas.com/tenant/sam-fuller/

McCormick, Kathleen. (2016). How TOD Is Fueling Growth in Southern Dallas. *Urban Land Institute.* Retrieved from https://urbanland.uli.org/industry-sectors/infrastructure-transit/tod-fueling-growth-southern-dallas/

Mealer, Lauren. (2017). Ector County Sales Tax Slated for November Ballot. *Empower Texans*. Retrieved from https://empowertexans.com/around-texas/ector-county-sales-tax-slated-november-ballot/

Medda, Francesca Romana, and Marta Modelewska. (2010). Land Value Capture as a Funding Source for Urban Investment: The Warsaw Metro System. *Ernst & Young Better Government Program. University College London.* Retrieved from www.ucl.ac.uk/qaser/pdf/publications/ernst_young

Mergo, Cheryl. (2016). Museum Park Livable Centers Study. *Houston-Galveston Area Council*. Retrieved from http://www.h-gac.com/community/livablecenters/planning-studies/museum-park.aspx

Metropolitan Area Planning Council. (2012). Growing Station Areas: The Variety and Potential of Transit Oriented Development in Metro Boston. *Metropolitan Area Planning Council*. Retrieved from cache.boston.com/news/pdfs/MAPC_TOD_Report.pdf.

Milne, Anne. Interview. April 2017.

Minnesota Geospatial Commons. (2018). Transportation. *Minnesota Geospatial Commons.* Retrieved from https://gisdata.mn.gov/group/transportation

Miotti, Marco, Geoffrey Supran, Ella Kim, Jessika Trancik. (2016). Personal Vehicles Evaluated against Climate Change Mitigation Targets. *Environmental Science and Technology.* Retrieved from https://pubs.acs.org/doi/full/10.1021/acs.est.6b00177

Mitchell, Terry. Interview. April 2017.

Monroy, M. (n.d.). Street Impact Fees- Impact Fees in Texas. *City of Austin.* Retrieved from http://www.austintexas.gov/sites/default/files/files/COA-TD-SIF-101-FINAL.PDF

My San Antonio. (2016). A Primo Reason for More VIA Funding. *My San Antonio.* Retrieved from https://www.mysanantonio.com/opinion/editorials/article/A-Pr-mo-reason-for-more-VIA-funding-7089914.php

National Academies of Sciences, Engineering, and Medicine; Transportation Research Board; Transit Cooperative Research Program; Sasha Page; Bill Bishop; Waiching Wong. (2017). Guide to Value Capture Financing for Public Transportation Projects. *The National Academies of Sciences, Engineering, and Medicine.* Retrieved from www.nap.edu/catalog/23682/guide-to-value-capture-financing-for-public-transportation-projects

NCTCOG TOD Team. Interview. April 2017.

Nelinson, Krystle. (2017). Where Connections Happen: TOD & the Redevelopment of Downtown Carrollton. *Texas APA Conference.* Speech.

Nelson, Arthur C. and Dejan Eskic, Shima Hamidi, Susan J. Petheram, Reid Ewing, and Jenny H. Liu. (2015). Office Rent Premiums with Respect to Light Rail Transit Stations. Case Study of Dallas, Texas, with Implications for Planning of Transit-Oriented Development. *Transportation Research Record: Journal of the Transportation Research Board.* Retrieved from https://trrjournalonline.trb.org/doi/10.3141/2500-13

Nelson, Arthur C., Rick Pruetz, and Doug Woodruff. (2013). The TDR Handbook: Designing and Implementing Transfer of Development Rights Programs. *Island Press.* Retrieved from https://books.google.com/books?id=2VtU3KIWd1MC&dq=king+county+washington+transfer+development+rights+%22transit+oriented%22&source=gbs_navlinks_s

North Central Texas Council of Governments (NCTCOG). (2016). Downtown Plano Station NCTCOG Fact Sheet. *North Central Texas Council of Governments.* Retrieved from http://www.nctcog.org/trans/sustdev/tod/factsheet/DT_Plano.pdf

North Central Texas Council of Governments (NCTCOG). (2016). Rail Station Fact Sheet: Cedars Station. *NCTCOG.* Retrieved from http://www.nctcog.org/trans/sustdev/tod/factsheet/Cedars.pdf

North Central Texas Council of Governments (NCTCOG). (n.d.). Rail Station Fact Sheet-Downtown Garland Station. *NCTCOG.* Retrieved from www.nctcog.org/trans/sustdev/tod/factsheet/DT_Garland.pdf

NYS GIS Clearinghouse. (2018). Capital District Transportation Authority. *New York State.* Retrieved from https://gis.ny.gov/gisdata/inventories/member.cfm?organizationID=98

Page, Sasha, William Bishop, and Waiching Wong. (2016). Guide to Value Capture Financing to Public Transportation Projects. *Transit Cooperative Research Program; National Academies of Sciences, Engineering, and Medicine.* Retrieved from http://www.trb.org/Main/Blurbs/175203.aspx

Pan, Qisheng, Haixiao Pan, Ming Zhang, and Baohua Zhong. (2014). Effects of Rail Transit on Residential Property Values. Comparison Study on the Rail Transit Lines in Houston, Texas, and Shanghai, China. *Transportation Research Record: Journal of the Transportation Research Board.* Retrieved from https://trrjournalonline.trb.org/doi/10.3141/2453-15

Pan, Qisheng. (2012). The Impacts of an Urban Light Rail System on Residential Property Values: A Case Study of the Houston METRORail Transit Line. *Transportation Planning and Technology*. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/03081060.2012.739311

Parcel U / Forest Hills. (2014). Site Plan. *Urbanica, Inc.* Retrieved from https://www.parcel-u.com/p/site-plan.html.

Paso del Norte Mapa. (2017) El Paso City / County. *Paseo del Norte Mapa.* Retrieved from http://www.pdnmapa.org/

Paterson, Robert, Susan Handy, Kara Kockelman, Chandra Bhat, Jumin Song, Jayanthi Rajamani, Juchul Jung, Kari Banta, Urvi Desai and John Waleski. (2003). Techniques for Mitigating Urban Sprawl. *FHWA, TXDOT.* Retrieved from http://ctr.utexas.edu/wp-content/uploads/pubs/0_4420_2.pdf

Patterson, Anne-Charlotte. Interview. April 2017.

Piedad, Joey. (2017). Stuck Behind the Wheel: How Rapid Bus Service May Reduce San Antonio Congestion. *Texas Public Radio.* Retrieved from https://www.tpr.org/post/stuck-behind-wheel-how-rapid-bus-service-may-reduce-san-antonio-congestion

Plumer, Brad. (2013). Cars in the U.S. Are More Fuel-Efficient than Ever. Here's How It Happened. *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/wonk/wp/2013/12/13/cars-in-the-u-s-are-more-fuel-efficient-than-ever-heres-how-it-happened/?utm_term=.547b967c8c3a

Pritchard, Caleb. (2017). Austin's Next Mobility Challenge: Free Parking. *Austin Monitor*. Retrieved from https://www.austinmonitor.com/stories/2017/06/austins-next-mobility-challenge-downtown-parking/

Rahim, Zamira. (2017). Here's How Much Sitting in Traffic Is Costing You. *Time Magazine.* Retrieved from http://time.com/money/4676929/traffic-los-angeles-driving/

Railfan Guides of the U.S. (2015). Todd's Railfan Guide to Austin, TX Capital MetroRail Commuter Line. *Railfan Guides.* Retrieved from http://www.railfanguides.us/tx/austinmetrorail/index.htm

Reconnecting America. (n.d.). Featured Topic: Joint Development. *Reconnecting America.* Retrieved from http://www.reconnectingamerica.org/resource-center/joint-development/

Reed, Philip, Nicole Arata. (2018). What Is the Total Cost of Owning a Car? *Nerdwallet.* Retrieved from https://www.nerdwallet.com/blog/loans/total-cost-owning-car/

Regional Plan Association. (2016). Gulf Coast. *America 2050*. Retrieved from http://www.america2050.org/gulf_coast.html

Regional Plan Association. (2016). Texas Triangle. *America 2050*. Retrieved from www.america2050.org/texas_triangle.html

Regional Transportation Commission of Washoe. (2018). Map Library. *Regional Transportation Commission of Washoe County.* Retrieved from https://www.rtcwashoe.com/metropolitan-planning/map-library/

Regional Transportation Commission. (2016). RTC Transit Operating Statistics. *Regional Transportation Commission.* Retrieved from https://www.rtcsnv.com/planning-engineering/transportation-planning/planning-studies-projects/

ROMA Design Group, HR & A Advisors, Studio 8 Architects, and Limbacher Godfrey Architects. (2009). Downtown Austin Plan Phase One Downtown Density Bonus Program. *City of Austin.* Retrieved from http://www.austintexas.gov/edims/document.cfm?id=133871

Rowlands, DW. (2018). Metrorail is No Longer the Second-Busiest Rapid Transit System in the Country. *Greater-Greater Washington.* Retrieved from https://ggwash.org/view/66466/metrorail-is-no-longer-the-second-busiest-rapid-transit-system-in-the-country

SA Tomorrow: Multimodal Transportation Plan. (2016). How do we get there? *City of San Antonio.* Retrieved from http://www.satransportationplan.com/files/managed/Document/413/Section%207%20How%20Do%20We%20Get%20There.pdf.

SANDAG. (2009). Smart Growth Score Card. Designing for Smart Growth: Creating Great Places in the San Diego Region. *SANDAG.* Retrieved from https://www.sandag.org/index.asp?projectid=344&fuseaction=projects.detail

SANDAG. (2015). Transit Oriented Districts: A Strategy for the San Diego Region. *SANDAG.* Retrieved from https://www.sandag.org/index.asp?classid=12&projectid=500&fuseaction=projects.detail

Schneider, Joachim. (2012). Public Private Partnership for Urban Rail Transit. *Springer Science and Business Media*. Retrieved from https://books.google.com/books?id=uV_2BwAAQBAJ&dq=%22special+assessment+district%22+%22transit%22+TOD+%22Texas%22&source=gbs_navlinks_s

Schroeder, Margaret. (2016). Brio Transforms El Paso Transportation. *Civil and Structural Engineer Magazine.* Retrieved from https://csengineermag.com/article/brio-transforms-el-paso-transportation/

Schwennesen, Tricia. (2017). San Antonio Ranks No. 3 for Largest 1-Year Population Increase, July 2015 to July 2016. *Biz Journals.* Retrieved from https://www.bizjournals.com/sanantonio/news/2017/05/25/san-antonio-ranksno-3-for-largest-1-year.html

Scribd. (2017). Assessing the Theory and Practice of Land Value Taxation. *Scirbd.* Retrieved from https://www.scribd.com/document/166124246/Assessing-the-Theory-and-Practice-of-Land-Value-Taxation

Siddiqui, Faiz. (2018). Falling Transit Ridership Poses an "Emergency" for Cities, Experts Fear. *Washington Post.* Retrieved from https://www.washingtonpost.com/local/trafficandcommuting/falling-transit-ridership-poses-an-emergency-for-cities-experts-fear/2018/03/20/ffb67c28-2865-11e8-874b-d517e912f125_story.html?utm_term=.b82caf0e645b

Smart Growth America. (2008). Transfer of Development Rights: Property Primer. *Smart Growth America.* Retrieved from https://www.smartgrowthamerica.org/app/legacy/documents/transfer-development-rights-policy-toolkit.pdf

Smart Preservation. (2018). San Marcos, Texas. *Smart Preservation.* Retrieved from http://smartpreservation.net/san-marcos-texas/

Sneider, Julie. (2018). DART's Light Rail System Is About to Get Even Longer. *Progressive Railroading.* Retrieved from https://www.progressiverailroading.com/passenger_rail/article/DARTs-light-rail-system-is-about-to-get-even-longer--54614

Solitare, L., Andress, L., Hamilton, W.J, Lewis, C., Crossley, D., Crossley, J.B. (2012). A Health Impact Assessment of Transit-Oriented Development at the Quitman Light Rail Station in Houston, Texas. Houston, TX: *Texas Southern University*. Retrieved from www.houstontomorrow.org/quitman-hia

State of Texas. (2001). Tex. Transp. Code Ann. § 451. *State of Texas.* Retrieved from https://statutes.capitol.texas.gov/Docs/TN/htm/TN.451.htm

State of Texas. (2009). Local Government Code Title 12. *State of Texas.* Retrieved from http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.372.htm

State of Texas. (2011). Tex. Loc. Gov't Code Ann. § 395. *State of Texas.* Retrieved from http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.395.htm

Sun Metro. (n.d.). Transit Fact Sheet. *Sun Metro.* Retrieved from http://www.sunmetro.net/~/media/files/sunmetro/factsheet.ashx?la=en

Sustainable Food Policy Board. (2015). Recommendation to Code Next from the Sustainable Food Policy Board. *City of Austin.* Retrieved from https://www.austintexas.gov/sites/default/files/files/Planning/CodeNEXT/Sustainable_Food_Policy_Board_RecommendationToCodeNext.pdf

Tao, S. et al. (2014). Exploring Bus Rapid Transit Passenger Travel Behavior Using Big Data. *Applied Geography*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0143622814001246

Texas Department of Transportation (TXDOT). (2018). Pass-Through Financing. *Texas Department of Transportation.* Retrieved from https://www.txdot.gov/government/programs/pass-finance.html

Texas Department of Transportation. (2017). Transportation Reinvestment Zone. *TXDOT.* Retrieved from https://www.txdot.gov/government/programs/trz.html

Texas Entertainment Services. (2016) South Side Ballroom. *Gilley's Dallas*. Retrieved from http://gilleysdallas.com/south-side-ballroom

Topalovic, P., J. Carter, M. Topalovic, and G. Krantzberg. (2012). Light Rail Transit in Hamilton: Health, Environmental and Economic Impact Analysis. *Social Indicators Research*. 329-50. Retrieved from https://eric.ed.gov/?id=EJ973585

Transit Cooperative Research Program (TCRP). (2004). Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects. *Transit Cooperative Research Program.* Retrieved from https://www.valleymetro.org/sites/default/files/legacy-images/uploads/general_publications/TCRP-Report-102_TOD-in-the-US-Experiences-Challenges-and-Prospects_10-04.pdf

Travaline, Mike. Interview. November 2017.

Tynberg, Alex. Interview. April 2017.

U.S. Census Bureau. (2014). American Community Survey 5-Year Estimates (2010-2014) by Block Group. *U.S. Census Bureau.* Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

U.S. Census Bureau. (2016). American Community Survey 5-Year Estimates - Dallas. *U.S. Census Bureau.* Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

U.S. Census Bureau. (2017). 2010 Census Summary File Table DP-1. *U.S Census Bureau.* Retrieved from https://www.census.gov/prod/cen2010/doc/sf1.pdf

U.S. Department of Commerce. (2017). Gross Domestic Product by Metropolitan Area, 2016. *Bureau of Economic Analysis.* Retrieved from https://www.bea.gov/newsreleases/regional/gdp_metro/2017/gdp_metro0917.htm

U.S. Department of Energy. (2016). *U.S. Department of Energy.* Retrieved from https://www.afdc.energy.gov/data/

URS Urban Design Studio. (2009). Richland Hills Trinity Railway Express (TRE) Station. *Richland Hills.* Retrieved from http://www.richlandhills.com/home/showdocument?id=16

Vadali, S. (2011). Planning Tools to Assess the Real Estate Leveraging Potential for Roadways and Transit: Technical Reports. *Texas Transportation Institute.* Retrieved from https://static.tti.tamu.edu/tti.tamu.edu/documents/0-6538-1.pdf

Vadali, Sharada Ph.D. (2017). Value Capture Tools—Texas Style. *Texas A&M Transportation Institute*. Lecture.

Valley Transit Authority. (2017). Current Bus System Data. *Santa Clara Valley Transportation Authority.* Retrieved from http://www.vta.org/getting-around/vta-ridership

Valley Transit Authority. (2018). Open Data Portal. *Santa Clara Valley Transportation Authority.* Retrieved from http://data.vta.org/

VIA Metropolitan Transit (2017). Ridership Report. *VIA Metropolitan Transit.* Retrieved from www.viainfo.net

VIA Metropolitan Transit. (2016). Vision 2040: Long Range Plan. *VIA Metropolitan Transit.* Retrieved from http://www.viavision2040.com/wp-content/uploads/2016/08/2016_0824_VIA_2040_LRP.pdf

Viña, Christine. Interview. October 2017.

Weinstein, Bernard, and Terry Clower (1999). The Initial Economic Impacts of the DART LRT System. *University of North Texas.* Retrieved from https://digital.library.unt.edu/ark:/67531/metadc30378/

Weinstein, Bernard, and Terry Clower. (2002). An Assessment of the DART LRT on Taxable Property Valuations and Transit Oriented Development. *University of North Texas.* Retrieved from https://www.valleymetro.org/sites/default/files/legacy-images/uploads/lightrail_publications/2002_DART_LRT__Property_Values.pdf

Welch, Terrence. (2007). Rough Proportionality: Who Pays for Infrastructure? *Texas City Attorneys Association*. Retrieved from https://www.tml.org/legal_pdf/Who-Pays-Infrastructure.pdf

Widner, C. (2017). Plaza Saltillo Development Finally Underway. *Curbed Austin.* Retrieved from https://austin.curbed.com/2017/6/29/15896540/austin-development-plaza-saltillo-started

Wood, Brittany S., Mark W. Horner, Michael Duncan, and Yazmin Valdez-Torres. (2016). Aging Populations and Transit-Oriented Development. *Transportation Research Record: Journal of the Transportation Research Board*. 75-83. Retrieved from https://trrjournalonline.trb.org/doi/10.3141/2598-09

Yantis, Tom. Interview. April 2017.

Zhang, Ming, Haitao Yu, and Hao Pang. (2017). Value-Added Effects of Transit-Oriented Development: The Impact of Urban Rail on Commercial Property Values with Consideration of Spatial Heterogeneity. *Papers in Regional Science.* Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/pirs.12304

Zhang, Ming. Transit Oriented Development. September 2017. Lecture.

Zhang, Ming. (2007). Value Capture Through Integrated Land Use–Transit Development: Experience from Hong Kong, Taipei, and Shanghai. *Urbanization in China: Critical Issues in an Era of Rapid Growth.* Retrieved from http://connection.ebscohost.com/c/book-chapters/36153595/chapter-2-value-capture-through-integrated-land-use-transit-development-experience-from-hong-kong-taipei-shanghai