



Opportunities for Increasing Sustainable Transport: Spotlight on Dallas, Denver, Nashville

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For an in-depth look into the indicators developed and measured to analyze cities in this report, please read ITDP's "Indicators for Sustainable Mobility" and visit naindicators.itdp.org.

DEEP DIVE CASE STUDY CITY INTERVIEWS

DALLAS

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KEY TERMS

Accessibility to Transit Stations: a 500 meter (0.31 miles) walk or a 10 minute bike ride to a transit station (conservative estimate)¹

Bus Rapid Transit (BRT): a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities; the BRT Standard evaluates BRT corridors based on a range of metrics to establish a common definition of BRT through the BRT Basics, and recognizes particularly high-quality corridors²

Capital Investment Grant (CIG): a Federal Transit Administration (FTA) funding allocation for transit projects through programs such as New Starts, Small Starts, and Core Capacity Improvements.

Catchment Area: the area around a transit station where the system is accessible to potential riders

Complete Streets: streets designed to ensure safe access for all users regardless of age, ability, or mode of transportation, including pedestrians, bicyclists, transit riders, and motorists³

Frequent Transit: less than 12-minute headways on average from 7am-9pm

Greenhouse Gas (GHG): a pollutant that contributes to heat in the atmosphere by absorbing infrared radiation (e.g., carbon dioxide and chlorofluorocarbons)⁴

High Occupancy Vehicle (HOV) Lanes: separated lanes that encourage ridesharing and reduce vehicle miles traveled (VMT); typically, HOV lanes are open to motor vehicles carrying two or more people, and sometimes access is open to motorcycles or vehicles that use alternative fuels (hybrid or electric vehicles)⁵

Low-income: a measure of the percentage of households that are making less than \$20,000 (the federal poverty level is \$20,780 for a household of three);⁶ a household is used as the unit of analysis because that is how the data is aggregated by the United States Census.

Light Rail Transit (LRT): a system of railways usually powered by overhead electrical wires and used for medium-capacity local transportation in metropolitan areas⁷

Metro Area Boundary: defined by the Global Rural-Urban Mapping Project (GRUMP)—a Data Center in NASA's Earth Observing System Data and Information System (EOSDIS)

Metropolitan Statistical Area (MSA): a central city area defined by the corporate limits; an urbanized, built-up area contiguous to the central city; and a non-urbanized area, delimited on a county basis, economically tied to a central city⁸

1 The 500 meter (0.31 miles) walking number is calculated using distance as a cost, where the biking number is calculated using travel time as a cost. 10.41 minutes is how long it takes to walk 500 meters using the walkspeed in the model. We use time as the cost to include bikes and show how they may extend the area near the frequent transit.

2 ITDP, *The Bus Rapid Transit Standard* (2016). <https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/>

3 Smart Growth America, *What are Complete Streets?* (2018). <https://smartgrowthamerica.org/program/national-complete-streets-coalition/publications/what-are-complete-streets/>

4 EPA, *Greenhouse Gas Emissions* (2016). <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

5 U.S. Department of Transportation, *High-Occupancy Vehicle Lanes* (2015). <https://www.transportation.gov/mission/health/High-Occupancy-Vehicle-Lanes>

6 Centers for Medicare & Medicaid Services, *Federal Poverty Level* (2018). <https://www.healthcare.gov/glossary/federal-poverty-level-fpl/>

7 Encyclopedia Britannica, *Light Rail Transit* (2018). <https://www.britannica.com/technology/light-rail-transit>

8 Encyclopedia Britannica, *Hinterland Geography* (2018). <https://www.britannica.com/science/hinterland#ref88658>

Mode Share: the percentage of the population or trips that use a particular mode of transportation (e.g., driving alone, public transit, walking, and bicycling)⁹

Multimodal: travel that uses a combination of different means of transport
Park-and-Ride: a location for commuters to park their cars and switch to a carpool, vanpool, bus, train, or another shared transit mode to travel to work¹⁰

People Near Frequent Transit (PNFT): an indicator that measures the percentage of the population that is within a 10-minute bike ride or walk of a frequent transit stop¹¹

People Near Rapid Transit (PNT): an indicator that measures the percentage of the population that is within a 500 meter (0.31 miles) walk of a rapid transit station¹²

Sharrows: road markings used to indicate a shared lane environment for bicycles and automobiles (a.k.a. shared lane markings)¹³

Spatial Mismatch: the geographic disparity between the locations of households and employment opportunities in urban areas¹⁴

Sustainable Transport: Public transport, walking and cycling

Transport Demand Management (TDM): aims to maximize the efficiency of the urban transport system by discouraging unnecessary private vehicle use and promoting more efficient, healthy, and environmentally friendly modes of transport and non-motorized modes of transport¹⁵

Transport Network Company (TNC): a ridesourcing service provider that connects passengers via websites and mobile apps with drivers of personal vehicles who provide prearranged and on-demand transportation services for compensation; transportation network companies are examples of shared mobility¹⁶

Transit Oriented Development (TOD): compact, mixed-use development, within walking distance of high capacity transit; TOD features vibrant streetscapes, pedestrian-oriented built forms, and land use characteristics that make it convenient and safe to walk, cycle, and use public transport¹⁷

Vehicle Miles Traveled (VMT): measures the amount of travel for all vehicles in a geographic region over a given period, typically one year¹⁸

9 U.S. Department of Transportation, *Commute Mode Share* (2016).

<https://www.transportation.gov/mission/health/commute-mode-share>

10 New York State Department of Transportation, *Park-and-Ride Locations* (2018). <https://www.dot.ny.gov/programs/parkandride>

11 ITDP, *Indicators for Sustainable Mobility*, (2019), <https://www.itdp.org/publication/indicators-sustainable-mobility/>

12 ITDP, *Indicators for Sustainable Mobility*, (2019), <https://www.itdp.org/publication/indicators-sustainable-mobility/>

13 NACTO, *Urban Bikeway Design Guide* (2014).

14 <https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/shared-lane-markings/>

14 Keith Ihlanfeldt, Georgia State University, *The Spatial Mismatch Between Jobs and Residential Locations Within Urban Areas* (Cityscape, 1994).

15 GIZ, *Transport Demand Management* (2009).

https://www.sutp.org/files/contents/documents/resources/H_Training-Material/GIZ_SUTP_TM_Transportation-Demand-Management_EN.pdf

16 U.S. Department of Transportation, *Shared Mobility: Current Practices and Guiding Principles* (2017).

<https://ops.fhwa.dot.gov/publications/fhwahop16022/index.htm>

17 ITDP, *What is TOD?* (2017) <https://www.itdp.org/library/standards-and-guides/tod3-0/what-is-tod/>

18 Texas A&M Transportation Institute, *Methodologies Used to Estimate and Forecast Vehicle Miles Traveled (VMT)* (July 2016).

<https://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-15-40-F.pdf>

INTRODUCTION

The objective of this report is to understand how select U.S. cities are implementing projects and policies to increase their sustainable transport mode share. Mobility services and land use developments in the U.S. are overwhelmingly predicated on driving for most needs. Yet a few standout cities are spotlighting how to expand sustainable mobility with measurable targets. A broad assessment was conducted in a dozen cities with deeper evaluations in three main case studies. The cities were selected for inclusion in this report based on population growth, comprehensive plans, infrastructure funding commitments, and political leadership. The assessments include a review of policy documents, a scan of news articles, telephone and in-person interviews with local stakeholders in deep dive cities, and in-person capacity building workshops to test assumptions using mobility indicators developed by ITDP. Recommended opportunities to improve sustainable mobility are highlighted in the three deep dive cities with short- and long-term strategies.

The dominant mobility paradigm in many U.S. cities limits access to goods and services for people without a car, especially the elderly, children, disabled people, and low-income families. Meanwhile, the transport sector is the largest contributor to greenhouse gas emissions (GHG) in the U.S., generating 28.5% of all emissions.¹⁹ Transport GHG is growing at a faster rate than other sectors. The long-term potential to mitigate these realities and increase access to opportunities for all people within cities will depend on a shift toward sustainable transport and away from drive-alone trips. Cities succeeding in the paradigm shift are evaluating existing travel behavior and setting measurable mode split targets. As a result, these cities are better able to monitor mobility services and expand infrastructure investments.

Several U.S. cities are setting transport mode share targets for the next decade or two. These cities are also dedicating funding toward project implementation to achieve sustainable mobility goals. For instance, Minneapolis is working on performance-based policies that are included in numerous documents such as the city's comprehensive plan (2018), protected bikeway plan (2015), complete streets policy (2016), funding allocation for parks and streets (2016), adoption of parking reforms into building codes (2015), and an update of zoning regulations to allow accessory dwelling units, duplexes and/or 'granny flats' to address the supply of affordable housing across the entire city.²⁰ The table below illustrates cities leading by example.

¹⁹ EPA, *Sources of Greenhouse Gas Emissions* (2018).
<https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

²⁰ Mark Thieroff, Streets. MN (2018).
<https://streets.mn/2018/03/20/accessory-dwelling-units-a-tale-of-two-cities/>

Table 1:
**City Mode Shares
and Targets**

	BOSTON		DENVER		ATLANTA		SEATTLE		MINNEAPOLIS	
	CURRENT	TARGET 2030	CURRENT	TARGET 2030	CURRENT	TARGET 2030	CURRENT	TARGET 2035	CURRENT	TARGET 2040
DRIVE ALONE	39%	19.5%	73%	50%	54%	35%	30%	18%	60%	50%
PUBLIC TRANSIT	34%	67%	7%	15%	17%	35%	48%	--	14%	--
WALK	14%	21%	5%	7.5%			8%	35%	7%	--
BIKE	2%	8%	2%	7.5%	29%	30%	3%	12% (by 2030)	4%	15% (by 2025)
CARPOOL	6%	reduce marginally	9%	--			10%	--	8%	--
OTHER/ WORK FROM HOME	5%	increase marginally	4%	--	6%	--	6%	--		
INVESTMENTS	\$5 million annually to achieve targets ²¹		\$2 billion total ²² \$431 million for transport, \$18 million for bike infrastructure ²³		\$100 million state-issued bond for transit improvements over 10 years ²⁴		\$835 million for road safety, \$855 million for transport, and \$370 million for sidewalks over 10 years by 2025 ²⁵		\$400 million over 20 years for complete streets, ²⁶ \$9.8 million per year for Bicycle Master Plan ²⁷	

SUSTAINABLE MOBILITY LANDSCAPE IN THE U.S.

In an ongoing study conducted at Harvard University, and a separate report from the NYU Rudin Center for Transportation, findings show that commuting time is the single strongest factor in the odds of escaping poverty.²⁹ The typical metropolitan commuter can reach only about 30 percent of jobs by public transit in 90 minutes or less, and only about one-quarter of those jobs are in low- and middle-skill industries.²⁹ These trends have tremendous implications, particularly for low- and middle-income residents.

In the first quarter of 2016, passenger trips for all public transit modes decreased nationwide by 3.13%.³⁰ Despite this slight reduction, especially between 2016 and 2017, public transport ridership (including heavy rail, light rail, commuter rail, trolleybus, and bus) has shown significant long-term growth—55% between 1973 and 2014. Of these modes, bus ridership has grown around 6% while heavy rail and light rail have more than doubled. Public transit ridership has increased by over a billion trips in the past two decades. Reasons for this continued growth include investments

21 Metro Magazine, *Boston Mayor unveils \$5M plan to boost city's transportation* (2018). <http://www.metro-magazine.com/management-operations/news/729191/boston-mayor-unveils-5m-plan-to-boost-city-s-transportation>

22 City of Denver, *Mobility Action Plan* (2018). <https://www.denvergov.org/content/denvergov/en/mayors-office/programs-initiatives/mobility-action-plan.html>

23 Jared Brey, Next City, *Denver Transportation Gets a \$430 Million Funding Boost* (2017). <https://nextcity.org/daily/entry/denver-transportation-430-million-funding-boost>

24 State of Georgia Office of the Governor, *Deal signs historic mass transit legislation* (2018). <https://gov.georgia.gov/press-releases/2018-05-03/deal-signs-historic-mass-transit-legislation>

25 Seattle Department of Transportation, *Move Seattle* (2015). <https://www.seattle.gov/Documents/Departments/SDOT/About/DocumentLibrary/MoveSeattle-FinalDraft-2-25-Online.pdf>

26 City of Minneapolis, *Linking Land Use & Transportation in Minneapolis* (2018). https://www.mayorsinnovation.org/images/uploads/pdf/2_Bender.pdf

27 City of Minneapolis, *Funding* (2010). http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/webcontent/convert_253725.pdf

28 Raj Chetty and Nathaniel Hendren, Harvard University, *The Impacts of Neighborhoods on Intergenerational Mobility* (2015). http://www.equality-of-opportunity.org/images/nbhds_exec_summary.pdf

29 Adie Tomer, Elizabeth Kneebone, Robert Puentes, and Alan Berube, *Missed Opportunity: Transit and Jobs in Metropolitan America* (Brookings, 2011). <https://www.brookings.edu/research/missed-opportunity-transit-and-jobs-in-metropolitan-america/>

30 American Public Transportation Association, *Transit Ridership Report* (First Quarter, 2017). <http://www.apta.com/resources/statistics/Documents/Ridership/2017-q1-ridership-APTA.pdf>

in public transit as well as renewed interest in urban living and real estate development in transit-accessible areas. More investment in transit leads to better service, thereby establishing a reliable option for commuters.³¹

New mobility services have the potential to further boost access to frequent transit, including small-wheeled personal mobility options such as e-scooters and dockless bikes. Transport Network Companies (TNCs) such as Uber and Lyft that use apps for multi-modal transport options potentially offer first- and last-mile connections, extending the immediate service area of frequent transit corridors. These services succeed financially and operationally where there is a higher population density—the same ripe condition for attracting riders to frequent transit.

Shared-use mobility partnerships with transit agencies can complement public transit by reducing reservation times and improving accessibility for seniors, children, and disabled travelers. All the case study cities surveyed in this report provide paratransit as a requirement under the Americans with Disabilities Act (ADA) to offer rides to people with mobility limitations. Current paratransit, taxis, and on-demand shuttle services operate at a premium cost to the user or receive public subsidies. There is still more research needed to understand their utility in reducing drive-alone trips and the potential for them to connect low-density areas to frequent transit.

Meanwhile, bicycling is proving to be a strong last-mile connector to frequent transit as well as a stand-alone commuting mode. Cycling nationwide is on the rise with the implementation of new infrastructure—from protected lanes to public for hire bike-share systems, including emerging dockless and electric-assist bike-share offerings. An analysis of bicycle commuting in American cities found rates grew 62% between 2000 and 2013, with nearly 900,000 bike commuters per day.³² Many U.S. and international cities have also noted economic benefits for local businesses after the implementation of bicycling paths—due to increased activity in front of their shops and the ease of parking a bicycle.³³

GENERAL WORK APPROACH

This broad scan of U.S. cities conducted by ITDP provides a better understanding of how national sustainable transport trends are playing out on the ground. In a review of about a dozen U.S. cities that focused on frequent transit, land use, political will, and funding opportunities, three cities emerged for deep dive analysis: Dallas, Denver, and Nashville. ITDP developed indicators to evaluate the broader set of cities. The indicators use Global Rural-Urban Mapping Project (GRUMP) data.³⁴ People near rapid transit (PNT), access to jobs, and low-income residents access to frequent transit are among the indicators developed to evaluate the cities. Coupled with mode share figures, the indicators demonstrate the level of access people have to jobs and services within each of the cities. Analysis done in conjunction with a policy review and stakeholder interviews in the deep dive case studies gives an impression of each city's sustainable mobility performance.

31 American Public Transportation Association, *Public Transportation Fact Book* (2016).

<http://www.apta.com/resources/statistics/Documents/FactBook/2016-APTA-Fact-Book.pdf>

32 The League of American Bicyclists, *Where We Ride: Analysis Of Bicycle Commuting In American Cities* (2014).

http://www.bikeleague.org/sites/default/files/ACS_report_2014_forweb_edit.pdf

33 Eric Jaffe, *The Complete Business Case for Converting Street Parking into Bike Lanes*, Citylab.com (2015).

<https://www.citylab.com/solutions/2015/03/the-complete-business-case-for-converting-street-parking-into-bike-lanes/387595/>

34 ITDP, *Indicators for Sustainable Mobility*, (2019), <https://www.itdp.org/publication/indicators-sustainable-mobility/>

OVERVIEW OF DEEP DIVE CITIES

Workshops with local stakeholders were held in Dallas and Denver, but not Nashville as it witnessed a setback after a ballot initiative to fund sustainable transport failed in 2017. Nonetheless, Nashville is included in this paper as one of the deep dive cities to learn from its experience. Table 2 below compares mode share in the three deep dive cities. Drive-alone trips are the dominant way people in these cities travel.

Table 2:
Mode Share Comparisons

	DALLAS (TX)		DENVER (CO)		NASHVILLE (TN)	
	CITY	METRO AREA	CITY	METRO AREA	CITY	METRO AREA
DRIVE ALONE	80.0%	84.9%	75.2%	81.7%	83.4%	86.2%
CARPPOOL	11.7%	10.5%	9.1%	9.4%	10.7%	9.9%
TRANSIT	4.5%	1.6%	7.3%	4.6%	2.5%	1.3%
BICYCLE	0.2%	0.2%	2.5%	0.9%	0.3%	0.2%
WALK	1.9%	1.3%	4.8%	2.3%	2.1%	1.4%
OTHER	1.7%	1.5%	1.1%	1.1%	1.0%	1.0%

Source: U.S. Census American Community Survey, 2015, 5-year estimate

Table 3 below shows a breakdown of how the deep dive cities compare in access to frequent transit, including reach of frequent transit by walking and cycling. While Dallas has over a million residents and even more in its metro area, Nashville and Denver are smaller and relatively similar in population size and proportion of low-income people. Yet Denver outperforms both cities on jobs and people, including low-income people, within 10-minute walking access to frequent transit.

Table 3:
Access to Frequent Transit Comparisons

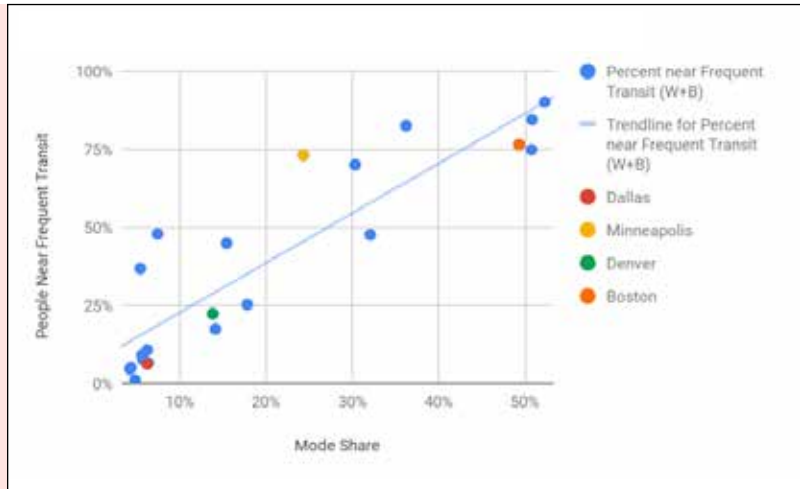
CITY	CATEGORY	ENTIRE CITY	PERCENT NEAR FREQUENT TRANSIT (W)	PERCENT NEAR FREQUENT TRANSIT (W+B)
DALLAS	POPULATION	1,729,600	9.5%	10.7%
	JOBS	947,300	39.4%	40.7%
	LOW-INCOME HOUSEHOLDS	122,100	11.9%	13.2%
DENVER	POPULATION	893,200	20.6%	22.3%
	JOBS	549,300	52.1%	53%
	LOW-INCOME HOUSEHOLDS	67,000	27.2%	29.3%
NASHVILLE	POPULATION	830,200	4.3%	4.6%
	JOBS	446,700	21.8%	22.8%
	LOW-INCOME HOUSEHOLDS	54,300	8.1%	8.8%

Key: FT: Frequent Transit / W: Walking / B: Biking

The percent of the population near frequent transit and sustainable transport mode share, which includes walking, biking, and public transit data acquired for this report—are correlated, as shown in the graph below. For example, Boston shows among the highest share of non-drive-alone

trips (nearly 50%), as well as a high percentage of people near frequent transit (>75%). Dallas shows both a low percentage of non-drive alone trips and a low percentage of people near frequent transit. This shows a strong opportunity to implement policies and projects to potentially increase sustainable transport mode share.

People Near Frequent Transit and Mode Share



In the three deep dive case study cities, Denver shows the highest level of access in terms of the total number of jobs and percentage of jobs accessible by public transport within 30 and 60 minutes. Nashville shows the lowest level of jobs access, while Dallas falls in between the two others as shown in Table 4.

**Table 4:
Comparison of Accessibility to Jobs**

	AVERAGE JOBS ACCESSIBLE BY TRANSIT + WALK + BIKE		AVERAGE JOBS ACCESSIBLE FOR WORKERS W/ LESS THAN HIGH SCHOOL EDUCATION BY TRANSIT + WALK + BIKE	
	within 30 minutes	within 60 minutes	within 30 minutes	within 60 minutes
Nashville	3,572 (0.40%)	56,357 (7.00%)	178 (0.27%)	2,890 (4.35%)
Dallas	19,242 (0.60%)	253,155 (7.90%)	1,987 (0.52%)	16,138 (4.20%)
Denver	42,329 (2.70%)	350,156 (22.30%)	3,180 (2.33%)	21,197 (15.53%)

Through the diagnostic analysis of the deep dive cities, this paper seeks to analyze the opportunities to increase access by sustainable modes. Transit ridership may be declining nationwide, but renewed efforts to boost transit, cycling, walkability, and micro mobility offer potential strategies to connect people to opportunities while tackling climate change and other undesirable consequences of drive-alone trips. Getting cities to set and monitor mode share targets is a first step in shifting away from drive-alone trips toward sustainable modes. Policy frameworks and associated funding allocations indicate cities are ready to make the shift. This paper uses the case studies as a snapshot to illustrate the mechanisms necessary to change the national paradigm.



Photo: Graham Cavanagh

CASE STUDY: DALLAS

The City of Dallas has a population of 1.341 million people within a total land area of 341 square miles (metro land area of 8,928 sq mi) at a population density of 3,518 per square mile.

OVERVIEW

Dallas is dominated by drive-alone trips. As the largest city in the Dallas-Fort Worth Metroplex, it is the beating heart of the fourth most populous metropolitan region in the U.S. The metro area is larger than the Boston and Detroit metro areas combined.³⁵ Since 2010, Dallas has experienced a 10% population growth and is projected to grow by 49% by 2050, reaching more than 3.5 million people.

The city's wealth has been historically concentrated in the northern region, and this trend continues. Fast-growing northern Dallas suburbs such as Plano, Frisco, McKinney, Denton, Garland, Carrollton, Richardson, and Allen are seeing an influx of new residents due to sprawling infrastructure and corporate offices opening to the north of Dallas.³⁶ Yet many low-income households are located in the southern part of the city and farthest from the new jobs. About 23% of Dallas residents are below the poverty line, compared to 15% nationwide.³⁷

The average travel time to work by car is 24 minutes within the city boundaries, while traveling by public transit is about 52 minutes. This makes public transit less convenient when time is of high value. VMT in Dallas is projected to increase 24% by 2030 from 1999 levels.³⁸ Meanwhile, 24% of the emissions in Dallas are from the transport sector, which is similar to the national average.³⁹ Severe congestion is expected to increase to 52% by 2030.⁴⁰ With growing VMT, Dallas may outpace the national GHG contribution.

The current mode shares for Dallas and its metro region are shown in the table below. While only 9.5% of the population lives within walking distance of frequent transit, the overall share that uses public transit is less than 5%. Regardless of whether frequent transit is nearby, this indicates that driving alone is more convenient for those who can afford it.

Table 5:
Mode Shares in City and Region of Dallas

MODE	CITY	REGION
Driving Alone	80.0%	84.9%
Carpool	11.7%	10.5%
Public Transit	4.5%	1.6%
Walk	1.9%	1.3%
Bike	0.2%	0.2%
Other	1.7%	1.5%

Source: U.S. Census Bureau (ACS 2016 Report)

35 United States Census Bureau, *Largest Urbanized Areas with Selected Cities and Metro Areas* (2012). <https://www.census.gov/dataviz/visualizations/026/508.php>

36 Scott Beyer, *The Explosive Northern Growth of Metro Dallas*, Forbes (2016). <https://www.forbes.com/sites/scottbeyer/2016/07/01/the-explosive-northern-growth-of-metro-dallas/2/#4dcc9dec2857>

37 United States Census Bureau, *Dallas* (2018).

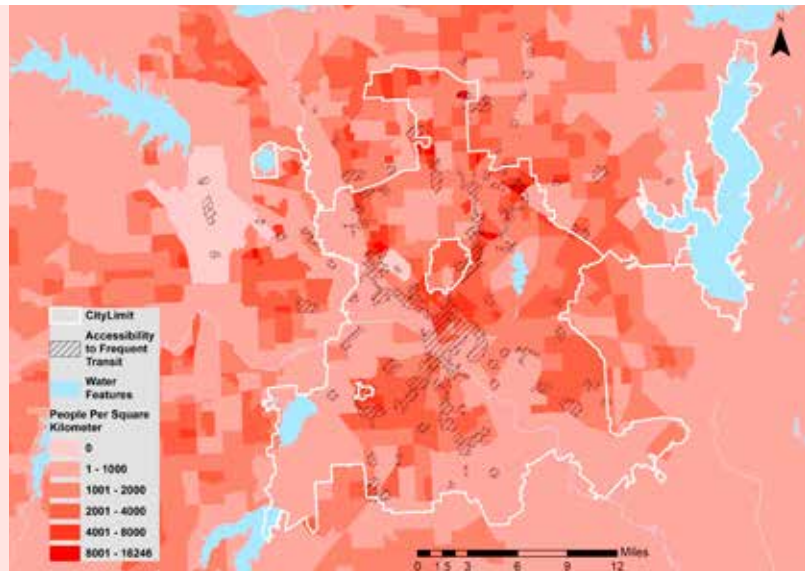
38 Strategic Planning Division - City of Dallas, *forwardDallas!* (2006).

39 City of Dallas, *Greenhouse Gas Emissions Inventory* (2012). <http://greendallas.net/wp-content/uploads/2016/01/DALLAS-GHG-Emissions-Summary-2010.pdf>

40 Strategic Planning Division - City of Dallas, *forwardDallas!* (2006).

Greater Dallas's population and jobs are distributed across the region, rather than clustered within the city. Many of the frequent transit services space stops incrementally further apart outside the city center, indicating that access to frequent transit drops as residents move away from dense, compact development. The fast-growing municipalities to the north of Dallas are not densifying around transit stations to capture ridership. The map below illustrates **People Near Frequent Transit (PNFT)** in the greater Dallas region.

Dallas People Near Frequent Transit



Distribution of frequent transit is uneven in Dallas and the surrounding area. Accessibility to frequent transit appears dispersed on the map—including light rail, commuter rail, and bus stations—and is not effective in making connections along corridors. High-frequency service (wait times of less than 6 minutes) to medium frequency service (wait times of 6-15 minutes) is concentrated in the downtown, but most of the Dallas region has low-frequency service (wait times 15-30 minutes or more). The service becomes much less frequent on weekends and evenings (off-peak hours), and many areas have no service at all.⁴¹

Dallas Area Rapid Transit (DART) is the transportation authority managing the rail and bus systems for commuters. The light rail is in a hub-and-spoke pattern branching out from downtown Dallas to the suburbs. Many DART stations include large park-and-ride facilities, rather than a dense, walkable urban fabric that would promote non-driving connections to frequent transit. HOV lanes were previously operated by DART, but TxDOT assumed all maintenance and operations in 2013.⁴²

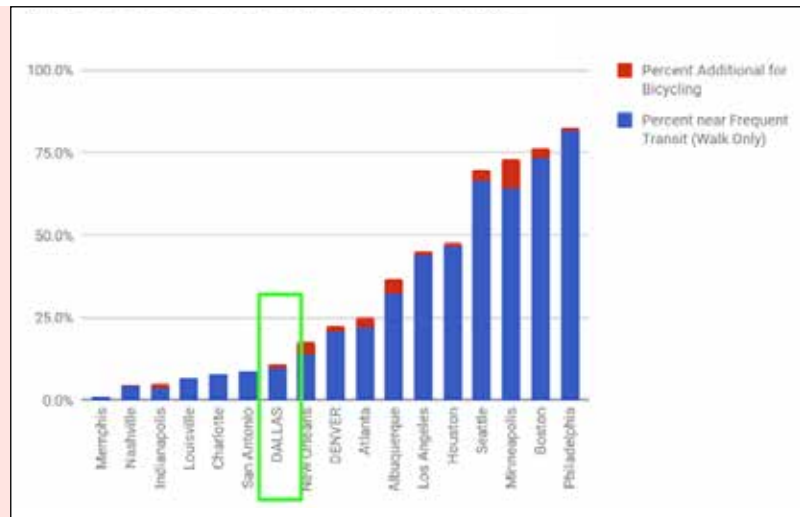
⁴¹ Shima Hamidi, *Transportation Equity & Access to Opportunity for Transit Dependent Population in Dallas*, Center for Transportation, Equity, Decisions & Dollars & Institute of Urban Studies (2017).

⁴² DART, High-Occupancy Vehicle (HOV) Lanes, DART.org (2018). <https://www.dart.org/maps/hov.asp>

DART opened its first light rail in 1996. Today it operates the longest light rail in the U.S. with approximately 64 stations and 93 miles of track, including 10 stations and 35 miles of the Trinity Railway Express commuter rail. DART’s transit programs combined operate throughout a 700-square mile service area across multiple jurisdictions. In 2016, DART light rail had nearly 30 million passenger trips, and bus ridership (including charter) had 34 million passenger trips. However, the miles of infrastructure and area covered are not indicative of ridership potential or operational efficiency. To put it in perspective, in a region of more than 6 million people,⁴³ only 100,000 riders use the light rail system on an average weekday.

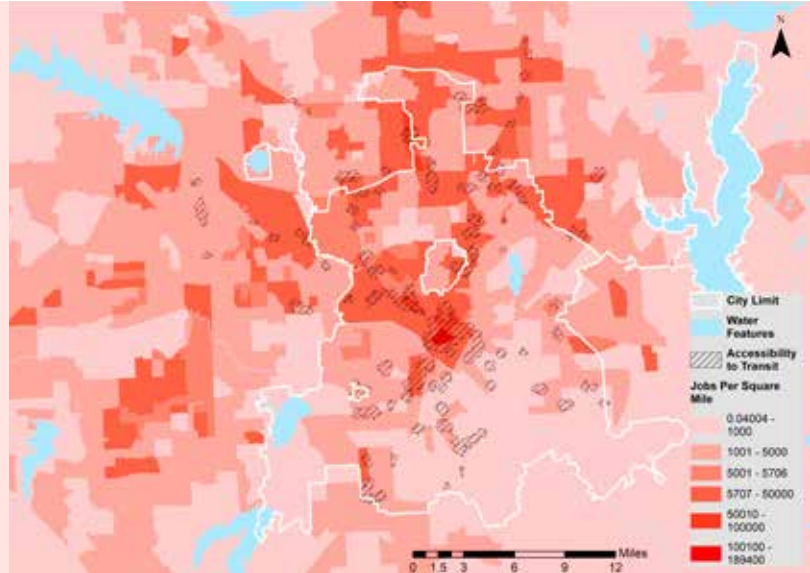
When comparing people near frequent transit between peer U.S. cities, Dallas performs less well on a benchmarking than Denver and Atlanta due to a lack of TOD around station areas. As shown in the table below, bicycle and walking infrastructure improve access to transit stations, filling the first- and last-mile gap.

Percentage of People Near Frequent Transit (W+B) - Cities



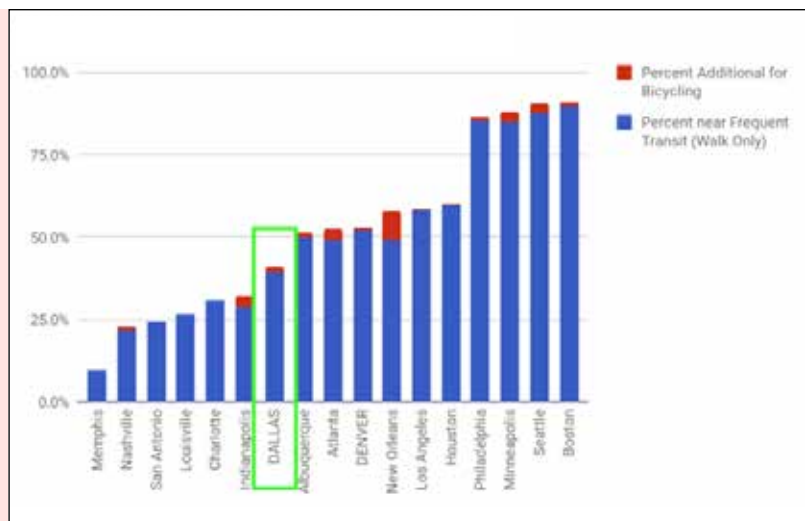
Approximately 40% of jobs are within a 10-minute walk to a frequent transit station in Dallas. That number drops to 13% when the entire region is considered. The map below shows **Jobs Near Frequent Transit**.

Dallas Jobs Near Frequent Transit



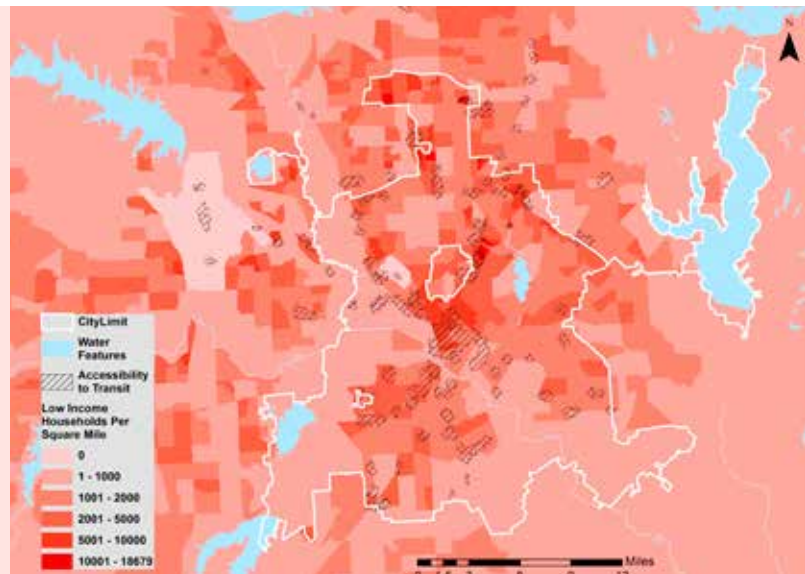
The majority of jobs are near but not within the frequent transit catchment area. Frequent transit connects the suburbs to downtown Dallas, where the largest agglomeration of jobs can be found, but connections are missing *within* the high concentration jobs areas. Sizable clusters of Dallas are not accessible by frequent transit where the remaining 60% of jobs are located. Many of the areas around frequent transit are single-family homes with the highest concentration of multi-family dwellings along the northeast perimeter of University Park, an inner North Dallas suburb that appears on the map in the upper area of the circular omission within the wider Dallas border.

Percentage of Jobs Near Frequent Transit (W+B) - Cities



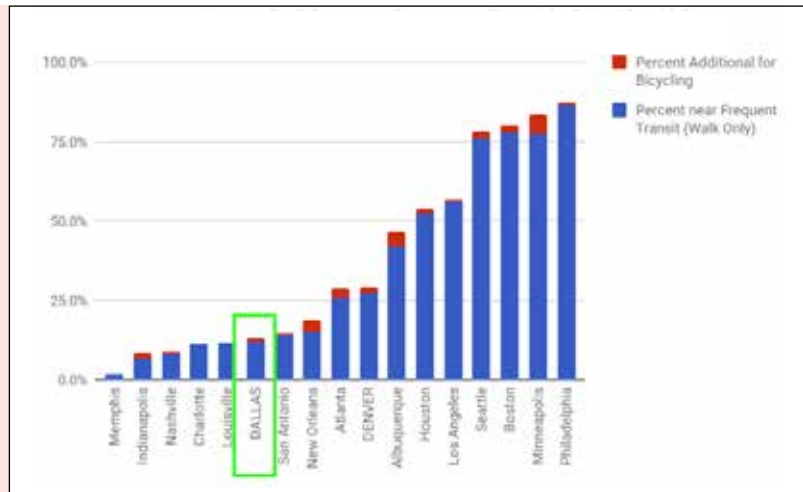
The majority of the transit-dependent population is in the downtown and south Dallas region. These areas also have the highest concentration of low-income households that spend 23-26% of their income on transport. Some of the high-concentration clusters of low-income households have no nearby frequent transit at all. While cycling infrastructure may help extend the catchment area of frequent transit and better connect low-income households to jobs, the existing networks leave most low-income people far from frequent transit and jobs. The map below illustrates **Low-Income Households Near Frequent Transit**.

Dallas Low-Income Households Near Frequent Transit



Accessibility to frequent transit by low-income residents, in particular, is significantly lower than in other major cities—about half that of Atlanta and a quarter that of Houston. About 13% of low-income people in Dallas have access to frequent transit within a 10-minute walk and/or bike ride; and only 5% regionally.

**Percentage
of Low-Income
Households
Near
Frequent
Transit
(W+B) - Cities**



Approximately 10% of the city population can walk to a frequent transit station in 10-minutes or less, and only 3% within the greater Dallas area. There is a land use policy mismatch when 40% of jobs in the city are within a 10-minute walk of frequent transit, but only a tenth of the population has access to the frequent transit. When bicycling is included as an option for residents to access frequent transit stations, those numbers grow by about 21,000 people in the city.

While there is momentum in the region to build transit closer to where people in the suburbs live, redevelopment projects are less common in Dallas due to the availability of land and cost. Multi-family housing developments are already on the rise in downtown Dallas but not in other parts of the city with frequent transit stops.⁴⁴ The mayor's Grow South initiative, to improve access for low-income neighborhoods in southern Dallas, may specifically target areas for transit improvements along potential high ridership corridors.⁴⁵ It is unclear how cycling is factoring into expanding the reach of transit in these neighborhoods.

The mode share for bicycling in Dallas is particularly low due to a lack of designated infrastructure, and other factors such as non-supportive land uses. There are only 19 miles of buffered bike lanes, and 45 miles of shared lanes (i.e., sharrows), which are insufficient to provide proper safety.⁴⁶ The 2011 Dallas Bike Plan envisioned 1,300 miles of interconnected bicycle facilities, including 840 miles of on-street facilities, 460 miles of off-street facilities, and over 130 miles of inter-jurisdictional connections to be implemented by 2021.⁴⁷ Dallas is still a long way from achieving that goal. Comparable cities across the country have added new bike lanes over the last few years at a faster pace than Dallas, which has a cycling mode share less than 1%. Bike Score ranked Dallas 44 out of 100 nationally (calculated by the level of bike infrastructure and road connectivity in a city).⁴⁸

⁴⁴ Dallas Regional Chamber, *Dallas-Fort Worth Real Estate Review* (2017). <https://issuu.com/drcpublications/docs/rereview-spring2017>

⁴⁵ City of Dallas, *GrowSouth Plan* (2011). <http://www.dallasgrowsouth.com/>

⁴⁶ Dallas News, *Dallas is curbing its bike-share mess, which means nothing without the bike lanes we were promised* (2018). <https://www.dallasnews.com/opinion/commentary/2018/06/06/dallas-curbing-bike-share-mess-means-nothing-without-bike-lanes-promised>

⁴⁷ City of Dallas, *Bike Plan* (2011). https://dallascityhall.com/departments/transportation/bikeway/DCH%20Documents/pdf/2011_Dallas_Bike_Plan.pdf

⁴⁸ Matt Wood, *The Plight of the Dallas Cyclist* (TOWERS, 2016). <http://dallastowers.net/2016/07/06/the-plight-of-the-dallas-cyclist/>

The Dallas City Council adopted a Complete Streets Design Manual in 2016. It spurred conversions of one-way streets into two-way streets, such as near the AT&T headquarters downtown. This type of conversion is meant to lower vehicle travel speeds and create a safer environment for pedestrians and cyclists. The conversion of the primary street in uptown Dallas, McKinney Avenue, from one-way to two-way, was approved in the Thoroughfare Plan amendment process.⁴⁹ Carlisle and Cole Avenues will also be transformed into two-way, calmer, more neighborhood-friendly streets. Funding agreements still need to be finalized with the city, Uptown Dallas Inc., TxDOT, and North Central Texas Council of Governments. Uptown Dallas has increased in population from about 2,500 to nearly 20,000 in the last twenty years. These roads now converted to be two-way were designed as cut-throughs for Highland Park executives to get to downtown jobs.⁵⁰

Beyond new cycling and walking infrastructure, Dallas is working to integrate DART with TNC operators, such as Uber and Lyft, to provide riders with first- and last-mile solutions. As of 2015, DART riders can reserve Uber or Lyft through the DART smartphone app, GoPass, to begin or complete their transit trips to areas that are not covered by DART. Electric scooter companies, such as Bird and Lime,⁵¹ and dockless bike sharing operators have brought thousands of bikes to the region as well, but no partnerships with DART have been developed just yet.⁵² More impact analysis is needed to determine whether first-and last-mile access to public transit stations have been improved.

DART has also teamed up with Zipcar (a private carshare operator) by adding five Zipcars in two DART stations to increase access and encourage the use of public transport. This provides an option for transit riders whose destination is not easily reached by other means from DART stations. Nevertheless, Zipcar only has 44 cars available (less than 0.1 cars per 10,000 people). In comparison, Austin, TX has 383 Zipcars (2.0 cars per 10,000).

FUNDING TO MEET TARGETS

Dallas does not yet have mode share targets. However, the City DOT is in the process of updating their comprehensive mobility plan. In 2017, Dallas voters approved Proposition A to issue \$534 million in general obligation bonds for street and transport improvements. These funds could be used to improve access to frequent transit and pay for the complete streets and placemaking projects. Twenty million was secured for the road conversions from one-way to two-way streets.⁵³ The new streets will improve safety for non-driving travelers and encourage people to spend time on them.

City Council increased the city's bike program budget to \$1 million, and will increase the budget annually by \$500,000 until reaching \$2 million.⁵⁴ Even if that funding is approved, it would still take 21 years to achieve the Dallas Bike Plan. For comparison, Denver allocates \$5 million per year to bicycle and pedestrian facilities.⁵⁵

49 City of Dallas, *Thoroughfare Plan* (2018). <https://gis.dallascityhall.com/thoroughfare/>

50 Patrick Kennedy, DART Board Member, interview (2018).

51 Ann Lee Ellingson, *Two electric scooter companies take on Dallas streets*, Biz Journal (2018). <https://www.bizjournals.com/dallas/news/2018/07/03/two-electric-scooter-companies-take-on-dallas.html>

52 Robert Wilonsky, *Mobike, no problem? Fifth bike-share company pulls into Dallas, with more on the way*, Dallas News (2018).

<https://www.dallasnews.com/news/dallas-city-hall/2017/12/30/mobike-no-problem-fifth-bike-share-company-pulls-dallas-way>

53 Patrick Kennedy, DART Board Member, interview (2018).

54 Jared White, City of Dallas Department of Transportation Manager, interview (2019).

55 Piep van Heuven, *Bicycle Colorado*, interview (2018).

In 1983, voters from 13 municipalities approved a 1% sales tax to pay for DART, contributing \$486 million in tax revenue to cover the entire operating budget, including both the bus and rail systems.⁵⁶ The DART light rail system cost \$8 billion to construct. The sales tax continues to cover the operating costs.

DART is planning expansions to its network and \$2 billion has been allotted for the Cotton Belt line, a commuter line which will connect Plano to DFW Airport, including several TOD sites such as CityLine in Richardson, Addison Circle, and Cypress Waters in Dallas. The Draft Environmental Impact Statement (DEIS) states that 81,349 people live within a half mile of the line, and even more are employed near the Cotton Belt—48,636 in Addison alone. Construction for the Cotton Belt is scheduled for 2019 and service will begin in December 2022.⁵⁷ This funding initiative is not focused on improving frequent transit service within the City of Dallas.⁵⁸

As all four DART LRT lines converge into one trunk line through downtown, the frequency is impacted throughout the entire system due to this choke point. The planned D2 subway project will be resubmitted with a new Locally Preferred Alternative (LPA) alignment into the Core Capacity Capital Investment Grants (CIG) program.⁵⁹ Both the Cotton Belt and D2 are in the 20-year financial plan and are expected to be operational in 2022 and 2024 respectively. Once complete, D2 will allow DART to double capacity throughout the entire system and improve frequency on all light rail.⁶⁰

RECOMMENDATIONS

SHORT-TERM (1-3 YEARS) OPPORTUNITIES

As Dallas is developing a comprehensive mobility plan in 2019, setting a vision with measurable targets to lower drive-alone trips and increase walking, cycling, and frequent public transit is essential for evaluating the success of the plan. Mode share serves as a baseline by which Dallas can measure improvements, as seen in Table 1. In the near future, Dallas can take the following actions:

- Include mode share targets in the comprehensive mobility plan with goals for sustainable modes as well as efforts to decrease drive-alone trips (e.g., drive-alone trips decrease to 40% by 2030).
- Improve walkability around Mockingbird and other frequent transit station areas (e.g., sidewalk expansions and intersection treatments), and build protected bicycle lanes to create greater neighborhood connectivity to boost transit ridership.
- Build a protected bicycle lane network focusing on downtown and surrounding neighborhoods (e.g., Cedars, Uptown, Deep Ellum, and Bishop Arts) to encourage active transport and help reach Vision Zero policy goals.
- Pilot better walking and cycling connections to highly populated areas to extend the reach of the frequent transit catchment zone. Some high population areas are very near to frequent transit. Dallas can look to cities like Minneapolis that have increased people near transit by expanding cycling infrastructure that works with bike-share and scooters with speeds regulated and parking areas established.

56 The 13 municipality service area includes Addison, Carrollton, Cockrell Hill, Dallas, Farmers Branch, Garland, Glenn Heights, Highland Park, Irving, Plano, Richardson, Rowlett, and University Park.

57 Dallas News, *DART's \$1.1 billion Cotton Belt plan about to come into public view* (2018). www.dallasnews.com/news/transportation/2018/03/18/darts-11-billion-cotton-belt-plan-come-public-view

58 Patrick Kennedy, DART Board Member, Interview (2018).

59 DART, *D2 Subway* (2018). <https://www.dart.org/about/expansion/downtowndallas.asp>

60 Patrick Kennedy, DART Board Member, interview (2018).

- Pilot dedicated bus lanes along congested corridors to improve travel times; work to create a network of frequent transit that demonstrates other forms of surface transport can be equally or more convenient than drive-alone travel.
- Leverage partnerships with mobility service companies as an intermediate step to identify demand in areas where frequent transit can be expanded. Evaluate TNC partnerships with DART based on how effective they are in offsetting drive-alone trips and accelerating intermediate milestones toward non-drive-alone mode share targets. Partnerships may be used to collect data on common travel patterns (i.e., origin and destination) to inform future investments in frequent transit services.
- Create a regulatory framework for improved mobility planning that requires dockless bike and electric scooter operators to share data.

Dallas can use target setting to align its investments in becoming a model sustainable mobility city, connecting the comprehensive mobility plan to fund the complete streets design vision, and by focusing efforts around existing frequent transit stations in order to capture more ridership on DART.

LONG-TERM (4-8 YEARS) OPPORTUNITIES

Dallas is poised to capture regional growth near its frequent transit stops. City streets can be used more efficiently to improve surface mobility in and around these stops. A greater realization of the city's complete streets policies will get more users to cycle, either using their own bikes or any number of personal mobility offerings such as dockless bikeshare and electric scooters. Below are longer-term actions that can be taken.

- Monitor changes in mode share and map infrastructure investment to assure they are aligned. Funding from the Proposition A bond measure can be used to implement projects that accelerate reaching mode share targets, enabling the priority streets near frequent transit that have been identified in the Complete Streets Design Manual.
- Large-scale redevelopment plans could concentrate jobs and households near existing and future frequent transit corridors to increase the population near frequent transit. There are multiple large urban developments in the works, such as Dallas Midtown and the Dallas Arts District, promoted by the Dallas Chamber of Commerce that can serve as demonstration projects for the region.
- The city can incentivize concentrating multi-family dwelling units around frequent transit stops in underserved areas such as in South Dallas. Concentrate a mix of uses (jobs, housing, commercial, and offices) around frequent transit stations, including the development of BRT corridors, to encourage walking, bicycling, and car-light to car-free living. Integrate affordable housing into each of these projects to address equity (e.g., Grow South initiative).
- Reform curbside parking policy and off-street parking regulations in building codes for new construction projects, instituting parking supply caps to promote transit-oriented neighborhoods.

As the city looks to reach mode share targets, it can shift from piloting sustainable mobility solutions to permanently implementing changes.



Photo: Graham Cavanagh

CASE STUDY: DENVER

The City of Denver has a population of 704,621 people within a total land area of 155 square miles (metro land area of 4,532 sq mi) at a population density of 4,044 per square mile.

OVERVIEW

Denver set mode share targets to address a growing concern that drive-alone trips with an increasing population would lead to unwanted traffic congestion, air pollution, and other undesirable consequences. Despite efforts to increase sustainable transport trips during the recent population boom,⁶¹ drive-alone trips have remained steady, indicating that any progress has been counteracted by continued growth in driving.⁶²

Denver's population is projected to grow by 38% between 2010 and 2050, reaching more than 833,000 people. It has already witnessed one of the largest influxes of domestic migrants in the country between 2010 and 2014. As the population has grown along with traffic congestion, transport emissions in Denver crept up to 26% of total GHGs.⁶³ The high level of congestion and related emissions can partly be explained by the rate of car use.

Targets for decreasing drive-alone trips are set in the mayor's Mobility Action Plan. Compared to the region, Denver only marginally succeeds in getting more trips to be non-drive-alone. In the next decade, the city intends to double public transit ridership, and increase biking and walking. At the same time, Denver expects to lower drive-alone trips. The table below shows the current mode share and the city's target to shift mode share by 2030.

Table 6:
Mode Shares in the City and Region of Denver, and City Targets

MODE	REGION	CITY	CITY TARGETS (BY 2030)
Driving Alone	82%	75%	50%
Carpool	9%	9%	--
Public Transit	5%	7%	15%
Walk	2%	5%	15%
Bike	1%	3%	
Other	1%	1%	--

Source: U.S. Census Bureau (ACS 2016 Report) & Denver Mobility Action Plan⁶⁴

In November 2004, voters in the counties comprising the Regional Transit District (RTD) supported a sales tax for a ballot initiative—called *FastTracks*—drastically expanded suburban rail. However, the land uses around the stations are low-density and include park-and-rides that are required by federal bond rules. The parking around certain rail transit stations is so vast, it requires knowledge of nearby destinations or imagination to trust what lies beyond the long stretches of asphalt.

61 Katie Hearsom, *Denver, Colorado: Best Places to Live*, US News (2017).
<https://realestate.usnews.com/places/colorado/denver>

62 David Sachs, *The Share of Denver Commuters Walking, Biking, and Riding Transit Rose a Sliver in 2016* (Streetsblog Denver, 2017).
<https://denver.streetsblog.org/2017/09/18/the-share-of-denver-commuters-walking-biking-and-riding-transit-rose-a-sliver-in-2016/>

63 City and County of Denver, *Climate Action Plan* (2015).
<https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/>

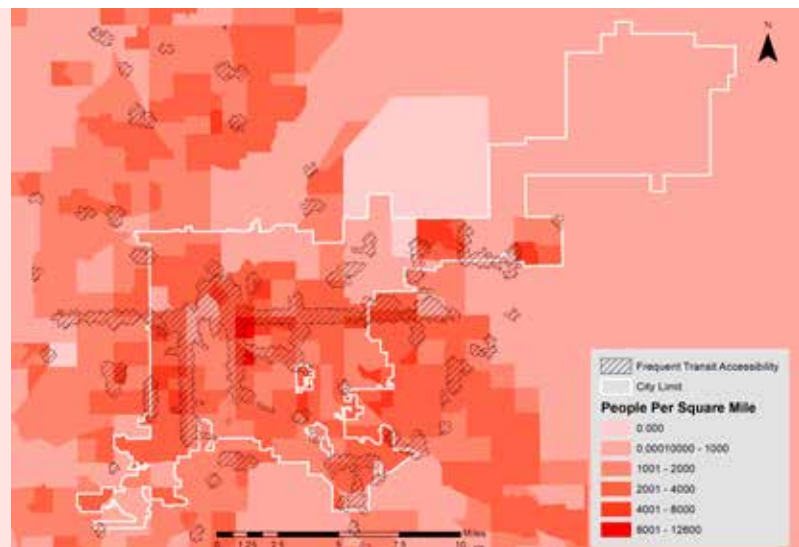
64 City of Denver, *Mobility Action Plan* (2018).
<https://www.denvergov.org/content/denvergov/en/mayors-office/programs-initiatives/mobility-action-plan.html>

Municipal bonds used to pay for the rail build-out preclude redevelopment of the vast parking lots surrounding the stations. The bonds stipulate that at least 90% of funding be dedicated to public use, thereby preventing the transit agency from engaging private developers to construct mixed-use projects. The federal bonds are a 25-year issuance from 2012 and may be refinanced.⁶⁵

Beyond the station areas, parking policies vary by neighborhood in Denver. Some neighborhood policies require new construction to include parking, which in turn increases the market housing prices. While in other areas, including downtown Denver, parking is already in high supply.⁶⁶ Downtown Denver has no minimum parking requirements, yet 0.75 spaces per unit is common in the urban center. The cost of parking is also relatively cheap (e.g., \$5/hour or \$15/day) which encourages driving for its convenience. The cost of living has increased in Denver by 31% since 2009.⁶⁷ This may partly explain why surrounding municipalities in the region are also seeing an influx of new residents as people seek more affordable housing.

The majority of Denver residents do not live within a reasonable 10-minute walk of frequent transit stations.⁶⁸ Approximately 22% of people in the city are within a 10-minute walk of frequent transit. If bicycling is added, around 15,600 more residents can access a frequent transit station in 10-minutes or less, and 12,400 more in the region as a whole. The primary east-west corridor of Colfax Avenue is easily identifiable on the map as a long stretch of frequent transit serving a high population density. Concentrations of PNFT outside of the downtown appear much further apart and disjointed than those in the city center. The cities of Boulder and Longmont, northwest of Denver, have frequent transit stops for commuting to Denver. The map below shows the concentration of **People Near Frequent Transit** in the Denver region.

Denver People Near Frequent Transit



65 William Sirois, RTD, interview (February 2018).

66 David Sachs, *Denver Warming to the Idea of Parking Maximums*, Streetsblog Denver (2017).

<https://denver.streetsblog.org/2017/10/19/denver-warming-to-the-idea-of-parking-maximums/>

67 Katie Hearsom, *Denver, Colorado: Best Places to Live*, US News (2017).

<https://realestate.usnews.com/places/colorado/denver>

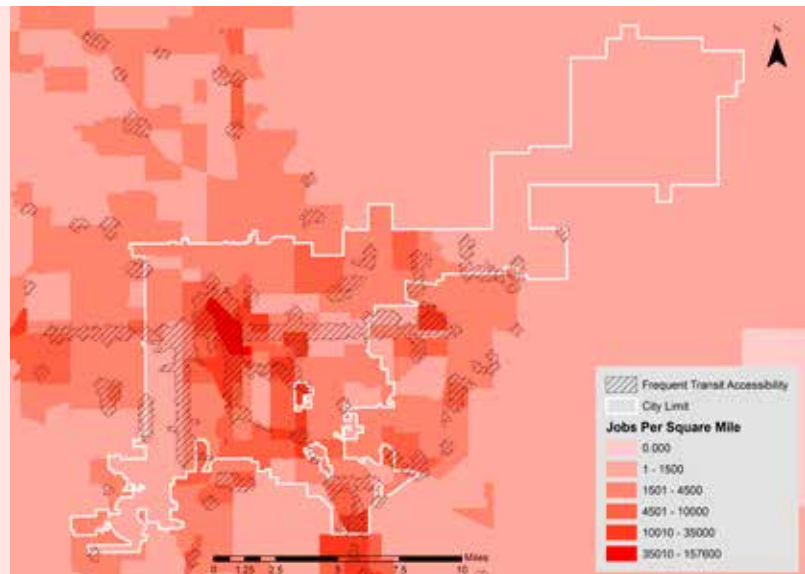
68 David Sachs, *Why Denver Needs to Get Cracking on a Grid of Frequent Bus Service*, Streetsblog Denver (2017).

<http://denver.streetsblog.org/2017/08/07/why-denver-needs-to-get-cracking-on-a-grid-of-frequent-bus-service/>

In August 2017, a survey of 2,400 people found “higher frequency bus service” was the top result when respondents were asked to rank how they would spend transit resources.⁶⁹ This illustrates the latent demand for better access to frequent transit, especially for buses. It also shows that existing bus service is not sufficiently frequent.

There is also poor connectivity of people to jobs by frequent transit. While the majority of jobs in Denver are near frequent transit, only a fifth of people live near to it. About 53% of jobs in the city and about 31% of the region are within a 10-minute walk to frequent transit. The average travel time to work in Denver is 24 minutes, while public transit takes 42 minutes on average.⁷⁰ The inclusion of bicycling improves access to frequent transit stations, particularly in the downtown corridors where protected bike lanes exist. The frequent transit network is less competitive in terms of the time value of travel compared to driving. The map below illustrates **Jobs Near Frequent Transit**.

Denver Jobs Near Frequent Transit



Denver has 172 miles of bicycle facilities of varying types with 39 miles of unprotected sharrow treatments, and less than two miles of fully protected cycle paths. The city has built only about 30% of its planned bicycle network.⁷¹ The Denver Moves: Enhanced Bikeway Study (2016) and *A Neighborhood Bikeway Traffic Management Study* (2016) are intended to guide new infrastructure and street calming efforts to make cycling a more feasible choice for commuters and other travelers.⁷²

69 David Sachs, *Imagine the Money to Improve Denver Transit Is in Your Hands. How Would You Spend It?*, Streetsblog Denver (2017). <https://denverstreetsblog.org/2017/05/08/imagine-the-money-to-improve-denver-transit-is-in-your-hands-how-would-you-spend-it/>

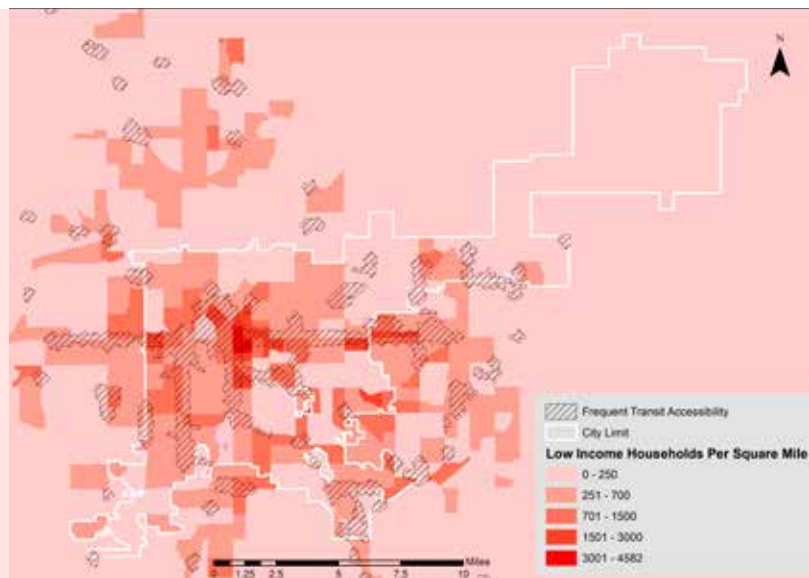
70 United States Census Bureau, *2011-2016 American Community Services* (2016).

71 Piep van Heuven, *Bicycle Colorado*, interview (February 2018).

72 City & County Of Denver, *Bicycle Planning Projects & Studies* (2017). <https://www.denvergov.org/content/denvergov/en/bicycling-in-denver/planning.html>

Only about 29% of low-income Denver residents are within a 10-minute walk or bike ride to frequent transit stations. However, this percentage is actually greater than the percentage of the general population, which is 22%. ITDP found this to be the case in most of the cities surveyed for this report. It is noteworthy that there are high concentrations of low-income housing along the E. Colfax Avenue corridor—which makes the BRT project all the more critical to improve access to jobs, goods, and services. The maps below shows the concentration of **Low-Income Households Near Frequent Transit**.

Denver Low-Income Households Near Frequent Transit



Unlike Dallas, Denver has set targets for different modes to reduce drive-alone trips and increase sustainable modes. Denver's 2020 Sustainability Goals provide a mobility framework that promotes transport options including public transit, carpooling, biking, and walking to reduce drive-alone travel to no more than 60% of all trips by 2020 (down from the current 75%). The plan aims to provide incentives to city employees so that no more than 55% commute in single occupant vehicles.⁷³ Denver's Mobility Action Plan (2017) further aims to reduce drive-alone trips to 50% by 2030.

Like other cities, Denver has TNCs including Uber, Lyft, Wanderlift, and UZURV, as well as other app-enabled mobility offerings. Conventional bike sharing is operated by B-cycle with 82 stations and 700 bikes.⁷⁴ Denver B-cycle is owned and operated by Denver Bike Sharing, a non-profit with an annual operating budget of about \$1.7 million. In 2017, there were more than 344,000 trips taken on Denver B-cycle bikes, including annual members.⁷⁵ That's approximately 1.6 rides per bike per day. ITDP's Bikeshare Planning Guide suggests at least two trips per bike per day in order to

⁷³ Denver—Office of Sustainability, *2020 Sustainability Goals* (2018). <https://www.denvergov.org/content/denvergov/en/office-of-sustainability/2020-sustainability-goals.html>

⁷⁴ B-cycle, *Station Map* (2017). <http://denver.bicycle.com/pages-in-top-navigation/map>

⁷⁵ Denver Bike Sharing, *2017 Annual Report* (2017). http://denver.bicycle.com/docs/librariesprovider34/default-document-library/annual-reports/dbs_annualreport_2017_04.pdf?s-fvrsn=75b321c5_2

justify investment.⁷⁶ Electric scooters are also available by operators Lime, Bird, Lyft, Spin, and Razor.⁷⁷ Furthermore, there are three car-share operators: ZipCar, Car2go, and eGo CarShare, with 415 vehicles (6.3 vehicles per 10,000 people). Together, these services are meant to increase the mobility options in the city, not just for the commute trip but for special purpose journeys like going to the doctor or grocery shopping.

The *Go Denver* app, launched by the city in 2016 in partnership with Xerox, allows users to search for the best route to their destination utilizing multi-modal transportation options. The app offers information like travel times, cost, calories burned (with active modes of cycling and walking), and carbon emissions.⁷⁸ The digital platform shows alternatives to driving. For those opting to travel by frequent transit, private mobility service options are also hosted on the app to create a seamless travel link to destinations. *Transportation Solutions*,⁷⁹ a local Transportation Management Association (TMA), for example, has been exploring the coordination of partnerships between the city and Lyft to offer subsidized rides to and from transit stations⁸⁰ that would be integrated within the app.

Denver has one of the most advanced TOD long-term plans in the U.S. Adopted in 2002, *Blueprint Denver* reimagined downtown Union Station as the central hub in the regional rapid transit network to include development concentrated around light rail, BRT, HOV lanes, and park-and-ride facilities. *Transit Oriented Denver* (2014), the city's strategic urban growth plan, guides public and private development investment at rapid transit stations. The strategic framework is meant to eliminate or reduce barriers to TOD, lead to the creation of realistic financing plans, and direct growth and investment around transit stations with the best opportunities for development for the next five to six years.⁸¹

The RTD Strategic Plan 2015-2020 provides a snapshot of the anticipated ridership growth on transit and the necessary revenue for operations to meet the increase in demand. As part of improving equity and accessibility, 48% of new apartments are being built within a half-mile of transit stations to encourage ridership and reduce dependence on private cars.⁸²

Denver has also taken on more creative means of public engagement in their city planning and transport growth strategies, including a *Growth Strategy Game with assistance from Maptionnaire*, in which Denver residents, planners, and decision makers may understand the implications of different amounts and patterns of growth, and the trade-offs associated with the varying future population, employment, and housing development formations.⁸³ According to the tool, Denver is projected to grow anywhere from 129,000 to 255,000 people by 2040. The city will need to add between 70,000 and 128,000 housing units to accommodate this growth.

76 ITDP, *Bikeshare Planning Guide* (2018). https://www.itdp.org/wp-content/uploads/2014/07/ITDP_Bike_Share_Planning_Guide.pdf
77 Jay Bouchard, *Electric Scooters (Nearly 2,000 This Time) Are Coming Back to Denver*, 5280.com (2018). <https://www.5280.com/2018/07/electric-scooters-nearly-2000-this-time-are-coming-back-to-denver/>
78 The City of Denver, *Go Denver* app (2016). https://www.centennialco.gov/uploads/files/MAP_Go%20Denver.pdf
79 Transportation Solutions Foundation, *About Us* (2018). <http://www.transolutions.org/about/>
80 Jon Murray, *RTD's rail system is having its biggest year, but Denver is still a city with many transit gaps* (Denver Post, 2016). <http://www.denverpost.com/2016/07/31/rt-d-rail-system-denver-gaps/>
81 The City of Denver, *Transit Oriented Development Strategic Plan* (2014). https://www.denvergov.org/content/dam/denvergov/Portals/193/documents/TOD_Plan/TOD_Strategic_Plan_FINAL.pdf
82 RTD, *2015-2020 Strategic Plan* (2015). <https://www.rtd-denver.com/documents/2015-2020-strategic-plan.pdf>
83 *Growing A Better Denver: A Growth Strategy Game* (Maptionnaire, 2017). <https://app.maptionnaire.com/en/2714/reboot>

FUNDING TO MEET TARGETS

The Capital Improvement Program (CIP), along with grants from RTD and the GO Bond, is currently funding several projects. Interagency partnerships and new funding will be needed to achieve the goals in Denver Moves. Implementation of high- and medium-capacity transit corridors will be critical to supporting the city's 20-year growth strategy outlined in the Blueprint Denver plan.⁸⁴

A referendum passed in November 2017 for 67% of \$431 million funding package dedicated to transport to be applied towards walking, biking, and transit. The package also includes \$55 million toward East Colfax's BRT project, \$30.7 million for new sidewalks, and \$18 million for protected bike lanes. These projects aim to offer alternatives to driving and achieve the city's goal to cut drive-alone trips by 2030.

The City of Denver allocates \$5 million per year to bicycle and pedestrian facilities.⁸⁵ The annual expenditure for the city to meet its own target would require a \$40 million a year investment, eight times the current allotment. The success of the B-cycle bike-share is dependent on increased cycling infrastructure. B-cycle operating funds come from user fees covering about 60% of costs. The City and County of Denver contribute \$250,000, making up about 15% of the operating budget. The remaining 25% comes from donations and sponsorships.⁸⁶

RECOMMENDATIONS

SHORT-TERM (1-3 YEARS) OPPORTUNITIES

While Denver is still building sidewalks and bike lanes to make walking and cycling a legitimate way to get around, the city will need to assure that all its investments in transit are supported by land uses and connections that capture ridership. Denver can take the following actions to increase people near frequent transit in the near term.

- Transit ridership can increase if frequent bus service is as convenient as driving—connecting where people live with the places they work. The travel times on bus and rail must become competitive with driving in order to lower drive-alone trips. If RTD jurisdictions are not interested in better bus service, improvements can be focused on downtown Denver with connections to concentrations of housing and job centers.
- Denver must demonstrate progress toward reaching its targets, accompanied by corresponding funding allocations and projects on the ground. This can be done by setting intermediate goals toward lowering drive-alone trips.

84 *Denver Moves Transit Plan* (August 2018).
<https://www.denvergov.org/media/denvergov/publicworks/planning/Denver-Moves-Transit-Draft-Plan.pdf>

85 League of American Bicyclists, *Benchmarking Report* (2018). <https://bit.ly/2DJZ4Nx>

86 Piép van Heuven, Bicycle Colorado, interview (February 2018).

- Mobility service operators can help ease the travel demands of a growing population while more robust frequent transit and land use efforts are planned.
- Continuing to expand the protected bicycle network will improve safety and comfort for cycling, and boost sustainable transport use. Designated parking areas for dockless bikes and electric scooters may mitigate the sidewalk clutter effect and better organize street and sidewalk space.

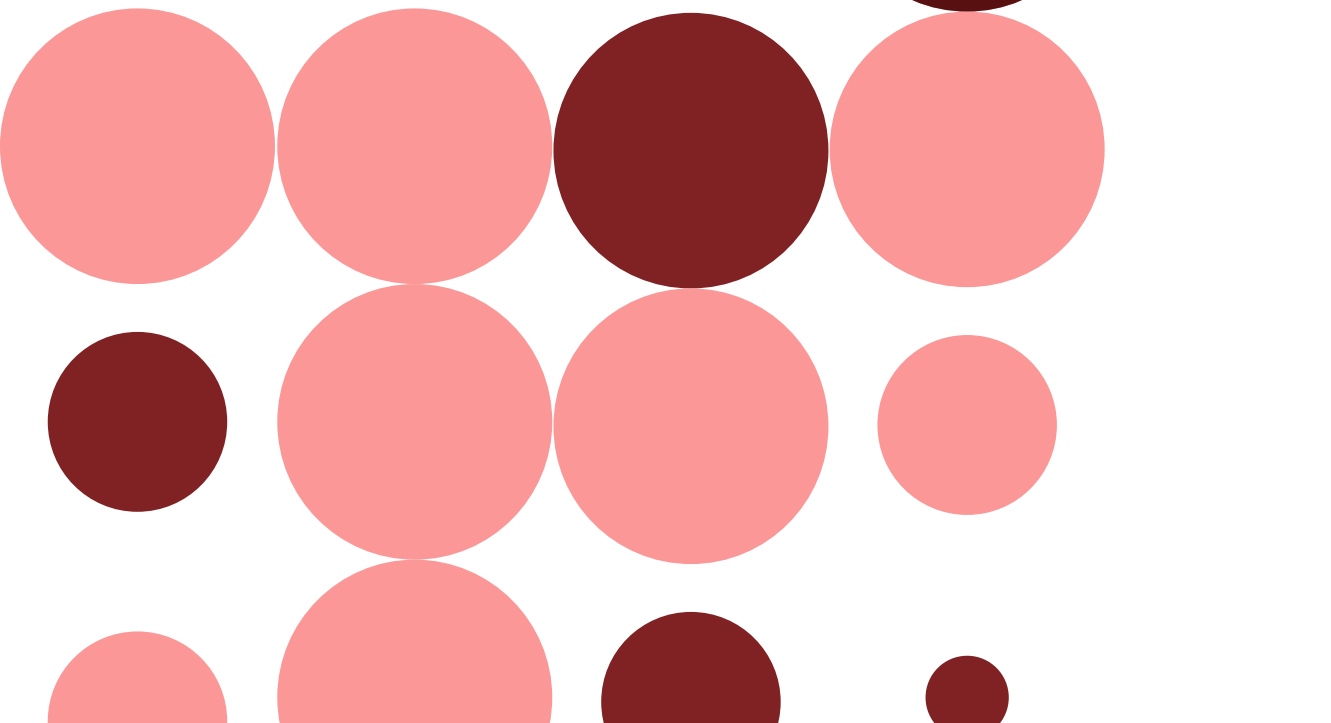
LONG-TERM (4-8 YEARS) OPPORTUNITIES

Getting people near frequent transit will be a key strategy for Denver to meet its sustainable mobility targets. Denver is now faced with the opportunity to reinvent themselves from a predominantly car-oriented city to one with Transit Oriented Development, including high quality walking and cycling facilities as first/last mile connections, with reliable and convenient frequent transit services. Below are longer-term actions that can be taken.

- Monitor the TOD implementation plan to maximize ridership on the existing rail corridors. As jobs are already located near frequent transit, locating people within reach of those jobs would solve the land use mismatch between jobs, housing, and frequent transit.
- Allow greater density along key frequent bus routes such as the East Colfax BRT corridor, which is currently in the design phase. This will be vital to guide growth. Not only does greater density, especially housing, along such corridors justify the mobility infrastructure investment but it also assures the operational success of the service. New developments need to include affordable housing to accommodate lower-income residents along the corridor.
- A frequent bus network redesign could be incorporated as a feeder system to the BRT, maximizing operations on the highest ridership routes with more direct connections between destinations. The BRT envisioned in Denver can be the backbone of a frequent bus service network.
- Develop a stronger long-term parking policy scheme to encourage mode shift and reduce traffic congestion, particularly in the downtown areas. The on-street pricing parking revenue can be used to cross-subsidize sustainable transport projects. This pricing policy could complement an off-street parking policy that sets maximums within building codes for construction projects.



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CASE STUDY: NASHVILLE

The City of Nashville has a population of 667,560 people within a total land area of 475 square miles (metro land area of 504.03 sq mi) at a population density of 1,265.4 per square mile.

OVERVIEW

In 2016, Nashville surpassed Memphis as the largest city in Tennessee. The city's population and economic boom are beginning to raise concerns about affordability and gentrification. Nashville's population is anticipated to grow by 33% by 2035 from 2015 levels to more than 2 million. Around 17% of Nashville residents are below the poverty line, compared to 15% nationally. Median family income in the Nashville area rose 6% from 2000 to 2013 but rents rose 21% for four-bedroom apartments and 39% for one-bedrooms. Unlike other fast-growing cities like New York and Washington DC, Nashville does not require developers to set aside units for affordable housing in new buildings that receive tax or other subsidies. With an increase in the cost of living, unavailability of public transportation and high reliance on cars, the population faces limited options to navigate and live in Nashville.⁸⁷

While 22.8% of jobs are within 10 minutes of frequent transit by walking or cycling, the overall public transit mode share is just 3%. This may indicate that the transit service is either too infrequent and/or not close to the greatest concentrations of where people live and work. The Liveable Nashville Draft recommends increasing households within 0.5 miles of transit—running at least every 15 minutes—to 40% by 2030.⁸⁸ Another issue to getting around the city is that only an estimated 37% of Nashville's street network has sidewalks. Walking infrastructure is missing from about 1,900 miles of city streets. Mode share for the City of Nashville and the metro region are shown in the table below.

Table 7:
**Nashville
Mode
Share**

MODE	CITY	DRAFT TARGETS (2030) ⁸⁹	REGION
Driving Alone	84%	--	86%
Carpool	11%	--	10%
Public Transit	3%	--	1%
Walk	2%	30%	1%
Bike	0.3%		0.2%

Source: U.S. Census Bureau (ACS 2016 Report)

The City of Nashville has three primary frequent transit corridors that link peri-urban parts of Davidson County into the downtown, with relatively good accessibility throughout. **The People Near Frequent Transit** map shows large areas with high concentrations of people without access to frequent transit, particularly to the south and east. West of the city appears to have very low densities as this is the location of the Cheatham Wildlife Management Area. As in the other cities, bicycles do somewhat improve accessibility to frequent transit stations particularly in the downtown area. Nashville has a total of 140-miles of bike lanes; yet the majority are not protected from traffic. The conventional docking bike sharing system is operated by B-cycle, with nearly 40 stations and 300 bikes. The limited number of protected bike lanes could be a contributing factor to the low mode share of bicycling ridership.

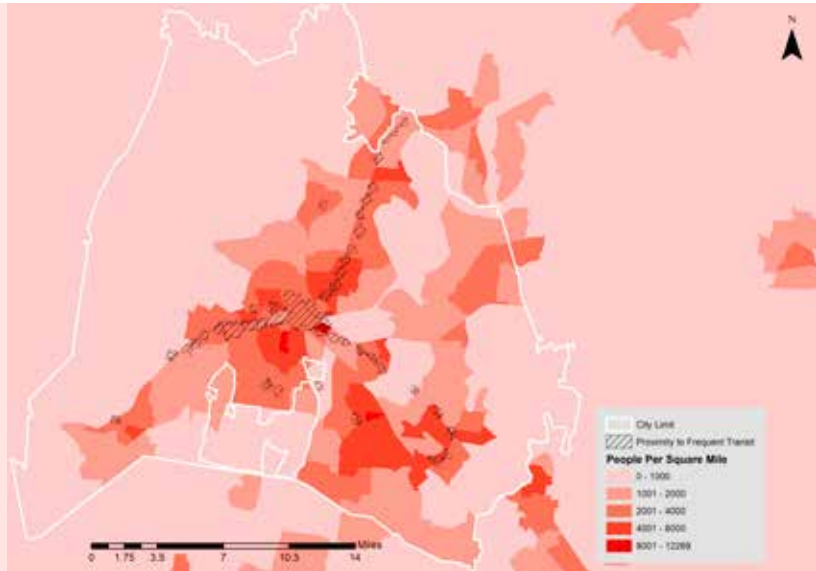
87 Peter Moskowit, *Nashville's boom prices out low-income, middle class residents* (Al Jazeera America, 2015). <http://america.aljazeera.com/articles/2015/3/29/nashvilles-boom-pricing-out-middle-and-lower-class.html>

88 *Liveable Nashville Draft Recommendations*, Nashville.gov (2018). <https://www.nashville.gov/Mayors-Office/Transportation-and-Sustainability/Livable-Nashville-Recommendations.aspx>

89 *Liveable Nashville Draft Recommendations*, Nashville.gov (2018).

<https://www.nashville.gov/Mayors-Office/Transportation-and-Sustainability/Livable-Nashville-Recommendations.aspx>

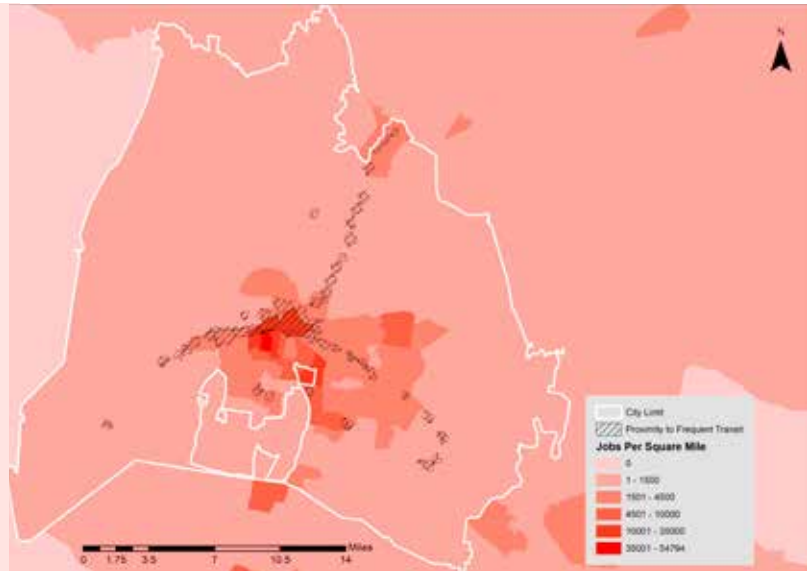
Nashville People Near Frequent Transit



In Nashville less than 23% of jobs in the city are accessible by a 10-minute walk or bike ride to a frequent transit station, and nearly 13% in the region. The people near frequent transit as well as the jobs accessibility maps together illustrate poor connections between the distributions of where people live and work, with only 4.6% of people in Nashville living within a 10-minute walk or bike ride to a frequent transit station. Despite many jobs located to the north, south, and east of the city, frequent transit connections peter out beyond the city municipal boundaries.

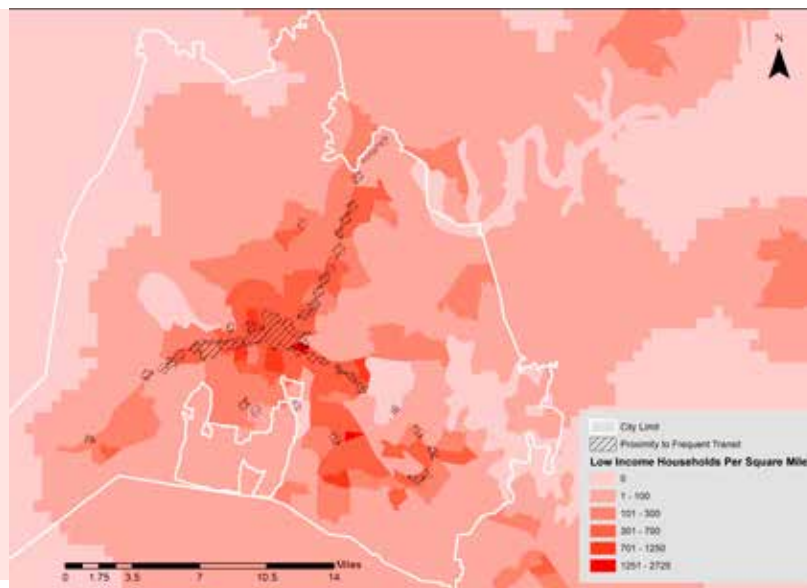
The map below illustrates **Jobs Near Frequent Transit** in Nashville. Less than 5% of the population in the city has access to frequent transit within a 10-minute walk, and less than 3% in the region. If bicycling is included, approximately 4,650 more jobs would be accessible by a 10-minute bike ride to frequent transit in the city, and 4,650 more in the region as a whole.

**Nashville
Jobs
Near
Frequent
Transit**



Less than 9% of low-income residents have access to a frequent transit station within a 10-minute walk, and less than 1% in the region. The next map shows **Low-Income Households Near Frequent Transit in Nashville**.

**Nashville
Low-Income
Households
Near
Frequent
Transit**



Between 1970 and 2010, driving alone to work has increased, and the percentage of those who commute by public transit had decreased overall. Based on USDOT Smart City Application data from 2016, 32.6% of the emissions in Nashville are from the transport sector—outpacing the national average.

The corresponding increase in vehicle congestion levels and average commute times may reflect these shifts. In Nashville, the average travel time to work in the city versus the metropolitan statistical area (MSA) is 23 minutes by car and 26 minutes by carpool, versus 42 minutes on public transit. Nashville MTA provides a bus-only public transit system without rail services, which is therefore more flexible in terms of service, operations, and route updates. However, Nashville MTA has an average daily ridership of 30,000 passengers in a city with a population of over 667,500. This raises questions of whether the infrastructure and service design are being optimized to cater to the majority of employers and residents.

The Regional Transportation Authority of Middle Tennessee (RTA) is an independent authority created under state legislation. The Nashville MTA is contracted to manage RTA services under a fee-for-service agreement. Funding comes from membership dues, federal and state funding, and local contributions based on services provided. The Board of Directors is composed of mayors of member communities, TDOT, and the governor's appointees.⁹⁰ MTA offers a rapid bus service that is designed to move bus riders along the city's busiest corridors faster than buses on four local routes (50, 52, 55, and 56). The service offers more frequent service and fewer stops.⁹¹

Tennessee Department of Transportation (TDOT) produced a 25-year long-range transport policy plan outlining strategies for transport demand management (TDM), future growth, trends, technology, and recommendations for improvements. The plan outlines several initiatives aimed at reducing driving alone, such as ridesharing, park and ride facilities, and High Occupancy Vehicle (HOV) lanes.⁹² *NashvilleNext* (published March 2015) is the city's general plan for the next 25 years. It identifies walking and public space improvements as critical needs in the downtown (including a new vision for Broadway between First and Fifth Avenues). Metro Public Works has already begun improvements to crossings, signals, and walking zones in these areas.⁹³

Connected Nashville is a citywide program which has several dimensions including one focused on accessibility and efficiency of all things related to transportation in Nashville. It prioritizes clean and non-motorized modes. Some of the strategies of the plan include implementing a multipurpose mobility platform that will allow its citizens to plan their trips with a variety of multi-modal transport options. One of the reasons the city is moving forward with this is to integrate mobile platforms that can provide real-time access to information and seamless trip planning between various on-demand and shared mobility modes.⁹⁴ The city also has TNCs and on-demand mobility services such as Autobuses and Adame which may serve as first- and last-mile connectors to transit.

90 Nashville MTA & RTA, *Quick Facts On Middle Tennessee's Transit Organizations* (2017). <http://www.nashvillemta.org/PDF/PowerPointForWeb4.pdf>

91 Nashville Authority, *Nashville MTA - BRT Lite* (Nashvillemta.org, 2017). <http://www.nashvillemta.org/Nashville-MTA-BRT-Lite-2016.asp>

92 Tennessee Department of Transportation, *TDOT 25-year Long-range Transportation Policy Plan Policy Paper* (2015). https://www.tn.gov/assets/entities/tdot/attachments/Mobility_022316.pdf

93 City of Nashville, *NashvilleNext*, Nashville.Gov (2017). <http://www.nashville.gov/Government/NashvilleNext.aspx>

94 Metropolitan Government of Nashville and Davidson County, *Connected Nashville* (2017). <http://www.nashville.gov/Government/Connected-Nashville/Dimension-2-Smart-Mobility.aspx>

Access Nashville 2040, the transportation component of the *NashvilleNext* long-range plan, addresses issues of land use, development, mobility, and environmental preservation as it guides public and private investment for planning decisions related to the city's transportation system. Development densities and higher bus frequencies are outlined as key factors in promoting greater public transit ridership.⁹⁵

Nashville's previous mayor Megan Barry was elected in 2015 and established a mobility plan called *Moving the Music City* which seeks to overhaul the transport system, including:

- Redesigning the city's bus network, adding service to the 14 busiest routes so buses arrive at least every 15 minutes, extending the hours of bus operation, eliminating transfer fees on buses, upgrading to an electronic fare-payment system, and adding transit-priority signals and bus lanes to key streets.
- Adopting a Vision Zero agenda to eliminate traffic fatalities, focusing on improving pedestrian safety at crash-prone locations by implementing quick, low-cost solutions.
- Piloting new public space projects downtown, with a focus on the Lower Broadway area, which is a popular destination for bars and live music.
- Installing new protected bike lanes on Magnolia Boulevard and Music Row, home to the headquarters of many record labels.
- Developing Transit Oriented Development guidelines, focusing on future light rail corridors.

Let's Move Nashville: Metro's Transportation Solution Plan was a ballot initiative that outlined a \$5.2 billion mass transit investment to fund the planning, design, and implementation of 26 miles of light rail across four new lines, four rapid bus lines, expanded bus service for existing routes, a major downtown tunneling project, and two dozen transit centers across the city. The projects were anticipated to begin in 2019 and be completed by 2032.⁹⁶

FUNDING TO MEET TARGETS

In 2014, TDOT established a program called the *Multimodal Access Grant* that allocates state dollars to support the transport needs of pedestrians and bicyclists as well as transit users through infrastructure projects that address existing gaps along state routes. These projects are 95% state funded and require only a 5% local match. Total project costs must not exceed \$1 million. For the 2014 award year, nearly \$10 million was allocated to 13 different communities to fund a variety of multimodal projects.⁹⁷ Nashville-Davidson County has not been awarded transport funding from this source to date. However, the Metro Parks Department did receive funding for greenway extensions in 2017.⁹⁸

In Spring 2017, the state legislature passed the IMPROVE Act, which raised the statewide gas tax and enabled legislation for communities to hold referendums for local option sales taxes or other taxes to fund transit projects. Municipalities in Tennessee must rely on local sales tax and other sources of revenue, as the state collects no income tax.⁹⁹

95 Nashville Planning Department, *Access Nashville 2040* (2015).

96 *Let's Move Nashville* (2018). <http://letsmovevashville.com/plan/>

97 Tennessee Department of Transportation (TDOT), *Multimodal Access Grant* (October 2017).

<https://www.tn.gov/tdot/topic/multimodal-multimodal-access-grant>

98 Greenways for Nashville, *The Parks & Greenways Master Plan* (2018). <https://greenwaysfornashville.org/master-plan/>

99 Kriston Capps, *Can Nashville Pull Off a \$5.2 Billion Transit Makeover?*, Citylab.com (2017).

<https://www.citylab.com/transportation/2017/11/can-nashville-pull-off-a-52-billion-transit-makeover/544301/>

In May 2018, Nashville-Davidson county residents voted on the \$5.2 billion *Let's Move Nashville* proposal.¹⁰⁰ The ballot initiative was defeated 64% (78,710) against versus 36% (43,767) in favor. Despite support in the urban core, there was significant opposition from the regional suburbs.¹⁰¹

RECOMMENDATIONS

Moving forward, Nashville will need to be highly efficient with what funds are still at their disposal. The following steps may keep up momentum and public awareness about sustainable transport options in the short term:

SHORT-TERM (1-3 YEARS) OPPORTUNITIES

- Set a target for increasing public transit ridership and reducing drive-alone trips by 2030 as it has for increasing active transport (i.e., cycling and walking).
- Develop a public outreach and education campaign strategy to build stronger support for sustainable transport improvements to galvanize citizens in favor of transit funding.
- Engage media partners (e.g., Streetsblog Nashville) to develop a narrative for influencing public opinion about sustainable mobility options.
- Experiment with lower-cost tactical pilot projects such as protected bicycle lanes, pedestrian safety intersection treatments, and dedicated bus-only lanes to demonstrate the benefits of these improvements and builds support for permanent project implementation.

LONG-TERM (4-8 YEARS) OPPORTUNITIES

In the longer-term, Nashville may seek more ambitious opportunities to enhance sustainable mobility options within the city boundaries including:

- Expand the pedestrian sidewalk network to improve access to frequent transit stations and encourage pedestrian safety in the city.
- Do a frequent bus network redesign that leverages high demand ridership corridors and can potentially be cost neutral, perhaps even making some streets into transit malls.
- Design a policy of curbside management that discourages drive-alone trips and gives priority to shared mobility services. This may be a way to use existing assets to reach sustainable transport goals and resolve funding constraints as part of longer-term initiatives.

¹⁰⁰ Angie Schmitt, *The Nashville Media Is Getting Played by Transit-Bashing Hired Guns* (2018).

<https://usa.streetsblog.org/2018/01/03/the-nashville-media-is-getting-played-by-transit-bashing-hired-guns/>

¹⁰¹ Joey Garrison, *Interactive map: A sweeping loss for Nashville transit referendum everywhere but city's core* (2018).
<https://www.tennessean.com/story/news/2018/05/03/interactive-map-see-how-nashville-tn-transit-vote-lost-election-results/573756002/>

CONCLUSION

Most of the cities analyzed in this report had higher percentages of jobs near frequent transit than shares of their population. This indicates a national issue with a lack of people near frequent transit. Low-income households were also found to have higher percentages near frequent transit than the population of each city. Due to increasing VMT, declining public transit ridership, and rising greenhouse gas emissions from the transport sector, it is more critical than ever to set targets for efficient and convenient low-carbon and zero emission transport modes. The diagnostic analysis of Dallas, Denver, and Nashville offers several takeaways:

- All cities and regions need to set targets around performance (i.e., mode share) and not just infrastructure
- People near frequent transit correlates strongly to sustainable transport mode share
- Frequent transit can't just be linked to jobs, it also needs to be linked to people
- Safe, connected walking and cycling environments contribute to extending the catchment area of frequent transit

Setting mobility targets to assess mode share changes allows city agencies to gauge progress and understand how policy frameworks, funding mechanisms, and infrastructure projects work to change behavior and shift towards sustainable transport for improved quality of life.

Even without great expenditures to reach performance-based policy targets, pilot demonstration projects (protected bicycle paths, dedicated bus-only lanes, and new mobility services coupled with traditional frequent transit) may drastically enhance safety for people walking, riding bicycles, riding public transit, and seeking opportunities. A shift toward sustainable transport necessitates a shift away from drive-alone trips.

