NTD

National Transit Database

2015 National Transit Summary and Trends

Office of Budget and Policy

October 2016

Federal Transit Administration
U.S. Department of Transportation

Table of Contents

Table of Exhibits

Introduction

General Information

Welcome to the National Transit Summaries and Trends (NTST), one of the Federal Transit Administration's (FTA) National Transit Database (NTD) Annual Data Products. The goal of the NTST is to present and summarize transit data in an easy-to-read format and to provide an overview of public transit in the United States. This 2015 NTST discusses data from 2006 to 2015. With the exception of the Rural Transit storyline and where explicitly noted, all data included in the NTST are from urban transit providers, whose data may also include service operated in rural areas.

What is the National Transit Database (NTD)?

The National Transit Database (NTD) is the primary source for information and statistics on transit systems in the United States. Congress requires the NTD to collect financial and service information annually from public transportation agencies that benefit from FTA grants. The NTD also requires larger urban transit providers (Full Reporters) to submit monthly operating and safety data. Each year, the FTA uses NTD data to apportion over $8 billion to urbanized areas (UZAs) and States under funding programs such as §5307 (Urbanized Area Formula grants), §5311 (Formula Grants for Rural Areas), §5329 (Transit Safety & Oversight grants), and §5337 (State of Good Repair grants).

Who reports data to the NTD?

§5307 Program Recipients

Recipients or beneficiaries of the FTA's Urbanized Area Formula Program (§5307) must file annual reports, monthly ridership, and safety and security reports with the NTD. These reporters are also called **Urban Reporters**. Beginning in FY 2011, transit agencies with 30 or fewer vehicles became eligible for reduced reporting requirements, including reporting exemptions for passenger miles, mode-specific capital and operations costs, employee counts, maintenance performance, energy consumption, monthly ridership, and safety data.

§5311 Program Recipients

Recipients or beneficiaries of the FTA's Other Than Urbanized Area Formula Program (§5311) must file annual reports to the rural module of the NTD, also called **Rural Reporters**. States and Indian Tribes report directly to the NTD. States file reports on behalf of their sub-recipient rural transit agencies, who do not report directly to the NTD.

Voluntary NTD Reporters

The FTA accepts voluntary NTD reports from other transit systems, both public and private, that serve both urbanized and non-urbanized areas. Voluntary reporters must provide public transportation services and meet all of the same reporting obligations as mandatory reporters.

Some agencies that do not operate transit service report to the NTD. **Build Reporters** are agencies that benefit from federal funding and are in the process of building transit infrastructure but do not yet operate service. **Planning Reporters** do not operate transit service but instead receive federal funding and distribute the funds among transit operators in their area.

Because of the difference in reporting requirements for agencies that report as Small Systems, certain exhibits within this document exclude their data for the entire ten-year period presented. In these cases, exhibits are labeled with a footnote. Unless otherwise noted, all exhibits in the NTST include data from all urban reporters.

What are the modes of transit?

Public transit includes buses, trains, ferryboats, paratransit, and much more. Certain transportation services are specifically excluded, such as intercity bus service, intercity rail service, intra-facility transport (airport people movers), and sightseeing rides.

Different types of vehicles, technologies, and operational characteristics distinguish the modes of transit. FTA identifies the following modes of public transit:

- **Aerial Tramway (TR)** is an electric system of aerial cables powered by centralized motors with suspended powerless passenger vehicles.
- **Alaska Railroad (AR)** is a public transportation system that shares vehicles and facilities with freight rail operations.
- **Bus (MB)** includes a variety of rubber-tired passenger vehicles operating on fixed routes and schedules over roadways.
- **Bus Rapid Transit (RB)** is a fixed-route bus mode that operates frequent service (short headways), has at least 50 percent of its route on exclusive guideways, and includes features that emulate rail transit modes.
- **Cable Car (CC)** is a street-running railway with individually controlled rail cars propelled by underground cables powered by centralized motors not on board the cars.

- **Commuter Bus (CB)** is a fixed-route bus mode that primarily connects outlying areas with a central city through bus service that goes at least five miles of closed-door service.
- **Commuter Rail (CR)** is an electric- or diesel-propelled railway for urban passenger travel on the general railroad system between a central city and adjacent suburbs.
- **Demand Response (DR)** includes automobiles, vans, or small buses dispatched by request to pick up passengers and transport them to their destinations.
- **Demand Response-Taxi (DT)** is a Demand Response function operated through contracted taxicab providers.
- **Ferryboat (FB)** is a seafaring mode carrying passengers over a body of water using steam- or diesel-powered boats.
- **Heavy Rail (HR)** is an electric railway that operates on exclusive track with the ability to carry a heavy volume of passengers and is typically powered by an electrified third rail.
- **Hybrid Rail (YR)** systems primarily operate light rail-type diesel multiple-unit vehicles on the national system of railroads.
- **Inclined Plane (IP)** is a railway on steep slopes with powerless vehicles propelled by centrally powered moving cables.
- **Jitney (JT)** includes passenger cars or vans on fixed routes (sometimes with minor deviations according to passenger demand) without fixed schedules or fixed stops.
- **Light Rail (LR)** is an electric railway that intersects vehicular traffic at grade crossings and is typically powered by overhead wires.
- **Monorail/Automated Guideway (MG)** is a group of rail services that operate over exclusive guideway and include monorails and driverless people movers.
- **Público (PB)** includes passenger vans or small buses operating with fixed routes but no fixed schedules.
- **Streetcar Rail (SR)** is a rail transit system powered by overhead catenaries that operates mostly on streets in mixed traffic.
- **Trolleybus (TB)** is an electric rubber-tire bus system powered by overhead catenaries that operates on streets in mixed traffic.

- **Vanpool (VP)** includes vans, small buses, and other vehicles operating as a ride-sharing arrangement, transporting at least seven people directly between their home area and a regular destination.

What is an Urbanized Area (UZA)?

The U.S. Census Bureau defines urbanized areas (UZAs) based on incorporated places (e.g., cities, towns, villages) and their adjacent areas. The U.S. Census Bureau considers a densely populated area of 50,000 people or more to be a UZA. There are 498 UZAs according to the 2010 U.S. census, and while UZAs make up 2.5 percent of United States land area, the populations of UZAs make up 71.5 percent of United States population.

The FTA bases UZA designations on the most current census (currently the 2010 census). The NTD reporting system uses a unique number for each UZA that represents its numerical ranking by population. For the purpose of transit grants, the FTA also designates the Virgin Islands, Lake Tahoe, and certain areas in Puerto Rico as urbanized areas.

In the NTD, transit providers indicate the primary UZA of service operations as their "primary UZA" along with any secondary UZAs they serve. For analysis purposes, the NTST groups UZAs into the following categories:

- **UZAs over 1 million**: population of more than 1 million (42 urbanized areas, 309 agencies, or 35.7 percent of all agencies reporting).
- **UZAs under 1 million**: population of more than 50,000 and less than 1 million (456 urbanized areas, 557 agencies, or 64.3 percent of all agencies reporting).

What is a Rural Area?

- Rural areas are all areas not included in a UZA. The FTA includes Urban Clusters (2,500 – 50,000 population) in rural areas, while the U.S. Census Bureau considers Urban Clusters a part of urban areas. For this reason, the FTA provides "Other Than Urbanized Area Formula Program" funds to reporters to the rural module of the NTD. In comparison to UZAs, rural areas tend to have large distances between transit destinations and smaller populations.

What data does the NTD collect?

Transit operators report information regarding service provided, service consumed, and service resources, including financial data. Service provided includes information such as Vehicle Revenue Hours (VRH) and Vehicle Revenue Miles (VRM). Service consumed is described in terms of Unlinked Passenger Trips (UPT) — the total count of individual

vehicle boardings — and Passenger Miles Traveled (PMT) — the total number of miles traveled by passengers. The NTD collects financial data such as Operating Expenses (OE) for each mode operated, as well as the sources of funds used to support transit service. The NTD also collects resource data related to transit staffing levels and asset data for fleets and facilities.

What is Safety and Security reporting?

NTD safety and security (S&S) reporting requires all reporters to provide the number of safety and security events that involve the transit system's property, along with the number of fatalities and injuries that result from those safety and security events. While the exact reporting timelines and level of detail differ slightly based on agencies' NTD reporting type, a safety or security event is one that meets any of the following criteria:

- A fatality resulting from the event occurs within 30 days;
- Injuries to one or more persons resulting from the event that require immediate transport for medical attention;
- The estimated property damage from the event is at least $25,000;
- Collisions involving transit vehicles that require towing away from the scene;
- An evacuation that is made due to potentially life-threatening conditions or to the rail right-of-way;
- Derailments including both mainline and yard derailments, as well as non-revenue vehicle derailments;
- Rail transit vehicle collisions at rail grade crossing;
- Rail transit vehicle collision with an individual on the right-of-way; and
- Collision between a rail transit vehicle and a second rail transit vehicle or rail transit non-revenue vehicle.

Generally, the NTD requires Full Reporters to provide summary data for all events on a monthly basis. However, these agencies report additional details for more serious safety events. In contrast, §5311 reporters and urban Small Systems provide annual summary totals of safety and security events, fatalities, and injuries.

Rounding and Inflation

Rounding may lead to minor variations in total values from one exhibit to another within this analysis or may lead to instances where percentages may not add to 100. Due to rounding, percent changes may not exactly match the values calculated using the formatted figures shown in the exhibits.

The NTD has adjusted all exhibits involving dollar amounts to 2015 constant-dollar values, or dollar amounts adjusted in terms of constant purchasing power using the Consumer Price Index (CPI).

Web Information

For information about National Transit Database publications and training, visit the FTA website at www.transit.dot.gov or the National Transit Database website at www.transit.dot.gov/ntd.

Transit Trends in Service Operated, Service Consumed, and Costs

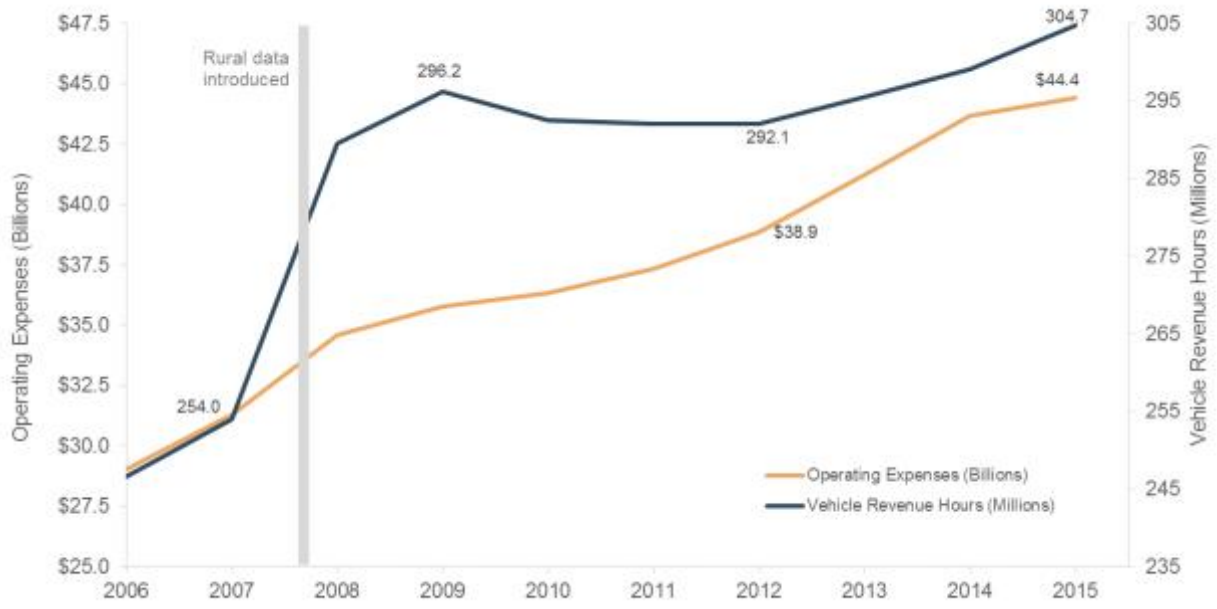


Exhibit 1 – Operating Expenses and Vehicle Revenue Hours: Time Series

Since 2006, use of public transit has increased overall. We see this increase in terms of service operated, service consumed, and service costs. In 2007, FTA introduced rural service data into the NTD, increasing total transit service data collected. Rural service makes up approximately 9.1 percent of all vehicle revenue hours (VRH) in 2015.

Since the introduction of rural data, unlinked passenger trips (UPT) have increased 5.6 percent (9.9 billion to 10.5 billion), VRH have increased 20.0 percent (254.0 million hours to 304.7 million hours), and operating expenses have increased 41.8 percent ($31.3 billion to $44.4 billion).

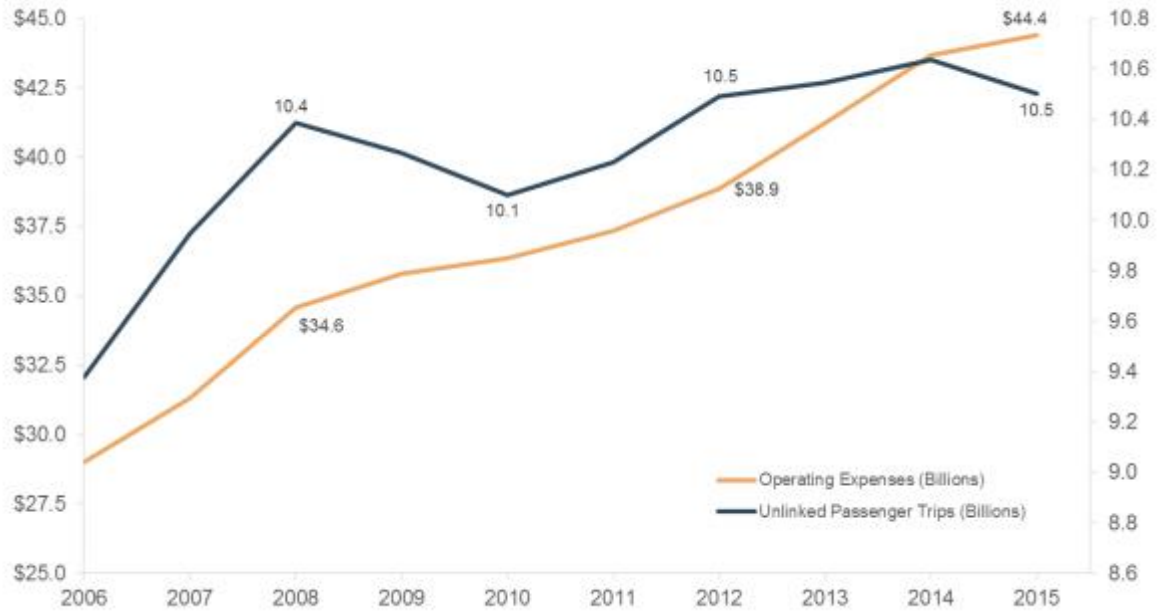


Exhibit 2 – Operating Expenses and Unlinked Passenger Trips: Time Series

Following the U.S. recession from 2007–2009, public transit passenger trips dropped 2.7 percent from 2008 to 2010 (10.4 billion trips to 10.1 billion trips). In response to reduced trip demand, transit operating expenses plateaued briefly, while transit service hours dropped 1.4 percent from 296.2 million revenue hours in 2009 to 292 million revenue hours in 2011.

Report Year 2015 Service and Cost Ratios

Service is provided, consumed, and financed differently for every transit mode. Service factors and expenses depend on the limitations and opportunities of different vehicles and the operating environment of different areas. For example, the average operating cost per vehicle revenue hour is highest for ferries (FB, $1,576.86). However, the mode provides an average of 175 trips per hour on large boats, thus the final cost per boarding is relatively low ($9.03).

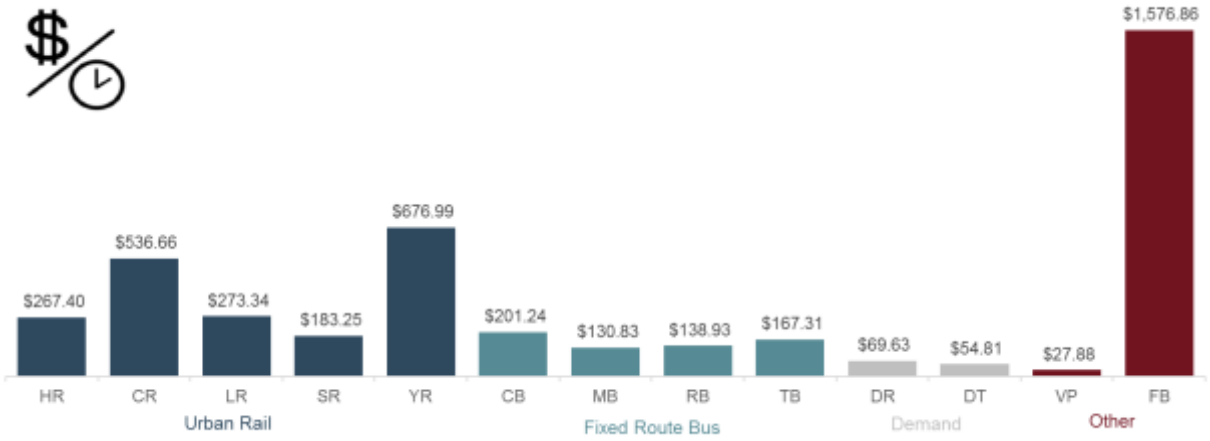


Exhibit 3 – Cost per Vehicle Revenue Hour

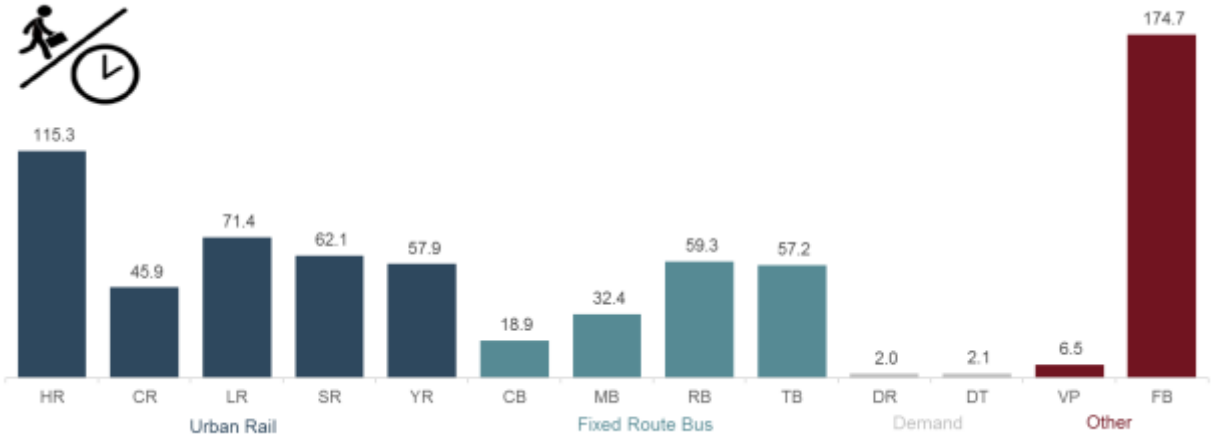


Exhibit 4 – 2015 Unlinked Passenger Trips per Vehicle Revenue Hour

By contrast, demand modes (demand response (DR) and demand response taxi (DT)) — which frequently provide single-passenger trips for individuals who meet the requirements of the Americans with Disabilities Act (ADA) — are very inexpensive per vehicle hour. However, due to the fewer trips per hour, the ultimate cost per unlinked trip on these modes is higher than other transit modes.

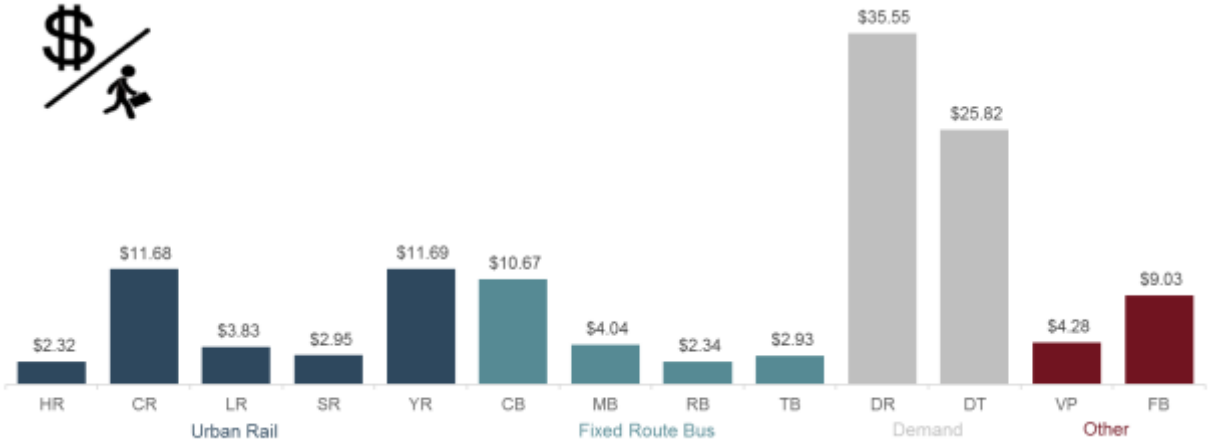


Exhibit 5 – 2015 Cost per Unlinked Passenger Trip

Urban rail modes split into transit rail (heavy rail (HR), light rail (LR), and streetcar (SR)) and commuter rail (commuter rail (CR) and hybrid rail (YR)). Typically, transit rail passengers use these services for shorter trips; commuter rail services carry passengers for longer trips on the Federal Railroad Administration-regulated (FRA) general railroad system. Transit rail has among the highest number of trips per hour among all modal categories. Therefore, even though cost per hour is higher than fixed route services, the ultimate operating cost per trip is comparable.

Unlinked Passenger Trips (UPT) are only one way to measure service consumed by the riding public. The goal of transit service is to transport passengers from one place to another, and a measure of that distance is Passenger Miles Traveled (PMT). With this more complete picture of service consumed, the operating cost per passenger unit is slightly different. Vanpool (VP) service, for example, may carry fewer people, but it carries them a consistently longer distance per trip. The opposite is true of trolleybuses (TB) and streetcars (SR), which carry many people — but not very far — in dense urban settings.

Exhibit 6 – 2015 Cost per Passenger Mile

Transit Service Providers: Organization Type

Transit providers indicate their organization type on the NTD Annual Report. The totals in Exhibit 7 do not include systems such as the Roosevelt Island Tramway in New York City and other systems that do not benefit from FTA funds and do not report to the NTD. Some NTD reporters, called Consolidated Reporters, submit a single report on behalf of multiple agencies. Exhibits 7 and 8 include individually re-classified constituent transit operators of Consolidated Reporters.

Organization Type	Count
City/County	456
Transit Authority	262
Other Types	179
Non-Profit	31
Planning	29
For-Profit	27
State Gov	20
Agency on Aging	18
Contractor	16
University	12
Subsidiary	12
Semi-Public Corp	10
Other	2
Tribe	2
Total Transit Providers	**897**

Exhibit 7 – Urban Transit Providers by Type

City and county organizations are departments of local government, while Transit Authorities are independent public agencies led by boards focused on providing public transit. Together, the two make up 80 percent of all public transit. The remaining portion of public transit is operated by private for-profit companies, non-profit companies, contractors, and semi-public corporations (9.4 percent); state governments (departments of transportation) (2.2 percent); universities (1.3 percent); Native American tribes (0.2 percent); and other transit operators (6.9 percent).

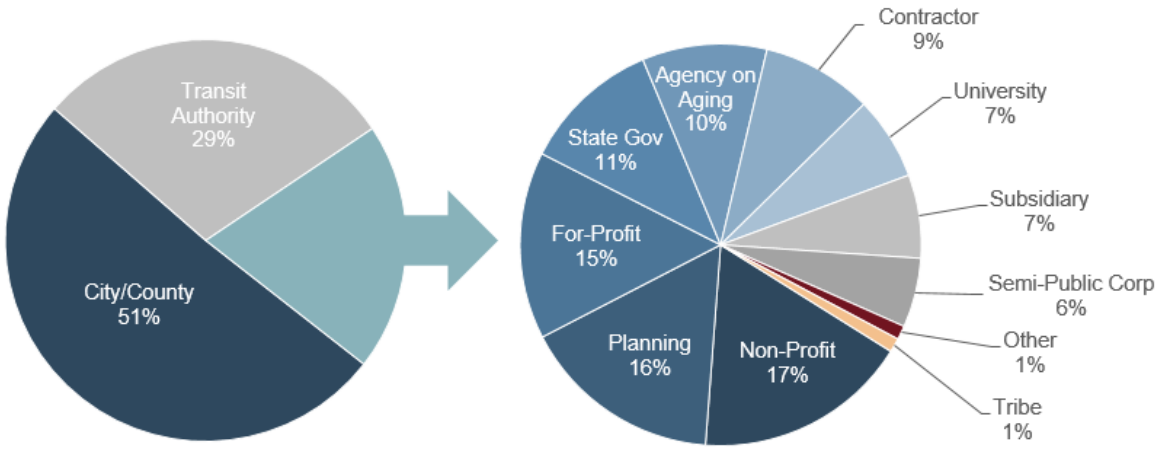


Exhibit 8 – 2015 Transit Provider Organization Types

Transit Funding

The Federal Transit Administration's Annual Budget

The FTA budget is a small portion of the U.S. Federal Government's total annual budget. During 2015, Congress appropriated 2 percent ($80.5 billion) of the total federal budget ($3.7 trillion) for transportation needs for the entire country. Over $12 billion goes to the FTA, making up 0.3 percent of the total federal budget.

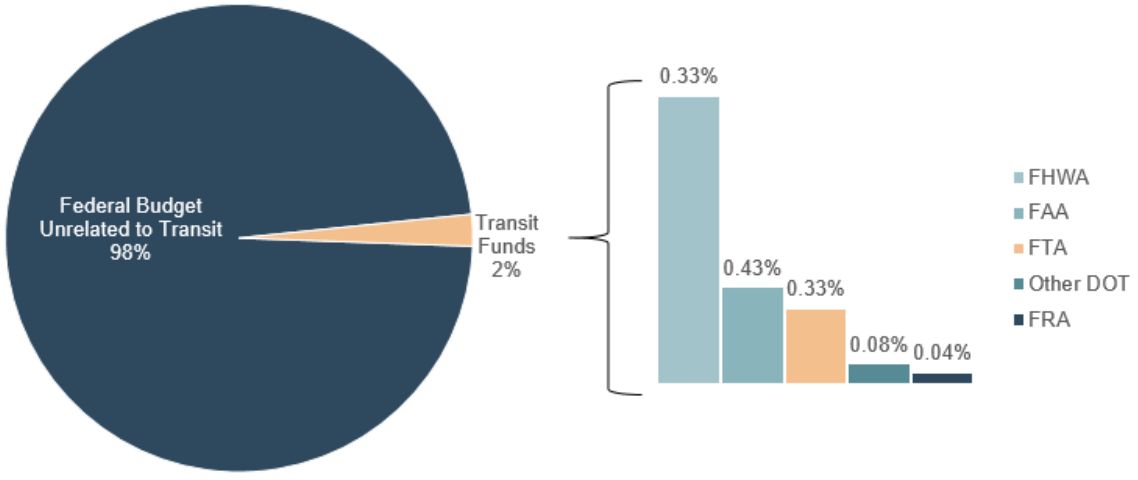


Exhibit 9 – 2015 Transportation as a Percentage of the Total Federal Budget

Operating Expense Funding Sources

On average, passenger fares fund 33 percent of public transit operations in the United States, with another 12 percent generated directly by the transit operator. Local and State sources fund 24 percent and 23 percent, respectively; Federal Government sources fund the remaining 8 percent.

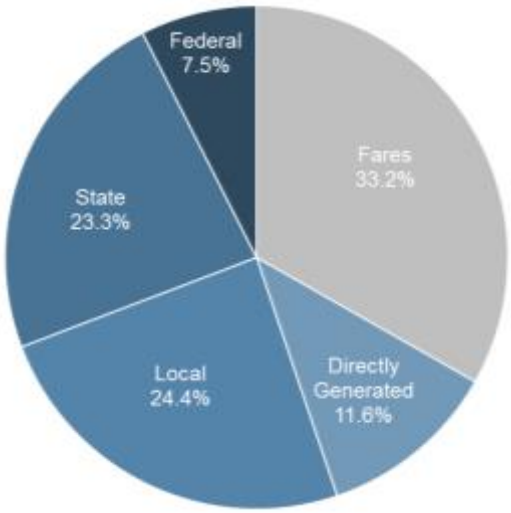


Exhibit 10 – 2015 Funding Sources for Transit Operations

Capital Expenditure Funding Sources

Transit operators spend resources not only on operations but also on constructing, acquiring, and improving the systems and equipment used to operate transit service. These improvements are called Capital Expenses.

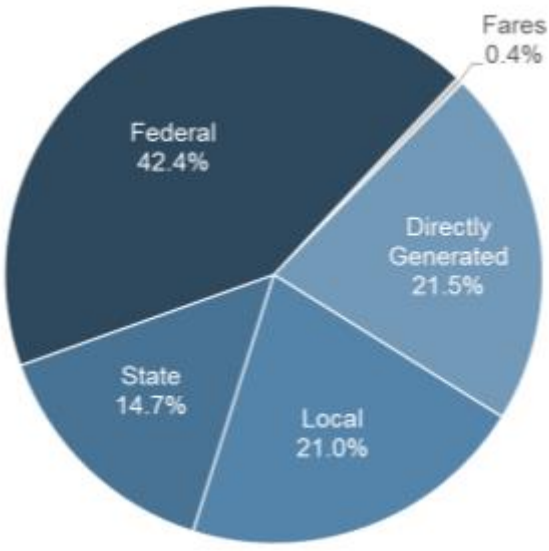


Exhibit 11 – 2015 Funding Sources for Capital Expenses

The funding support for capital expenses differs from operational expenditures. In 2015, 42 percent of all capital funds came from federal sources. Recently, transit agencies and local and state governments have increased their funding to replace and rehabilitate aging infrastructure. Fares and directly generated funds from transit agencies now account for about 22 percent of all capital purchases. Local and state governments make up the remaining 36 percent of capital funding.

Fare Box Recovery

Transit agencies do not establish passenger fares simply based on the cost of each trip. For each dollar spent in operating costs per trip across all modes and all transit systems, 36 cents are recovered through fares. The fare box recovery ratio is the percent of a trip's operating costs recovered through passenger fares. This ratio varies by mode and each transit operator. It is typical, for example, to see low recovery ratios on demand response services (DR and DT) that often serve the needs of customers who cannot use conventional modes of transportation and frequently have no alternate means of transportation. Vanpool transit, however, operates by scheduling passengers ahead of time, with one passenger driving the van to and from a specified destination. The combination of efficient scheduling, unpaid drivers, and simplicity of technology results in a high fare box recovery ratio (84.6 percent in 2015).

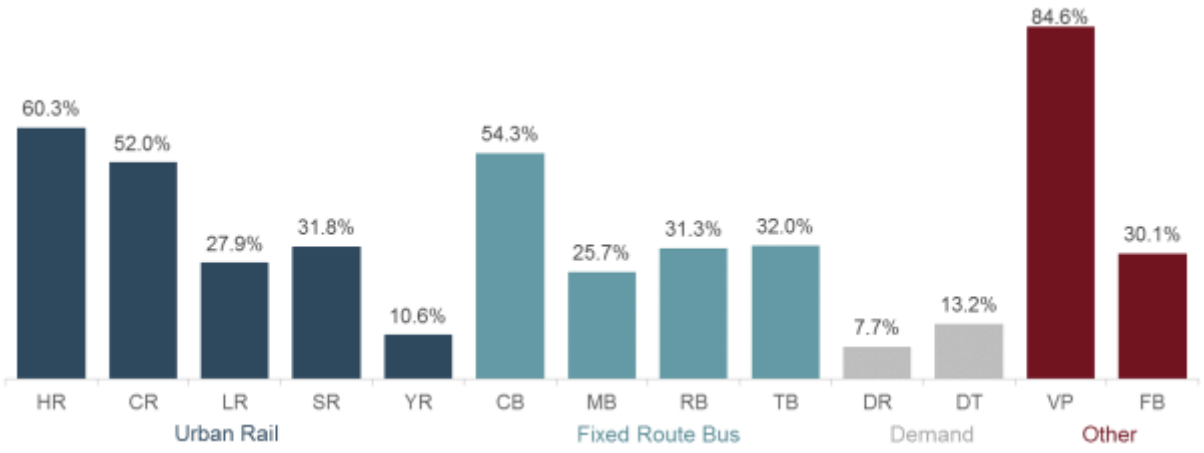


Exhibit 12 – 2015 Fares as a Proportion of Operating Costs

Modal Differences

Service Size

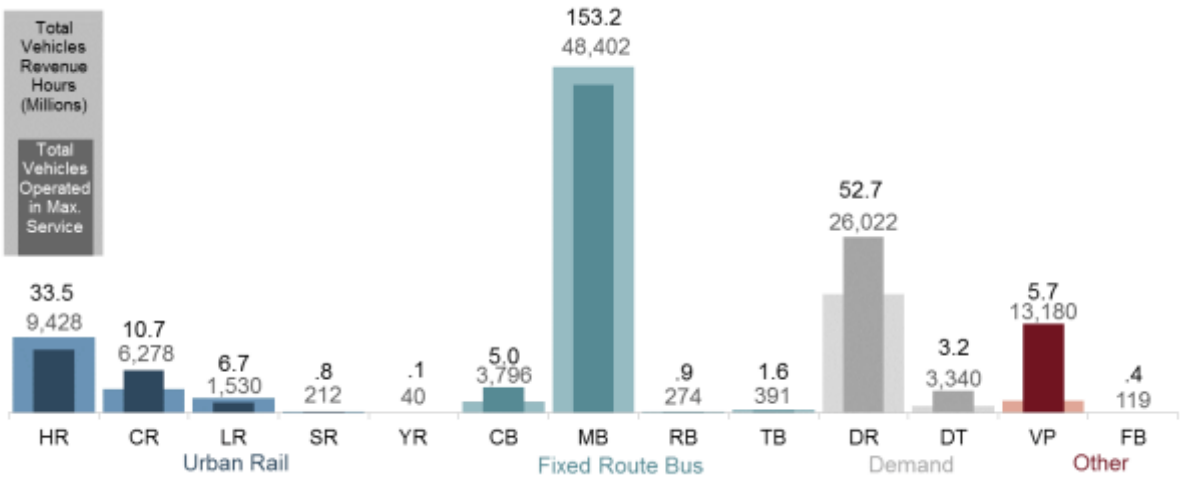


Exhibit 13 – 2015 Service Provided Size

FTA divides transit service into many different modes, as noted previously. Modal differences are clearly visible in graphs that compare and analyze transit service. For example, Exhibit 13 above demonstrates that fixed route bus (MB) systems are the most common form of public transit in the United States. With over 48 thousand vehicles operating during peak service (VOMS) and operating over 153 billion revenue hours (VRH) of service, MB is typically the most cost effective method of providing public transit in an urbanized area where building the necessary infrastructure for a rail network is impractical. Demand response (DR) is the second largest transit service type (26 thousand VOMS and almost 53 billion VRH) and is the main provider of service in rural and sparsely populated areas. Fixed route bus or rail service often uses DR as a support mode. Among rail modes, heavy rail (HR) systems are the most used (over 9 thousand VOMS and 33 billion VRH), with commuter (CR) and light rail (LR) close behind in terms of service provided.

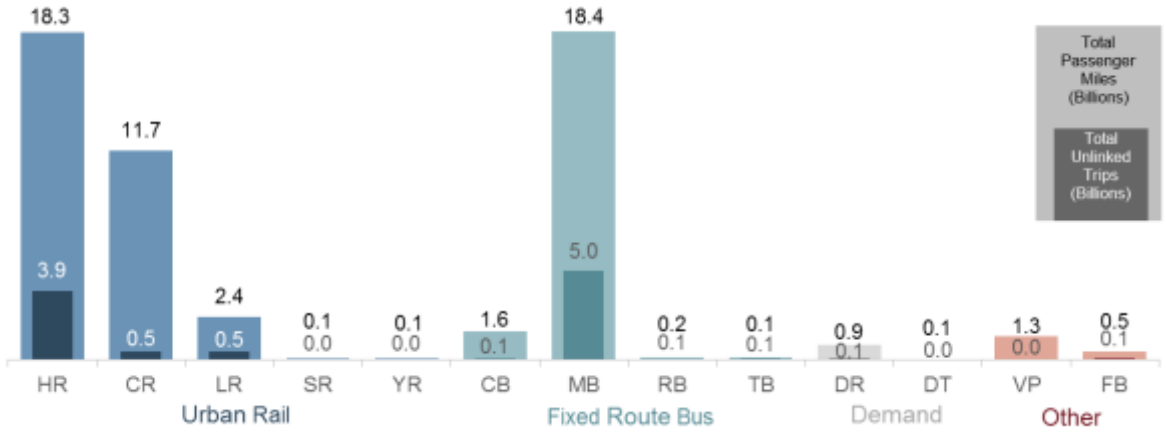


Exhibit 14 – 2015 Service Consumed Size

Service Data by Factor

Exhibits 15, 16, and 17 compare transit operation statistics across transit modes. **Average Trip Length** (passenger miles per trip) estimates the average distance a passenger travels when using a certain mode of public transit, and **Trips per Vehicle Revenue Hour** indicates the volume of passengers moved in an equivalent period on a vehicle. **Passenger Miles Traveled per Vehicle Revenue Miles** estimates the average number of passengers per vehicle at any given time.

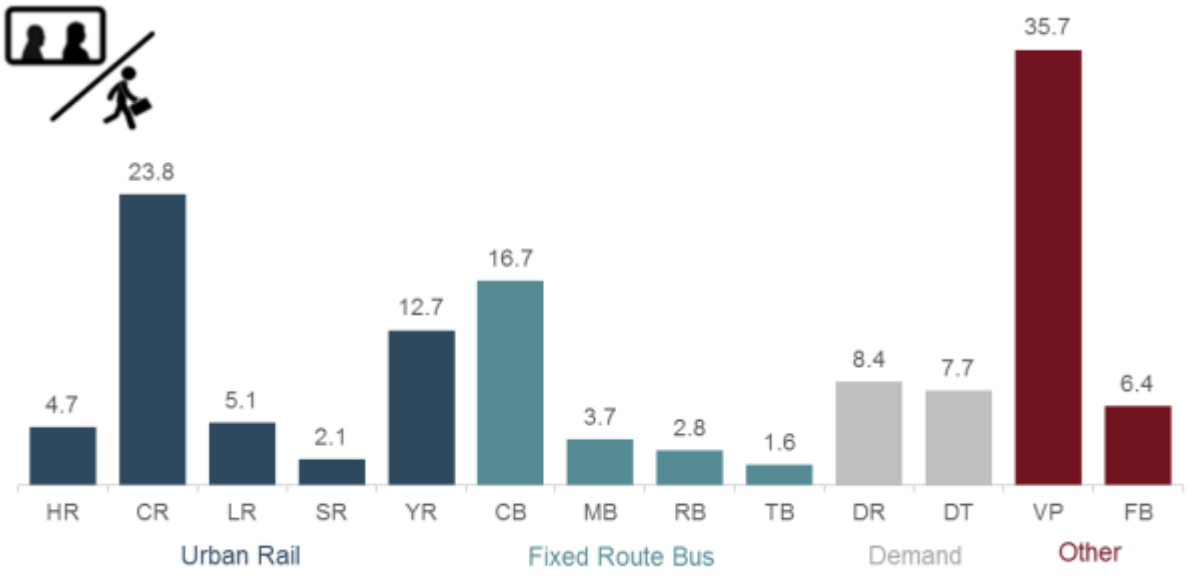


Exhibit 15 – 2015 Passenger Miles per Unlinked Passenger Trip (Average Trip Length)

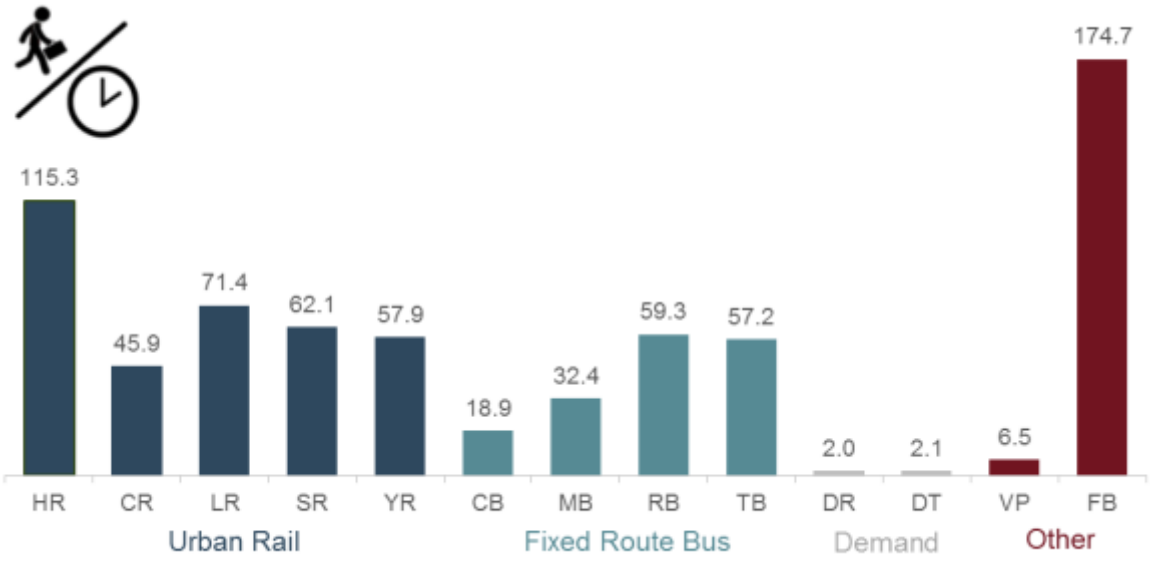


Exhibit 16 – 2015 Unlinked Passenger Trips per Vehicle Revenue Hour

Comparing average trips per hour and average trip length demonstrates how many passengers are on a transit vehicle and how far they travel, respectively. Demand modes take small passenger loads a relatively long distance to meet the requirements of the ADA. Ferry boats move the largest number of passengers often a very short distance across a waterway. Commuter rail (CR), hybrid rail (YR), commuter bus (CB), and vanpool (VP) all transport a comparatively smaller load of commuters (typically) a longer distance per trip.

Intensive city transit modes such as heavy rail (HR), light rail (LR), streetcar rail (SR), bus rapid transit (RB), trolleybus (TB), and bus (MB) all tend to provide a larger number of trips for a much shorter distance compared to long distance commuter-related modes. These intensive city transit modes also often include multiple transfers on a passenger's journey between vehicles of the same mode and among multiple modes. To get to work, for example, a passenger might take a bus trip to get to the underground train, ride the train for three stops, and walk from the train station to their workplace. In this example, the single commuter represents two unlinked passenger trips, one on bus and one on rail.

Ferryboats are capable of carrying more passengers at a single time than any other mode, an average of 126 passengers. Demand modes often assist disabled passengers (as a part of the ADA compliance) and respond to single passenger trip requests, dropping their load factor to nearly one passenger at a time. For most of the other modes that run on

schedules instead of requests, load factor does not take into account peak travel, such as rush hour, which can be more than twice the number of passengers in off-peak times.

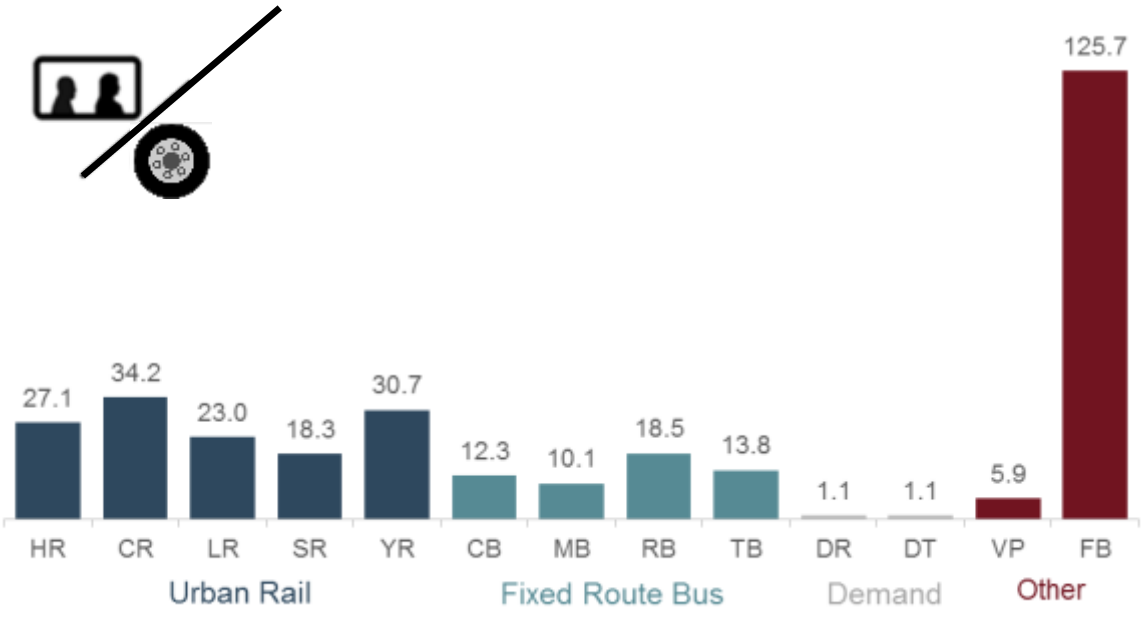


Exhibit 17 – 2015 Passenger Miles per Vehicle Mile (Average Number of Passengers per Vehicle)

Fixed Guideway and High Intensity Busway

Fixed Guideway Route Miles from 2006 to 2015

Public transit often operates on fixed guideway. The NTD separates fixed guideway into two categories: exclusive fixed guideway (FG) and high intensity busway (HIB). FG is a facility that uses separate right-of-way (ROW) or rail exclusively for public transportation. FG may be a fixed catenary system useable by multiple forms of public transit (e.g., trolleybus, light rail, etc.). HIB is roadway that is either:

- Exclusive at all times (24 hours, 7 days per week) as a High Occupancy Vehicle (HOV) lane or transit-way; or
- Controlled access, which is exclusive for part of the time but is otherwise available to general traffic.

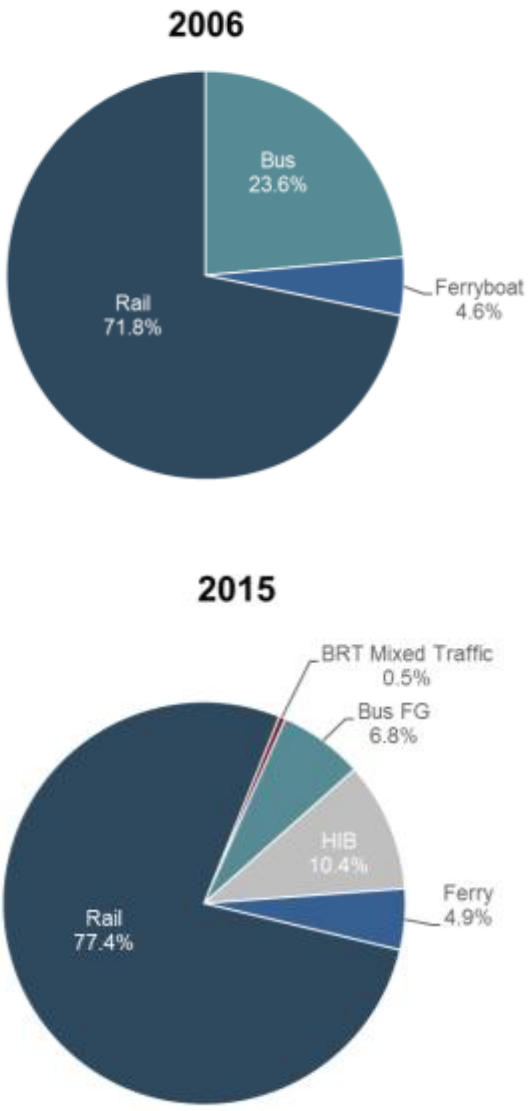


Exhibit 18 – FG Route Miles, 2006-2015

All rail, catenary, and ferryboat (FB) systems operate over FG. Bus systems may operate over FG, HIB, or publicly available roadway (mixed traffic ROW).

The NTD collects directional route miles for FG, HIB, and mixed traffic. The total mileage in each direction that public transportation vehicles travel in revenue service is calculated in directional route miles. For example, if a transit provider operates one mile of revenue service in two directions, the NTD counts this as two directional route miles.

Congress introduced HIB lanes during 2012 in the “Moving Ahead for Progress in the 21st Century Act” (MAP-21) legislation. In 2006, over 2,000 bus directional route miles

qualified for funding as bus fixed guideway. After MAP-21, only 320 bus directional route miles qualify as bus fixed guideway, with the remainder being reclassified as either HIB lanes or bus rapid transit (BRT or RB) mixed traffic.

Since 2006, public transit agencies have added 2,877 new miles of rail FG routes. In 2015, rail transit modes accounted for 77 percent of all directional route miles of fixed guideway, up about 5.6 percent from 2006. This high proportion of rail is due in part to the increase of light rail (LR) and streetcar rail (SR) modes in growing urban areas.

Fixed Guideway Concentration

Building separate infrastructure for public transit is costly, and dedicated rail transit only makes sense in high density areas with congested transportation and high demand for travel alternatives. As a result of this, only the most developed and congested cities in the United States have the demand and resources to build and maintain fixed guideway transit. According to the U.S. Census Bureau, the densest metropolitan areas in the 2010 census were New York, San Francisco, Los Angeles, Honolulu, Chicago, San Jose/Santa Clara, Boston, and Philadelphia. As each grew, dedicated rail became a viable transit solution.

	City Population			Population Density (Pop per Sq Mi)				
Metropolitan Area	1830	1890	1900	1940	1970	1990	2000	2010
New York city, NY	202,589	1,515,301	3,437,202	24,933	26,343	23,705	31,684	31,251
San Francisco, CA	n/a	298,997	342,782	14,227	15,764	15,502	12,438	12,145
Los Angeles, CA	n/a	n/a	102,479	3,356	6,073	7,427	12,442	12,114
Honolulu, HI	n/a	n/a	n/a	n/a	3,872	4,411	10,977	11,548
Chicago, IL	n/a	1,099,850	1,698,575	16,434	15,126	12,252	9,830	8,613
San Jose-Santa Clara, CA	n/a	n/a	n/a	n/a	3,273	4,567	8,300	8,418
Boston, MA	61,392	448,477	560,892	16,721	13,936	11,865	7,912	7,980
Philadelphia, PA	80,462	1,046,964	1,293,697	15,183	15,164	11,736	8,064	7,773

Approximate start of public rail transit service

Exhibit 19 – Metropolitan Area Density, 2010 Census

In 2015, the 5 urbanized areas with the most directional route miles of fixed guideway account for nearly 45 percent (6,249 miles) of all fixed guideway route miles, an average of 1,250 fixed guideway miles per UZA.

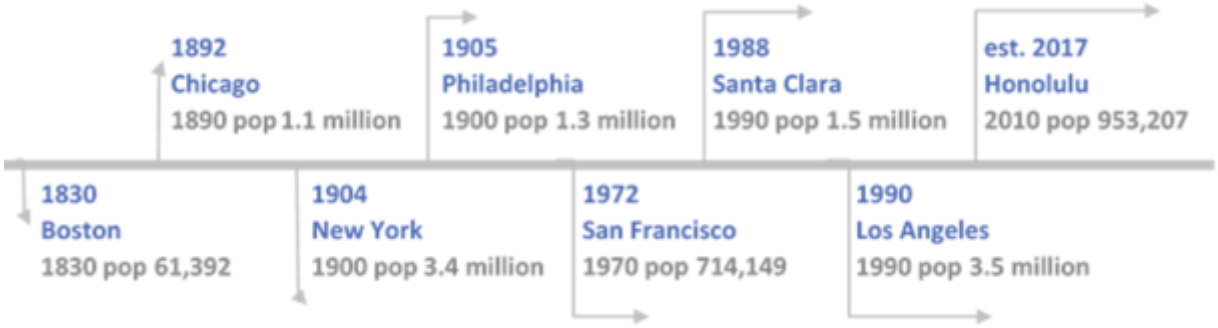


Exhibit 20 – High Density City Rail Transit Start Dates

The systems in Exhibit 20 have some of the longest histories and have had more time to develop, with gradual investment of resources towards infrastructure. The remaining 87 urbanized areas (and rural Alaska) account for 7,681 fixed guideway miles, an average of 88 fixed guideway miles per UZA.

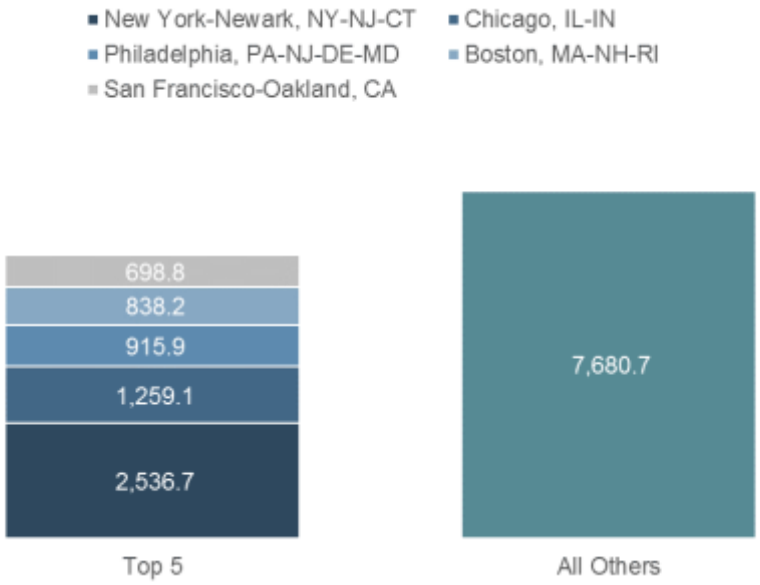


Exhibit 21 – UZAs with Most Directional Route Miles

The efficiency of fixed guideway systems varies significantly across the country. For example, Philadelphia had 838 fixed guideway route miles in 2015, which provided 1.2 billion passenger miles, an average of 1.4 million passenger miles per fixed guideway route mile. In comparison, Antioch, CA, has 8.3 fixed guideway route miles and provided 72 million passenger miles, an average of 8.6 million passenger miles per fixed guideway route mile.

Safety and Security

Safety and Security (S&S) events include vehicle collisions on the roadway, assaults on transit property, train derailments, slips and falls, damage from fallen trees, and more. The NTD requires large transit agencies to report any safety or security events that meet any of the following criteria:

- A fatality resulting from the event occurs within 30 days;
- Injuries to one or more persons resulting from the event that require immediate transport for medical attention;
- The estimated property damage from the event is at least $25,000;
- Collisions involving transit vehicles that require towing away from the scene;
- An evacuation that is made due to potentially life threatening conditions or damage to the rail right-of-way;
- Derailments, including both mainline and yard derailments, as well as non-revenue vehicle derailments;
- Rail transit vehicle collisions at rail grade crossing;
- Rail transit vehicle collision with an individual on the right-of-way; and
- Collision between a rail transit vehicle and a second rail transit vehicle or rail transit non-revenue vehicle.

Any of these events qualify as a Major Event that the agency must report within 30 days to help FTA better address safety and security issues in public transit.

Notes on safety data:

- All safety data presented on the following pages are sourced from Calendar Year 2015 NTD major event reports. At the time of this document's publication, NTD reporters can still add, modify, and delete major event data for Calendar Year 2015. As such, these data are considered "preliminary" and numbers may change based on ongoing validation activity.
- The analyses on the following pages use Calendar Year service data sourced from the NTD's Monthly Ridership data collection to calculate Calendar Year safety rates.

- The Federal Railroad Administration oversees safety for commuter rail (CR) systems and a select set of Hybrid Rail (YR) and Heavy Rail (HR) systems. These agencies do not report safety data to the NTD and are therefore excluded from any safety analyses in this document.

2015 Safety Statistics by Mode

Mode	S&S Events per 100M VRM	Fatalities per 100M VRM	Injuries per 100M VRM	Fatalities per 100 events	Injuries per 100 Events
HR	126.2	14.8	110.6	11.8	87.6
LR	773.9	44.7	416.3	5.8	53.8
SR	4,114.1	52.0	1,944.2	1.3	47.3
YR	601.5	200.5	551.4	33.3	91.7
CC	6,697.0	-	1,860.2	-	27.8
MG	119.7	-	99.8	-	83.3
CB	62.8	2.4	62.8	3.8	100.0
MB	306.1	4.9	472.1	1.6	154.2
RB	500.6	-	842.0	-	168.2
TB	469.8	36.8	635.6	7.8	135.3
DR	125.5	0.6	133.7	0.6	106.5
DT	53.4	-	66.2	-	124.0
FB	138.4	55.3	166.1	40.0	120.0
VP	22.4	-	14.0	-	62.7
PB	34.0	5.6	39.7	16.7	116.7

Exhibit 22 – 2015 Safety and Security Major Event Rates by Mode

Streetcar (SR) and Cable Car (CC) modes operate across short distances and within motor vehicle traffic and experience higher event rates than other modes. However, CC and SR modes also operate at lower speeds and report fewer injuries and fatalities per event. Ferryboat (FB), Motor Bus (MB), Bus Rapid Transit (RB), and Trolleybus (TB) modes operate over longer distances at higher speeds with more people aboard. These modes report fewer events per VRM, but more injuries and fatalities per event.

Non-Rail Safety Events

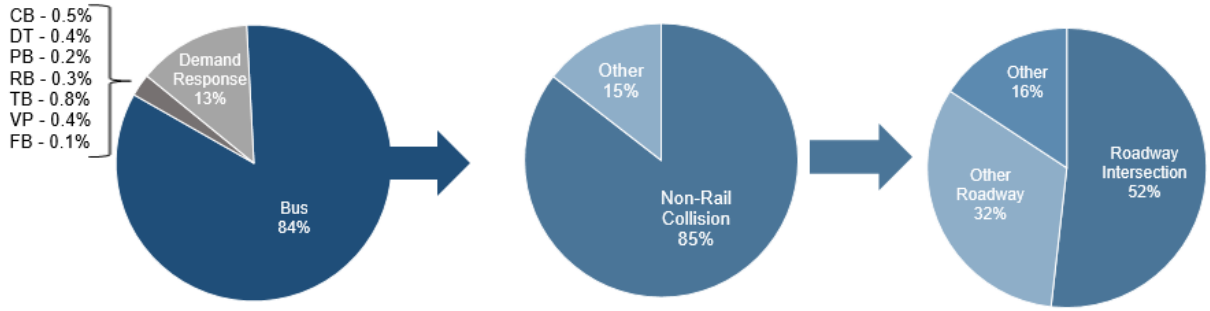


Exhibit 23 – Non-Rail Event Categories

Between 2008 and 2015, transit agencies reported 46,432 major events, 83 percent of which involved non-rail transit modes. Of these non-rail events, 84 percent involved Motor Bus (MB) modes. Of the Motor Bus events, 85 percent were collisions, and of those MB collisions, 84 percent occurred in the roadway.

Rail Safety Events

Between 2008 and 2015, urban transit agencies reported 8,195 rail safety and security events to the NTD, 55 percent of which were on heavy rail (HR) modes.

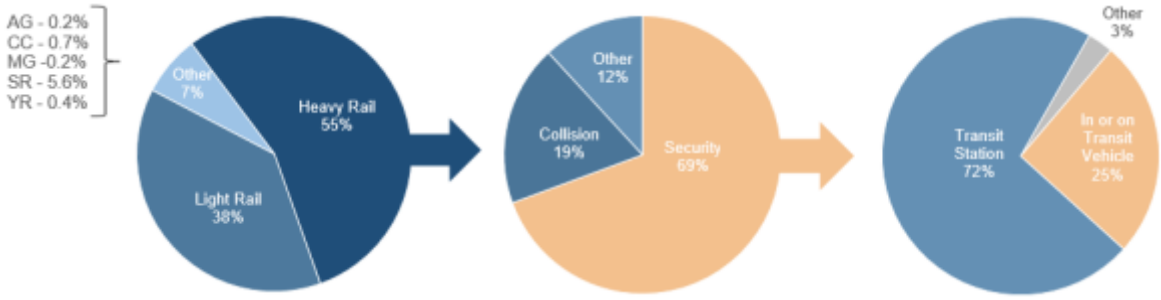


Exhibit 24 – Rail Events by Mode

Of those HR events, 69 percent were security-related events, 72 percent of which occurred within a transit station. HR service interacts far less often with general vehicular traffic and pedestrians than bus modes and experiences fewer collisions. Almost half of all HR events were security incidents occurring in the station.

Fatalities

In 2015, transit agencies reported 255 fatalities. The majority of these fatalities were members of the public, such as non-customer pedestrians, cyclists, and occupants of other vehicles. Rail security events (such as suicides and homicides) and non-rail collisions accounted for 40.8% of all fatalities in 2015.

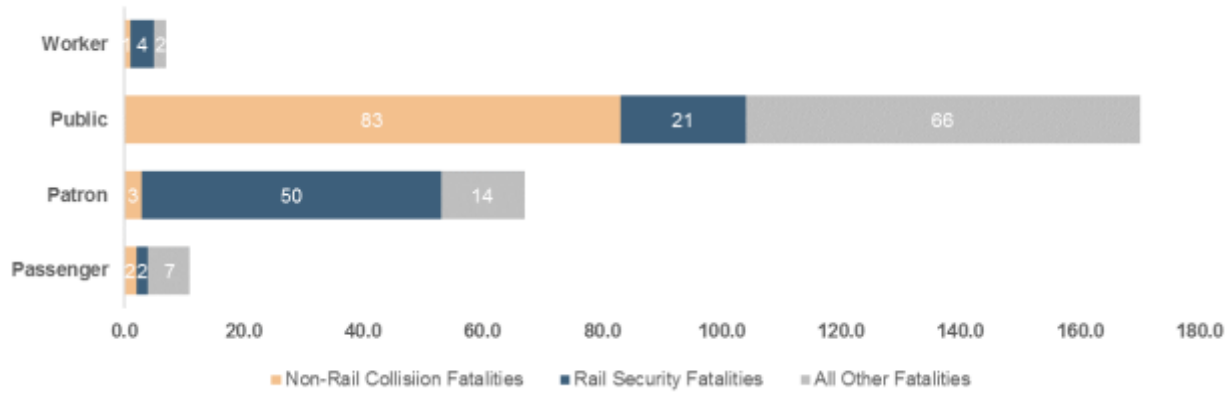


Exhibit 25 – Fatalities by Person Type

- Worker – Transit agency employee or contractor
- Public – Individual who is not a transit customer
- Patron – Transit customers that are not on board a vehicle
- Passenger – Transit customers that are on board a vehicle

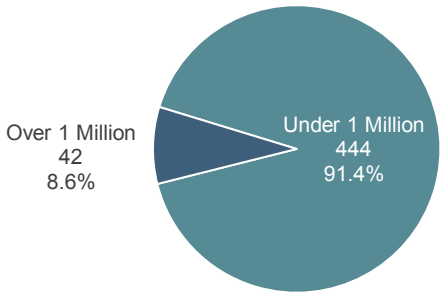
Urbanized Areas Over and Under 1 Million People

Population and Transit Agencies

Public Transit Service is dependent on population density in order to function efficiently. In the United States, most UZAs have populations of less than 1 million people, but most people live in those UZAs, and they consume most of the public transit service.

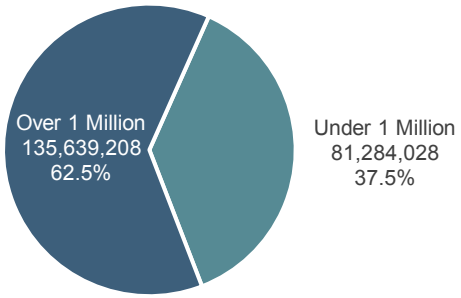
Only 42 (8.6%) of the UZAs in the US have a population over 1 million people.

UZA Count by Population Size



However, 62.5% of UZA residents live in those 42 UZAs.

Resident Population per UZA Size



Residents of these 42 UZAs consume 88.4% of the public transit service captured in the NTD as measured by Passenger Miles Traveled.

Service Consumed (PMT) per UZA Size

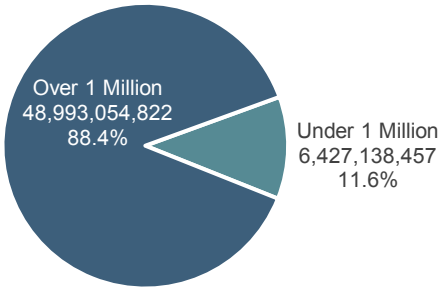


Exhibit 26 – UZA Count, Population, and Total Passenger Miles Traveled

Trips per Capita

UZAs over 1 million have more trips on public transit per capita. The median ridership density for UZAs under 1 million in 2015 is 5.90 trips per capita, whereas the median for UZAs over 1 million is 26.30. Owning and driving your own vehicle in a dense urbanized area can be both expensive and inconvenient. Choosing public transit over private cars, bicycles, motorcycles, or walking is called a “discretionary trip” and indicates a personal choice that is not out of necessity, medical or otherwise.

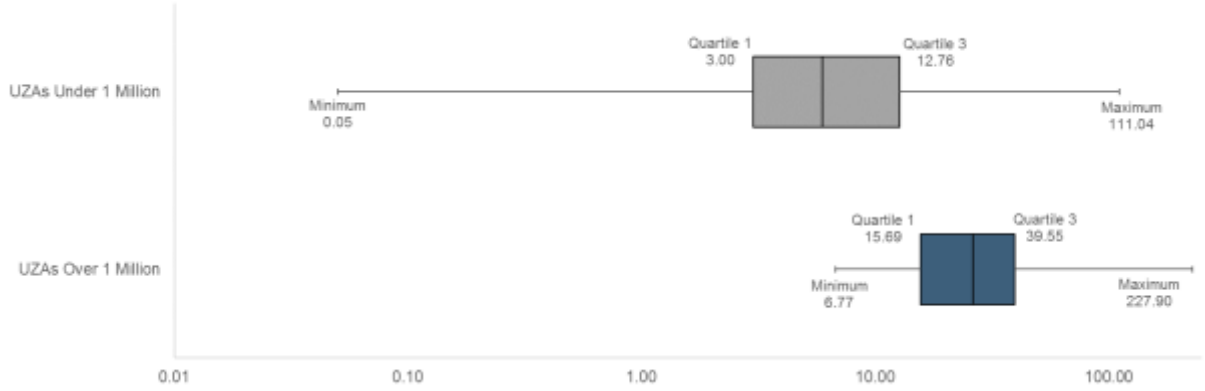


Exhibit 27 – 2015 Ridership Density (Passenger Trips per Capita)

Operating Cost per Passenger Trip

Cost per trip varies widely in UZAs under 1 million, from $0.94 to over $45. In UZAs over 1 million, the range is narrower, between $2.91 and just over $7 per trip. There is less difference between the median cost per trip between UZA size categories (a difference of $1.41), suggesting that there are more rural demand response services (comparatively expensive) in UZAs under 1 million. These rural demand response services on average carry the fewest number of passengers per trip. UZAs over 1 million more often have extensive fixed-route and fixed-guideway systems that carry more passengers per trip, dramatically dropping the average cost per trip.

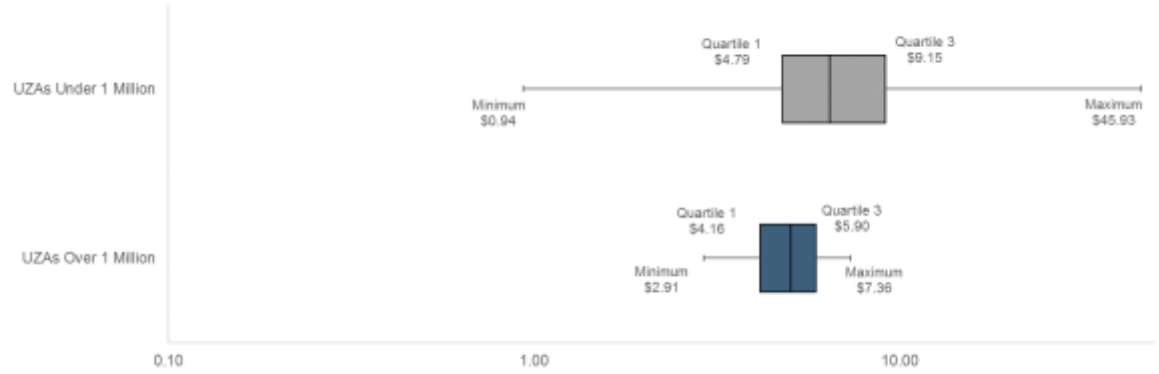


Exhibit 28 – Operating Cost per Passenger Trip

Operating Cost per Revenue Hour

UZAs over 1 million have a slightly lower cost per trip but a higher average cost per hour. The lowest average cost per hour in UZAs over 1 million is $86.23, the middle of the pack (median) for UZAs under 1 million is $75.52. Intensive urban transit carries significantly more passengers at a time, requiring more workers, equipment, and space. Additionally, prices are higher in dense cities, which raises wages, property costs, and general supply prices.

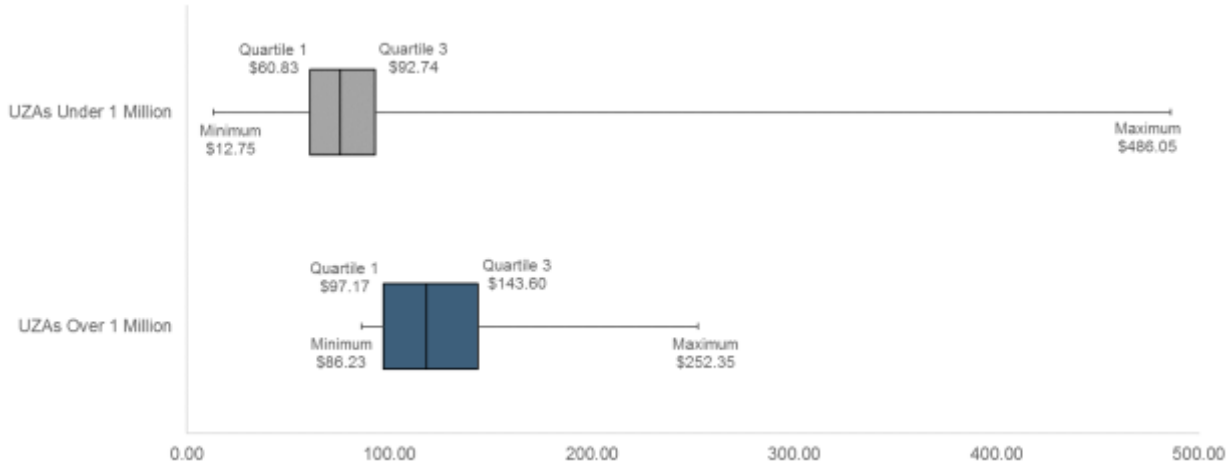


Exhibit 29 – Operating Cost per Vehicle Revenue Hour

Event Rate Comparison

In 2015, UZAs with populations over 1 million experienced 253.09 S&S events per 100 million Vehicle Revenue Miles (VRM). UZAs with populations less than 1 million people experienced S&S events at a lower rate: 133.06 events per 100 million VRM.

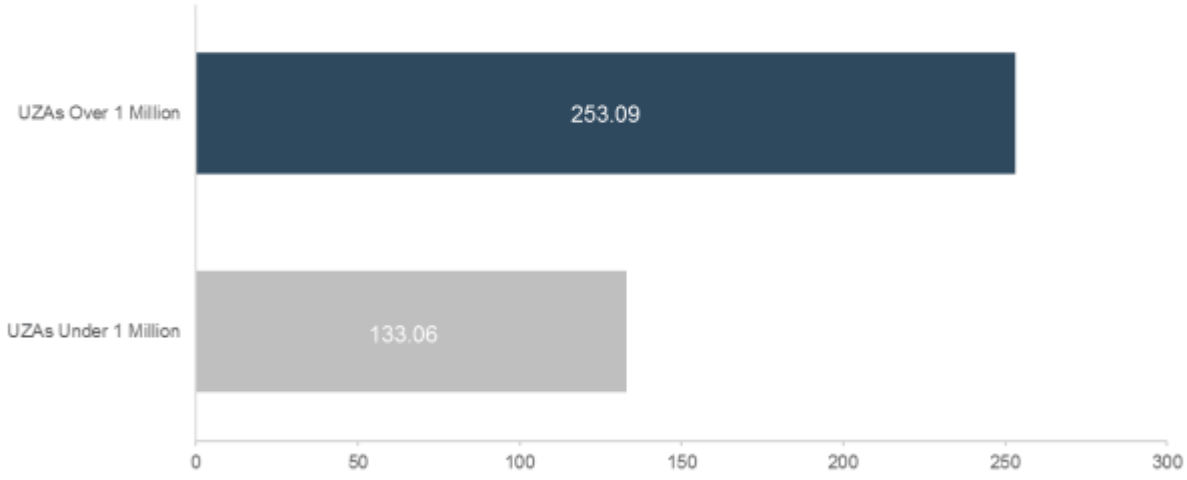


Exhibit 30 – Total S&S Event Rate Comparison

Fixed Guideway Comparison

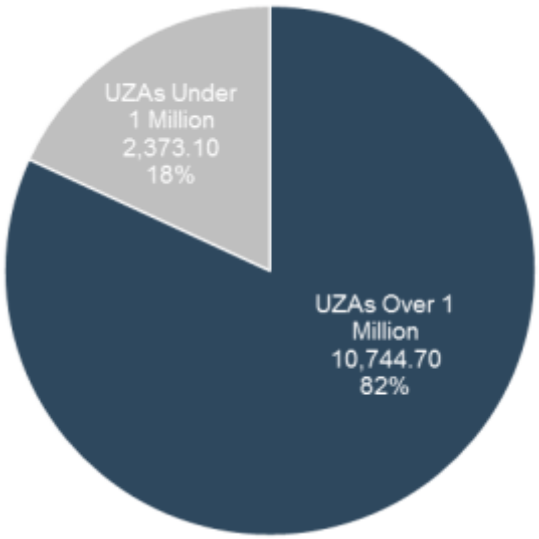


Exhibit 31 – Rail, Bus, and Other Fixed Guideway Directional Route Miles Comparison

UZAs with populations over 1 million operate over 82 percent of all fixed guideway directional route miles. Each directional route mile is a mile of transit operation space where private transportation cannot operate. For example, the New York City Subway operates on rail track unavailable to Amtrak, CSX, and any other private trains. The Boston Silver Line is bus rapid transit with dedicated right-of-way, meaning that it operates similarly to rail transit: car traffic cannot trespass on the roadway reserved exclusively for the Silver Line.

Alternative Fuels

In the past several years there has been an increased focus on the use of alternative and renewable energy sources. The U.S. Department of Energy identifies electricity, hydrogen, natural gas, and propane as sources of alternative energy. While gasoline and diesel fuels are still the primary fuel sources for most fixed route, paratransit, and vanpool vehicles, there has been a growing trend towards alternative energy sources.

Traditional Energy Sources

The most widely used energy source is diesel fuel. This is largely a result of diesel engines providing a greater amount of torque from a standing start, making diesel preferable to gasoline for larger vehicles.

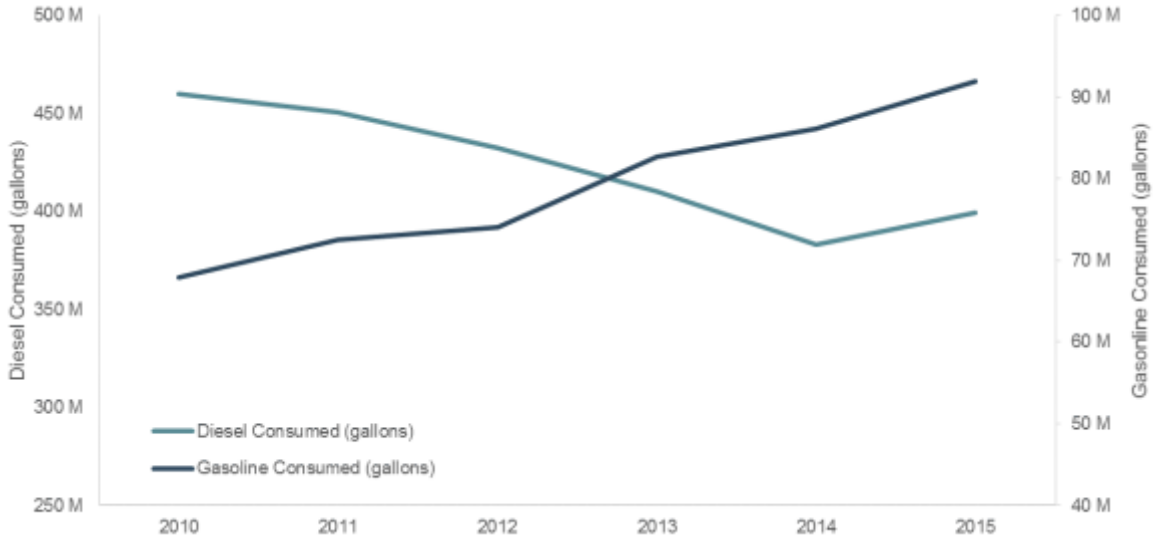


Exhibit 32 – Traditional Energy Sources

Despite this benefit, diesel fuel consumption has decreased 13.2 percent since 2010. The use of gasoline has increased 35.5 percent in the same time frame. However, the collective use of traditional fuels has decreased 7.4 percent.

Natural Gas and Propane

Natural gas and propane are very similar fuels. Natural gas is naturally occurring, while propane is a byproduct created during the process of refining and cleaning natural gas and petroleum. While natural gas and propane are considered fossil fuels, the use of

these fuel sources has increased significantly due to their domestic abundance and relatively cheap price.

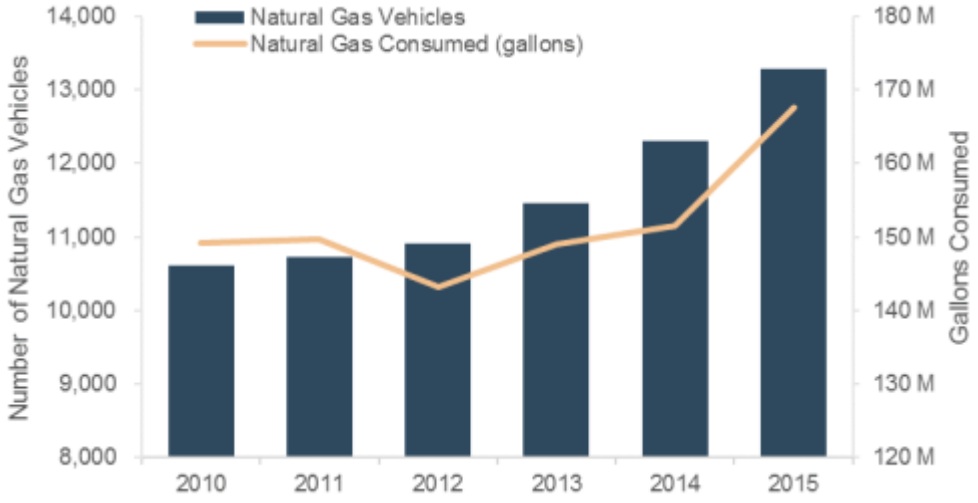


Exhibit 33 – Natural Gas

The number of vehicles using natural gas has increased 25.1 percent since 2010. Over those same six years, natural gas consumption has increased 12.3 percent.

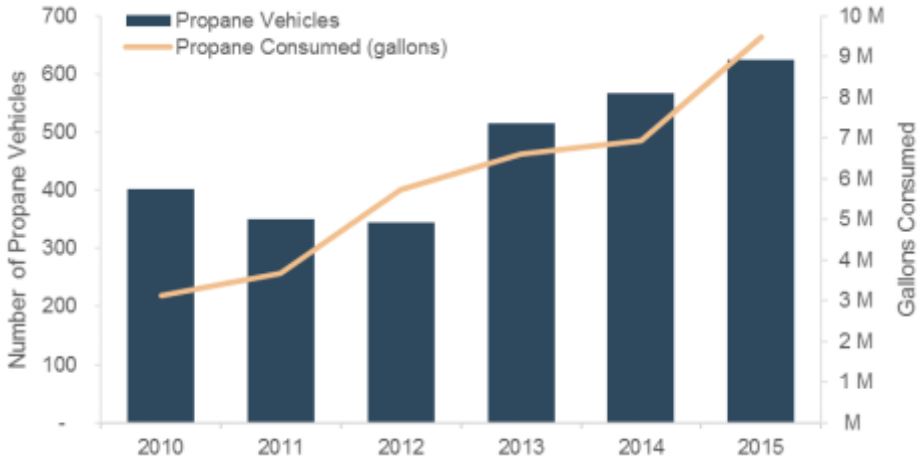


Exhibit 34 – Propane

The use of propane is more common with smaller buses or cutaway vehicles. While the number of vehicles using propane has only increased 55.5 percent over the past 6 years, consumption of propane increased 203 percent, suggesting an increased utilization of these propane-powered vehicles.

Electric Battery

One of the most noteworthy increases in alternative energy sources is electric-battery vehicles. The consumption of electric power (in kilowatt-hours) has increased by 271.8 percent since 2010. During the same time period, the number of vehicles solely powered by electric battery has increased 210.6 percent. Today 17 agencies are using electric vehicles — an increase from only 5 agencies 6 years ago.

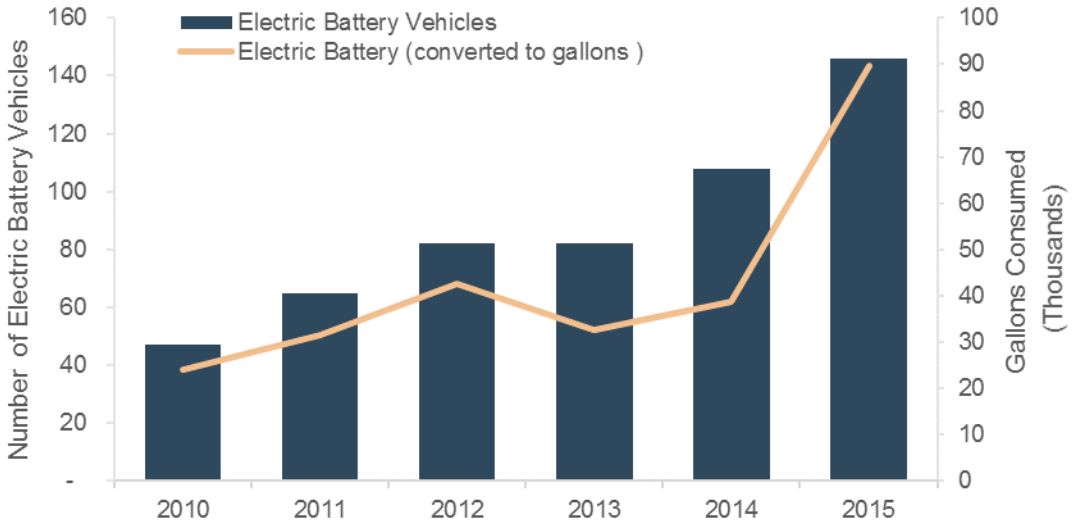


Exhibit 35 – Electric Battery

Electric-battery-powered buses show the potential to become more commonplace as battery efficiency improves and the costs of these vehicles begin to decrease.

The use of electric-battery buses is most promising for industries and agencies hoping to reduce their carbon footprint. Although electric power is still primarily produced using fossil fuels such as coal, an increasing supply of renewable energy sources (such as geothermal heat, solar power, and wind turbines) is also generating electricity.

Hydrogen

Hydrogen is a more exclusive energy source since the fuel is limited and the technology behind the fuel cells is expensive. While there are only a few agencies currently using hydrogen-powered vehicles, there is still an observable increase in its usage.

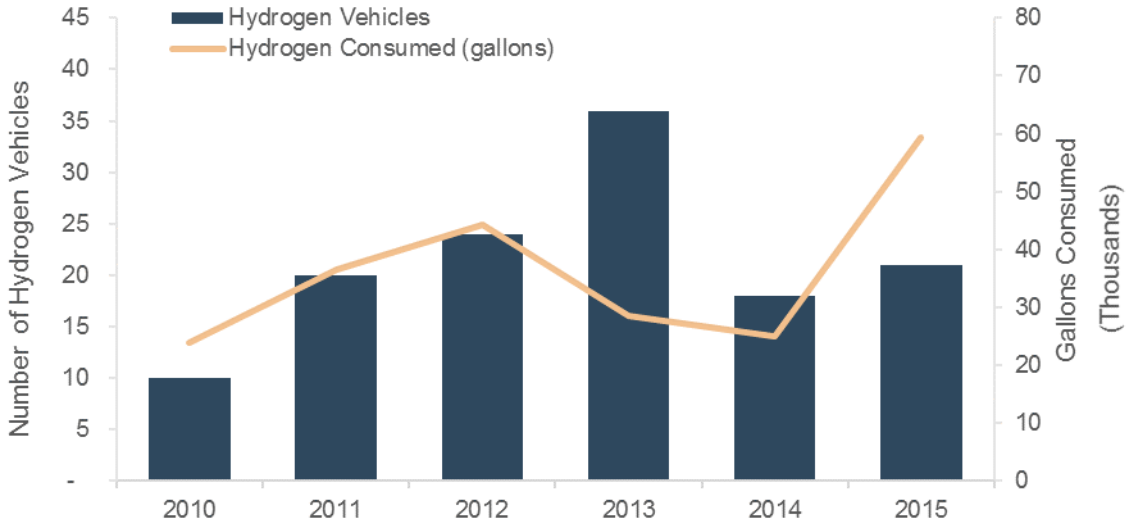


Exhibit 36 – Hydrogen

Hydrogen-powered vehicles use outside air to create a chemical reaction that results in an electrical current that powers the vehicle, producing water as waste. The gallons of hydrogen consumed increased from 23,823 gallons in 2010 to 59,443 gallons in 2015. The number of hydrogen-powered vehicles increased from 10 to 21 across that same time period.

Alternative Fuels as a Whole

Collectively, alternative-fuel consumption has increased 14.0 percent since 2010, while the consumption of all other fuel types has decreased 5.6 percent.

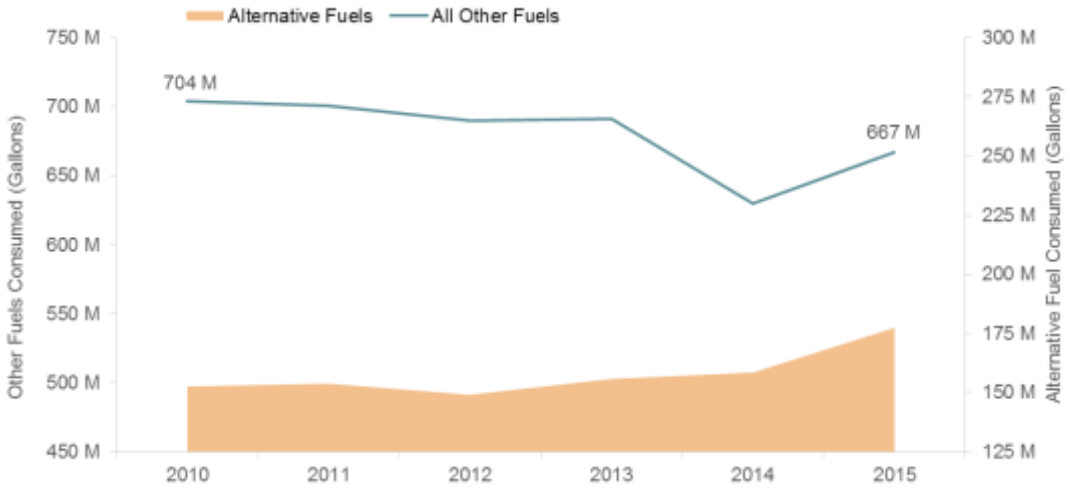


Exhibit 37 – Alternative and Other Fuel Consumption

Federal Funds

Operating and Capital Expenses

Since the beginning of Federal funding for the public transit industry, the emphasis has been placed on providing support for capital investments. This capital-focused mindset ensures that tax-payer dollars are going towards expenditures that will benefit multiple years versus supporting the operations of a single year. While most Federal funding for transit goes towards capital purchases, FTA does provide operating assistance each year for transit agencies meeting certain criteria.

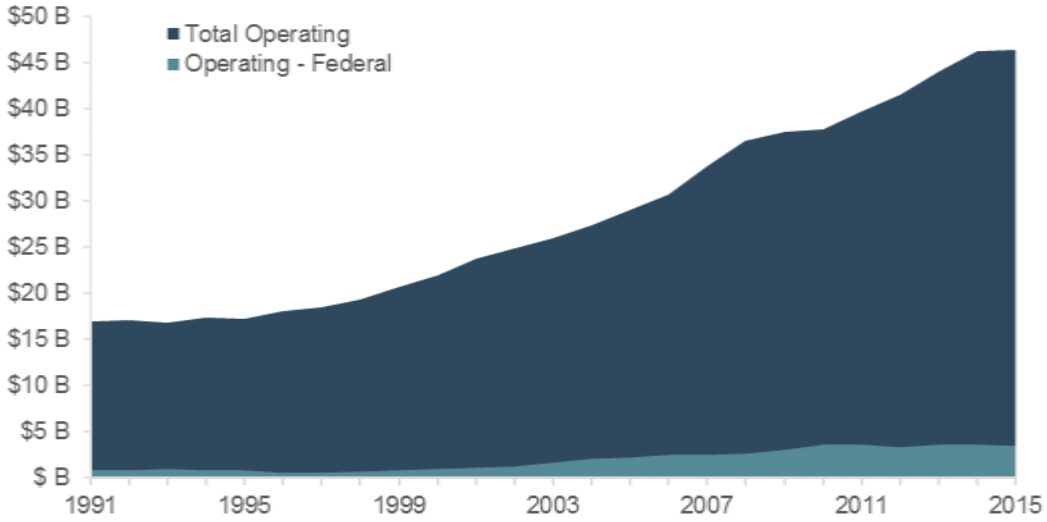


Exhibit 38 – Federal Funds - Total Operating Expenses

As seen in Exhibit 38, Federal funds have accounted for less than ten percent of total operating expenses across the years. Total operating expenses have risen sharply in the past decade, going from $30.7 billion in 2006 to $46.3 billion in 2015. Meanwhile, Federal programs continue to fund about 8 percent of the total industry operating costs.

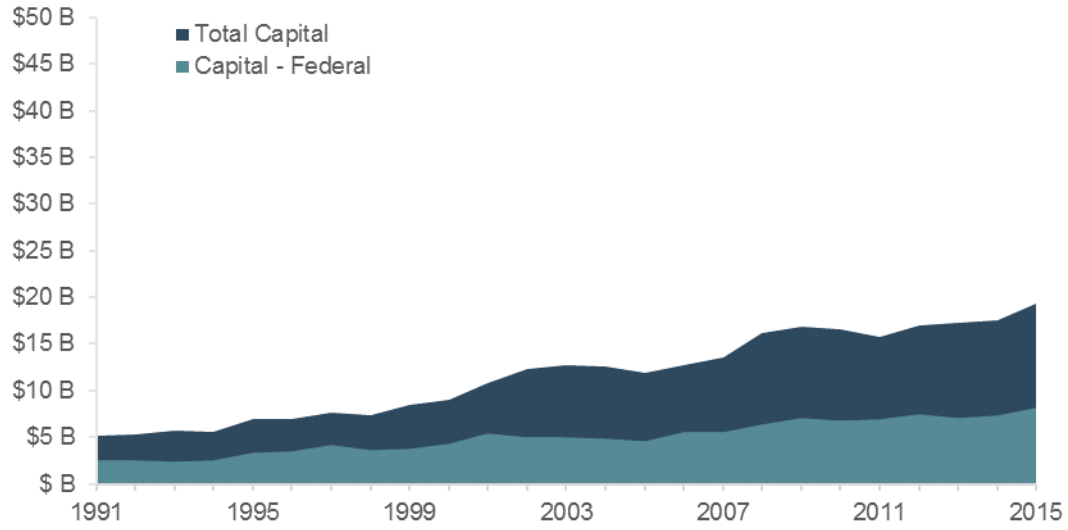


Exhibit 39 – Federal Funds - Total Capital Expenses

As Exhibit 39 illustrates, Federal funds account for a much larger percentage of total capital expenses compared to total operating expenses. In the past decade, Federal funding has hovered around 42 percent of total capital costs. In 2015, the industry expended $19.3 billion on capital, $8.2 billion of which was federally funded.

Top 50 Agencies

The top 50 agencies are the agencies with the 50 highest Unlinked Passenger Trips (UPT) each year. These agencies tend to be larger systems and thus have slight differences in the funds that make up their total operating and capital expenses.

Exhibit 40 – Top 50 Operating Expenses – Federal

Federal funds make up a smaller portion of the total operating expenses for the top 50 agencies. For the past ten years, Federal assistance has made up an average of 8.1 percent of the total operating costs for the industry as a whole. Across the same decade, Federal assistance has accounted for only for 6.3 percent of the total operating costs for the top 50 agencies.

Exhibit 41 – Top 50 Operating Expenses – Fare Revenue

Higher fare revenues are the result of many factors, some of which include higher service efficiency and higher population density. Thus, the top 50 agencies have a higher percentage of operating expenses funded through fare revenue than the industry as a whole.

Exhibit 42 – Top 50 Capital Expenses – Federal

The top 50 agencies generally fund a smaller percentage of their capital investments with Federal funds than does the industry as a whole. Across the past decade, Federal funds

made up an average of 39.0 percent of total capital expenses for the top 50 agencies, compared to an average of 42.1 percent for the industry as a whole.

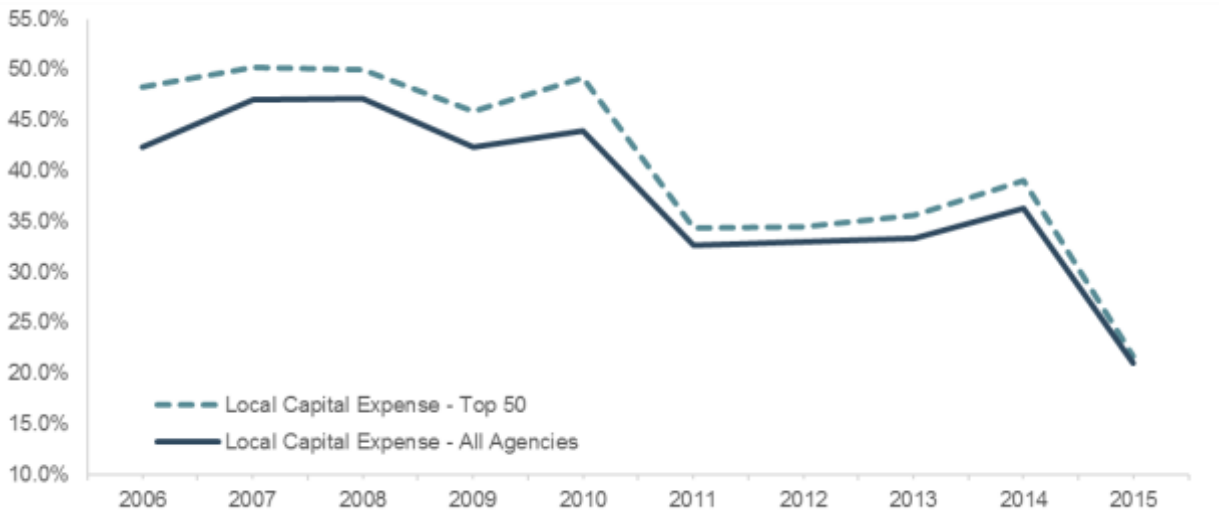


Exhibit 43 – Top 50 Capital Expenses – Local

Conversely, these top 50 agencies have a larger portion of their capital expenditures funded by local sources of funds. Across the same ten-year time period, an average of 40.9 percent of the total capital expenses for the top 50 agencies was funded locally. Only 37.9 percent of total capital expenses incurred across the entire industry were paid for with local funds.

§5307 and §5311

The two major sources of Federal funding from FTA to transit agencies are the Urbanized Area Formula Program (§5307) and the Rural Area Program (§5311). Section 5307 provides capital, operating, and planning assistance for public transportation operated in urbanized areas (UZAs). Section 5311 provides formula funding to States and Indian Tribes to support public transportation in rural areas.

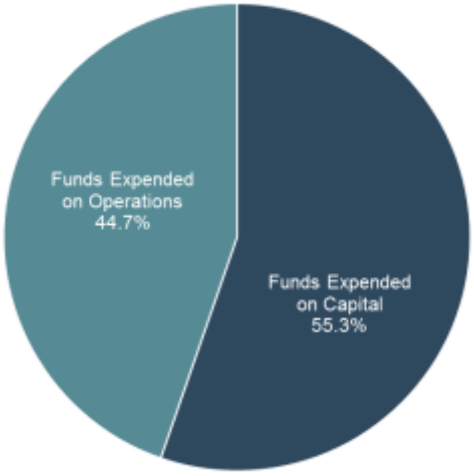


Exhibit 44 – 2015 Urbanized Area Formula Program (5307)

In 2015, 55.3 percent of (§5307 funds was expended on capital, while the remaining 44.7 percent was expended on operations. Of that $2.6 billion expended on operations, $1.5 billion was capital assistance spent on operations. Agencies must meet certain requirements in order to be matched at a capital rate.

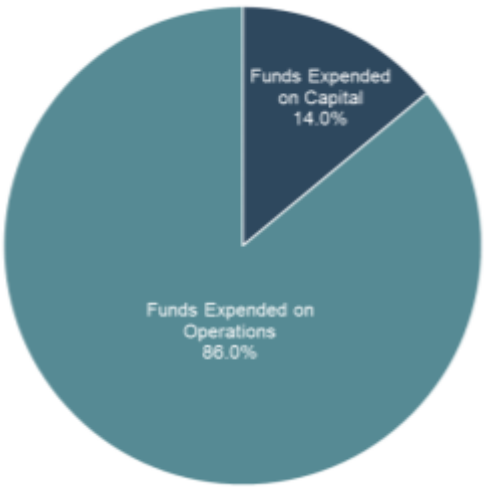


Exhibit 45 – 2015 Other than Urbanized Area Program (5311)

In 2015, only 14.0 percent of §5311 funds were expended on capital, while the remaining 86.0 percent was expended on operations. Of that $490 million expended on operations, $12 million was capital assistance spent on operations.

Unique Transit Modes

More modes were described in the Introduction than were included in most exhibits. This is because some modes are so rare and unique in their service characteristics that they appear as outliers in comparison to all other modes.

Passenger Miles Traveled (PMT) provides insight into the use of public transit services. The majority of PMT is concentrated in three transit modes: Bus (MB), Heavy Rail (HR), and Commuter Rail (CR) (Exhibit 46). About 87 percent of the PMT are on these three modes. The remaining modes are responsible for about 13 percent of transit service across the United States, of which the unique modes subset accounts for less than 1 percent. The NTD includes the following under unique modes of service:

- Aerial Tramways (TR)
- Alaska Railroad (AR)
- Cable Car (CC)
- Inclined Plane (IP)
- Monorail/Automated Guideway (MG)
- Públicos (PB)

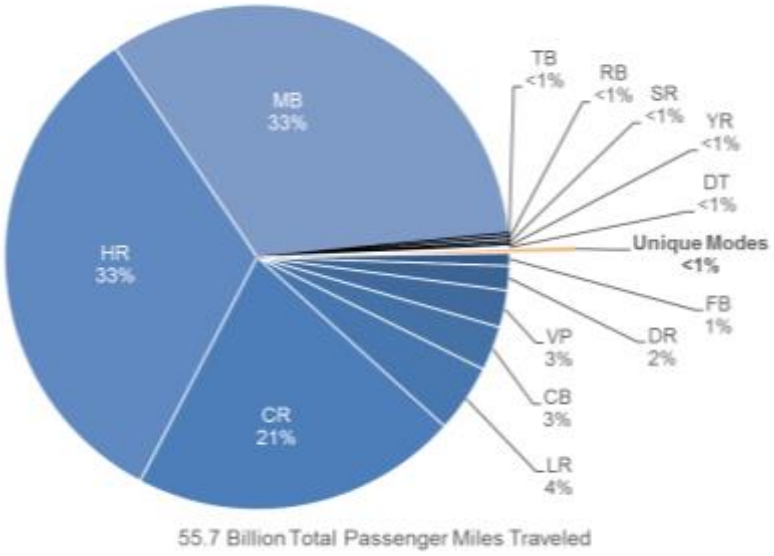


Exhibit 46 – Full Reporters' Passenger Miles Traveled, 2015

Aerial tramways, cable cars, inclined planes, and automated guideway systems are unique because of the technology required to run these systems. The Alaska Railroad, for example, services the widest area of any rail system in the country, using more than 500 miles of track across Alaska. The Público system is the largest transit system in Puerto Rico, and each driver operates as a separate business unit.

Aerial Tramway

Aerial tramway (TR) is a transit mode where vehicles shuttle along suspended cables between two tram terminals at differing heights. In most cases, one or two fixed cables support the vehicle while the vehicle's electrically powered wheels roll up and down a third cable, or haulage rope. This propulsion method and cable setup enables aerial trams to move forward or backwards as needed.

Source: http://commons.wikimedia.org/wiki/User:Another_Believer

Exhibit 47 – Portland Aerial Tram

Different variations of tramways have been in use for hundreds of years, especially for industrial cargo and in mountainous regions to carry ore in mining operations. As time passed, aerial trams began to carry passengers instead of exclusively cargo.

However, as electric power became more widely used in transit services in the 1930 – 1940s, aerial tramways became obsolete. Since then, tramways have been largely used for recreational purposes such as ski lifts. However, there has been a recent interest in operating tramways in the urban market. There now are two aerial tramways that provide mass transit service in the country. The Roosevelt Island Tramway connects Roosevelt Island to the upper east side of Manhattan in New York City, which does not benefit from federal funding, and was featured in the 2002 film *Spider-Man*.

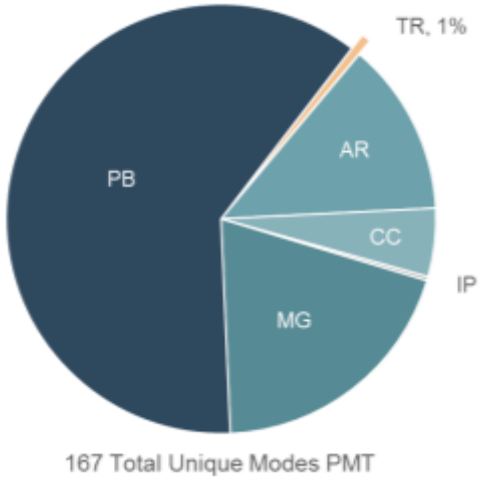


Exhibit 48 – Aerial Tramway PMT

The City of Portland is the only NTD reporter that reports aerial tramway service. The Portland Aerial Tram opened in 2006 and operates a two-vehicle line service that can carry 78 passengers per cabin. The tramway connects the Oregon Health & Science University (OHSU) campus with the South Waterfront district of Portland.

While an aerial tramway does not operate on rails or roadway, it operates in exclusive air space. For the purposes of NTD reporting, the NTD considers aerial tramway a non-rail, fixed route mode operating exclusively on fixed guideway.

Alaska Railroad

Alaska railroad (AR) is a transit mode designated solely for the Alaska Railroad Corporation. This railroad provides both freight and passenger services and uses more than 500 miles of track across the state of Alaska.

Source: Alaska Railroad Corporation http://www.alaskarailroad.com

Exhibit 49 – Alaska Railroad Corporation

This railroad has been in operation since the early 1900s. The Alaska Central Railway constructed the railroad to provide an all-weather route to take advantage of the natural resources in the interior of the Alaska Territory. Alaska Central Railway began laying the first railroad in Seward, Alaska, in 1903, which eventually extended 50 miles north. In 1914, Congress approved the construction of 470 miles of track to Fairbanks that was completed in 1923.

During World War II, the railroad played an important role in the war effort by hauling military and civilian supplies and materials to and from Whittier, a military port and fuel depot. Due to the heavy use of the railway, Congress approved a $100 million rehabilitation program after the war.

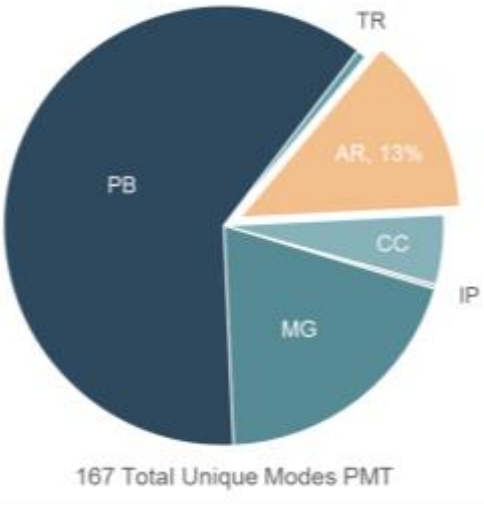


Exhibit 50 – Alaska Railroad PMT

The Alaska Railroad experienced another challenge in the mid-1960s when an earthquake caused $30 million in damage. The 9.2 magnitude earthquake, known as the Great Alaskan Earthquake, is the strongest recorded in North America and the second strongest in recorded history.

In 1984, Governor Sheffield signed legislation creating the Alaska Railroad Corporation. Shortly thereafter, the State of Alaska purchased the railroad from the Federal government. The Alaska Railroad continues to provide freight and passenger services today.

The Alaska Railroad Corporation provided 21,842,570 passenger miles of service in Report Year 2015. This service accounted for approximately 13 percent of the total unique mode PMT.

Cable Car

The cable car (CC) mode operates on a railway propelled by underground cables. While several cities operated cable cars in the past, the San Francisco cable car system is the last system in operation in the country today and has received recognition as a National Historic Landmark. This system is one of two National Historic Landmarks that move — the other is New Orleans' St. Charles Streetcar line.

Exhibit 51 – San Francisco Cable Car

Andrew Smith Hallidie created the first cable railway in San Francisco known as the Clay Street Hill Railroad. Clay Street provided the template for San Francisco's cable car system that exists today.

Prior to cable cars, people used horses to move passengers and supplies up and down San Francisco's steep streets. Throughout the late 1800s, San Francisco converted from horse operations to cable cars, reaching 23 operating lines by 1890. There are three cable car lines still in operation today: Powell-Mason, Powell-Hyde, and California.

San Francisco's cable cars move using centralized, powerful electric motors that replaced the original steam powered engines. These engines move large wheels that pull the underground cables through the streets. Each car requires two operators on board in order for the cable car to move safely and efficiently — a grip operator and a conductor.

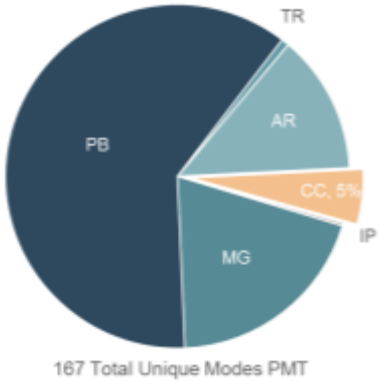


Exhibit 52 – Cable Car PMT

The cable car system employs "grips" that extend through the vehicle and directly clench and release the cable underground. This gripping action is performed by grip operators, or gripmen, through a ratchet lever. This procedure allows the cars to coast over crossing cables and brake whenever necessary. Conductors are responsible for fare collection, boarding management, and control over the rear wheel brakes. The San Francisco Municipal Railway operates the cable cars and reports the data to the NTD. In Report Year 2015, San Francisco's cable cars provided 8,574,599 passenger miles of service, making up 5 percent of total unique modes PMT.

Inclined Plane

An incline plane (IP), commonly referred to as a funicular railway, is a mode of transit that operates on a railway over steep slopes and grades. Moving cables power the vehicles, which have the ability to move both up and down the grade. An incline plane differs from a cable car in that the cable is permanently attached to the inclined plane vehicle.

Source: http://en.wikipedia.org/wiki/Monongahela_Incline

Exhibit 53 – Monongahela Incline

There are three NTD reporters that provide information for inclined planes: Cambria County Transit Authority (CCTA), Port Authority of Allegheny County (PAAC), and Chattanooga Area Regional Transportation Authority (CARTA).

PAAC owns and operates the Monongahela Incline, also known as the Mon Incline, which is the oldest continuously operating incline plane in the country. John Endres built the incline plane in 1870 in response to the rapid expansion of Pittsburgh. As the factories and mills grew on flats near the river, people built houses nearby on top of Mount Washington. The construction of the incline facilitated further development and accessibility to the area.

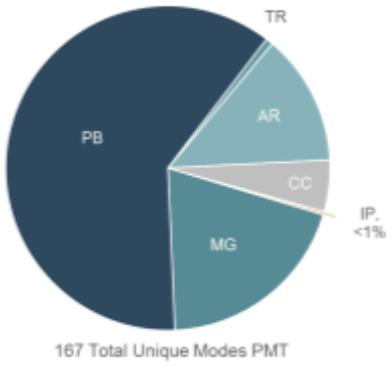


Exhibit 54 – Inclined Plane PMT

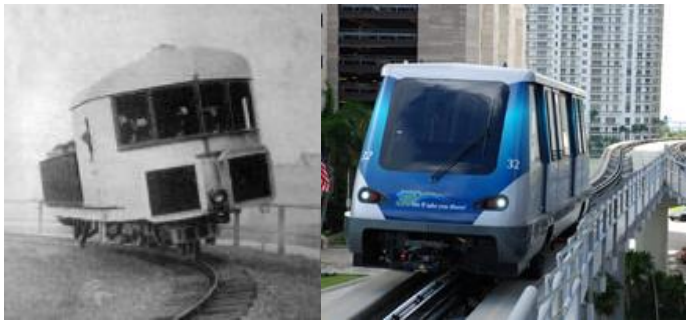
CCTA owns and operates the Johnstown Inclined Plane, another transit service rich in history. This incline is 118-years-old and carries nearly 100,000 riders each year.

Lookout Mountain Incline Railway is the inclined plane operated by CARTA. Located in Chattanooga, Tennessee, this incline began operation in 1895 and today is one of the word's steepest passenger railways.

Inclined planes operate using two cars that attach to a cable. This cable runs through a pulley at the top of the grade. The two cars run simultaneously; one car moves up the incline while the other moves down. This procedure allows the cars to counterbalance, therefore minimizing the energy required to propel the car going up the incline.

The inclined plane mode generates the smallest amount of passenger miles traveled of all NTD transit modes. During Report Year 2015, the IP passengers traveled 511,489 miles.

Monorail/Automated Guideway



Sources: http://en.wikipedia.org/wiki/Monorail / www.miamidade.gov/transit/metromover.asp

Exhibit 55 – Louis Brennan's Gyrocar & Miami-Dade Metromover

Automated Guideway (MG) is a type of public transit system where trains operate over a single electric rail. Automated guideway systems are typically above grade, or elevated, and may either operate over or suspend from the central beam. Many airports utilize automated guideway systems for transferring passengers to and from terminals.

Henry Palmer invented and patented one of the earliest monorail designs in 1821. Since that time, many engineers experimented with a single rail system as a cheaper alternative to existing rail transport.

In 1903, Louis Brennan patented a gyroscopically balanced monorail, or gyrocar, as shown on the left-hand side of Exhibit 55. While he intended to use this system for military purposes, it did not move past the prototype stage.

Since then, automated guideway systems have become significantly more modern. Today's automated guideway systems straddle center beams that support and guide the train, and use pneumatic, or air-filled, rubber tires. The electric motors use third rails or contact wires that power the straddle beam to propel the trains forward.

Automated guideway systems benefit from being elevated above normal traffic, allowing them to operate free of congestion and pedestrians. Additionally, monorail systems are typically quiet and environmentally friendly due to their electrical propulsion, and costs tend to be lower than tunneling options.

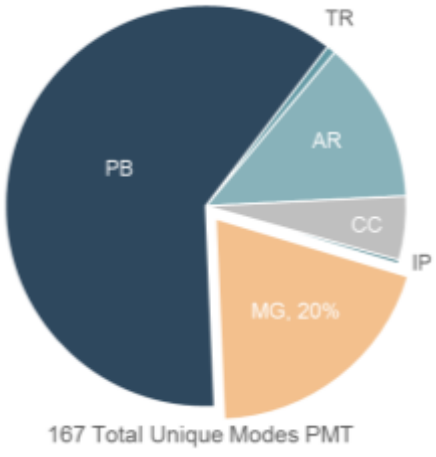


Exhibit 56 – Monorail PMT

There are six agencies that reported data for MG services to the NTD: Seattle Center Monorail Transit, Morgantown Personal Rapid Transit, Miami-Dade Transit, Detroit Transportation Corporation, Jacksonville Transit Authority, and Las Vegas Monorail Company.

Públicos

The Público system (PB) is a transit mode unique to Puerto Rico, and provides fixed route services predominantly in Puerto Rico's urbanized areas. The Público system is the largest public transportation system in Puerto Rico.

Exhibit 57 – Público

Públicos are similar to informal transport systems operated in developing countries. The biggest distinction between the Público service and other transit modes is the way in which Públicos operate. Drivers own their vehicle and are given exclusive rights to the route where they provide service. The drivers, or route owners, are responsible for their service and operate as independent business units. Besides maintaining the vehicles and routes, drivers must determine their schedule and supply the funds to run the service.

Puerto Rico Highway and Transportation Authority (PRHTA) manages the Público service and grants permission to potential drivers. PRHTA surveys the area and determines if there is a need for transit. If approved, PRHTA franchises the rights for that particular route to the prospective operator.

There are currently over 2,800 operators providing Público service. In some cases, drivers may have rights to multiple routes and employ others to operate the service on their behalf.

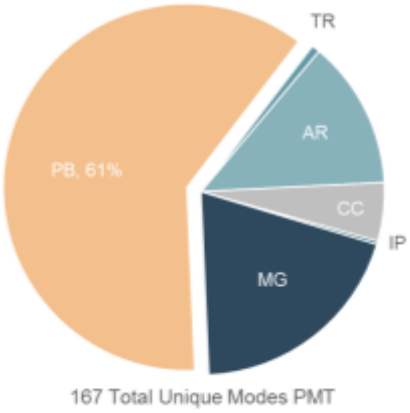


Exhibit 58 – Público PMT

The drivers operate entirely from revenues earned from passenger fares. PRHTA does not provide drivers with operating or capital assistance.

Drivers collect and report their financial and service data to PRHTA, who subsequently reports it to the NTD under the Público mode.

Públicos account for 61 percent of the passenger miles traveled by unique transit modes in the U.S. This translates to 101,942,091 PMT out of the 167 million unique modes' PMT.