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First/Last Mile Solutions

Implementation Brief

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First/Last Mile Solutions

This implementation brief provides general guidance for the NJTPA and partners to support first/last mile solutions as a strategy for advancing transportation demand management (TDM) and mobility. This brief was developed in coordination with NJTPA staff and the project Technical Advisory Committee (TAC) and was informed by consultation with transportation management associations (TMAs) within the region that support shuttles and other first/last mile solutions. Note, this brief focuses on first/last mile solutions for passenger travel needs rather than for freight movement.

Strategy Overview

When implemented, a comprehensive first/last mile strategy has a high potential for reducing vehicle miles travelled (VMT) and improving access to jobs and community services. By expanding the reach of transit, first/last mile solutions can also improve mobility and safety while decreasing parking demand. Users of first/last mile solutions are members of the public who may be travelling for commute trips and non-commute trips such as shopping and social/recreational purposes. Users may be transit-dependent, lacking access to a personal vehicle, or they may be "choice riders" who have the option to drive but choose transit due to convenience, cost savings, and/or time savings.

First/last mile solutions are transportation services and infrastructure that enhance connections to and from fixed-route transit: the "first mile" from a trip origin to transit and/or the "last mile" from transit to the trip destination. These solutions can have an outsized impact on the total demand for travel and on regional mobility by filling gaps in the multimodal transportation network. An obstacle for many would-be transit commuters is getting from their home to a transit stop or from a transit stop to their workplace. For instance, the trip from home to the transit stop could be made on an e-bike for some commuters. At the other end of the transit trip, the link from the transit stop to the workplace could be facilitated by a shuttle bus. However, it should be noted that first/last mile solutions do not work in all contexts. In rural and low-density areas without transit, a complete-trip solution provided through a ridematching system, transportation network company (TNC) partnership, or demand-response shuttle may be needed to transport users between their origin and destination rather than to or from a transit stop.

Among the 51 strategies identified in the TDM & Mobility Plan, the TAC ranked two strategies related to first/last mile solutions as tied for third-highest in priority: (a) shuttles, TNC, microtransit first/last mile solutions, and (b) end of trip bicycle facilities. The project team combined these strategies into one – first/last mile solutions – and advanced this combined strategy as an implementation brief. The NJTPA region has a wide variety of

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first/last mile transit services operated by the public and private sector and funded by state, federal, and private funds, yet there remain opportunities to improve first and last mile connections.

To support this strategy, the TDM & Mobility Plan project team developed a framework for first/last mile analysis that includes the following elements: 1) a Regional First/Last Mile Opportunity Analysis to connect rail stations and park & ride lots with jobs and workers, 2) a site-level decision tool of the suitability for first/last mile investment based on a site's place type and distance to transit, and 3) a descriptive typology of first/last mile solutions by mode. This framework will help stakeholders take a coordinated approach to identifying and prioritizing opportunities for first/last mile solutions across the region.

Connections to Other Strategies

This strategy focuses on extending the reach of transit through services and infrastructure, and thereby connects to other TDM & Mobility strategies including complete streets, local land use and transportation policy, mobility on demand, and evaluating rideshare matching service options.

Institutionalize Complete Streets: Complete streets provide facilities for users to safely complete the first or last mile(s) of their trip by walking, biking, or another active mode of transportation.

Local Land Use and Transportation Policy: First/last mile trips tend to be shorter and therefore more subject to local planning rather than regional planning. Municipalities can address first/last mile needs in the transportation elements of master plans. They may also regulate the operations of shared micromobility programs such as through the placement of vehicle hubs and requirements for reporting and maintenance. There may be an opportunity to tie first/last mile solutions to municipal requirements for affordable housing. Existing affordable housing requirements include providing a transit connection, and municipalities can work to route existing bus lines by developments or implement shuttles. Municipalities or benefits districts may issue a common area charge for new developments to establish a shuttle or other first/last mile solution to meet transportation needs in areas that are not served by transit. Common area charges are fees paid by tenants to landlords for costs associated with maintaining common areas.

Mobility on Demand (MOD): An MOD platform would facilitate connections between transit and first/last mile solutions (such as bikeshare) through integrated trip planning, booking, and/or fare payment across service providers.

Evaluate Rideshare Matching Service Options: A rideshare matching system facilitates carpool and vanpool formation, providing a complete trip solution in circumstances where there is no transit available or low suitability for a first/last mile solution

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to connect to transit. Because of the logistical overhead traditionally involved for users to form carpools and vanpools, these modes have not been efficient first/last mile solutions. However, systems that enable more dynamic and on-demand ridematching may make it easier for users who carpool or vanpool for the first or last mile of their trip to connect to transit.

Potential Actions

Potential actions to advance first/last mile solutions are presented below along with anticipated resources, implementation partners, and specific next steps. Each action also includes a table outlining key questions and steps to address those questions and support implementation. Actions are presented in order of anticipated level of effort, starting with the lowest.

1. Identify Priority Areas for Public Investment in First/Last Mile Solutions

Utilizing the regional first/last mile analyses developed for the TDM & Mobility Plan and the Accessibility and Mobility Strategy Synthesis, the NJTPA and partners can identify priority areas for public investment in first/last mile solutions.

In 2021, the NJTPA completed the Accessibility and Mobility Strategy Synthesis, an update to the required regional Congestion Management Process (CMP)[1]. The CMP identifies first/last mile transportation as a congestion management strategy and presents a regional analysis of first/last mile transportation needs based on census blocks with high concentrations of workers and jobs within one-half to two miles of rail stations. Building on this regional screening, the TDM & Mobility Plan project team conducted a Regional First/Last Mile Opportunity Analysis to determine priority areas for enhanced first/last mile services for workers and jobs within two to five miles of both rail stations and park & ride lots. In both cases, the regional rail analyses excluded areas within one-half mile of bus stops, which presumably could serve as a first/last mile service to rail. More information about the Regional First/Last Mile Opportunity analysis is found in an Appendix to the TDM & Mobility Plan Final Report.

The NJTPA and partners can use the results of these regional analyses and/or refine the methodologies to determine opportunities and areas of high need for enhanced first/last mile services. Once priority census blocks with high numbers of workers and/or jobs are identified, the NJTPA and/or local partners can conduct a local area analysis at the scale of a county or municipality to better understand local conditions, bridging the macro/regional

[1] NJTPA. 20201. "Accessibility and Mobility Strategy Synthesis. NJTPA. https://www.njtpa.org/Planning/Regional-Programs/Studies/Active/Accessibility-and-Mobility-Strategy-Synthesis.aspx

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analyses with the site-level decision framework described later in this brief under the section Analysis Tools and First/Last Mile Typology. The local area analysis should include industry classifications, equity considerations such as neighborhood demographics, and transit characteristics such as service capacity, directionality, and reverse peak direction demand to employment destinations such as warehousing and distribution centers. Consideration of the operations and ridership of existing fixed route bus and employer shuttles may need to consider the impacts and aftermath of the COVID-19 pandemic, along with resulting uncertainties about future demand and service levels. The local area analysis should also be easily replicable and scalable across geographic areas with updated data as demographics, transportation networks, and population and employment centers shift in the future.

Implementation Partners: The NJTPA would lead the evaluation in coordination with NJDOT, NJ TRANSIT, and planning partners at the municipal and/or county levels on data sources and interpretation of findings. Transportation Management Associations should be involved to ground-truth findings of the analysis with their experience supporting workforce access in suburban and rural areas, including shuttles as a complete-trip or first/last mile solution to worksites. The New Jersey Council on Access & Mobility Working Group (CAM) can advise on equity considerations and first/last mile solution needs beyond commuting to work including non-emergency medical trips and trips to other appointments and services.

Resources and Funding: This action would require staff time and potentially consultant support to conduct the evaluation. Data resources may include area-based Census data on demographics, Geographic Information System (GIS) and Google Transit Feed Specification (GTFS) data for existing transit routes and stations, stop-level ridership, Longitudinal Employer-Household Dynamics (LEHD) / Origin-Destination Employment Statistics (LODES) data for jobs and workers at the Census block level, location-based data services for origin-destination analysis, and locations of major employers.

Key Questions	Steps to Address
How should potential priority areas for first/last mile solutions be identified (e.g., by geography, employer type, potential type of mode or vendor)?	Develop a framework for how potential opportunities will be identified.
How should equity be addressed in the development of expanded first/last mile services?	Identify strategies for the planning and implementation stage to ensure equitable outcomes.
Will future dense development support improved transit service?	Work with municipalities to identify areas where future dense development is anticipated.

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Next Steps: The NJTPA should review results of the regional CMP first/last mile screening as well as the TDM & Mobility Plan Regional First/Last Mile Opportunity Analysis for potential priority areas across the region with high concentrations of workers and/or jobs that are one-half to two miles from rail stations, and then two to five miles from rail stations and/or park & ride lots. Based on these priority areas, the NJTPA and partners would conduct analysis at the municipal or county level that incorporates industry classifications, demographics, and transit service characteristics to identify potential locations for site-level evaluation. This local area analysis would identify priority areas within a specific municipality or county, serving as a bridge between the regional screening and more detailed site-level analysis needed to identify operational parameters for potential first/last mile solutions. In addition to individual priority areas, the analysis may also consider priority routes to connect disparate geographic areas to each other and to transit. Additional data sources may include transportation network data, transportation user data, area-based census measures, and destination nodes. Once priority areas are identified, it will be important to match needs with applicable first/last mile solutions. The identified priority areas may be targeted for implementation of current or future grant programs, including the NJTPA's competitive CMAQ solicitation for shuttle operations.

Timeframe: Short term (6-18 months)

2. Identify Gaps in Bike and Pedestrian Infrastructure

Complete streets partners including NJDOT and the NJTPA can identify gaps in bike and pedestrian infrastructure based on existing facilities and demand for bike and pedestrian access. This analysis may be regional in scope, or it may focus on the priority areas identified in Potential Action 1. The analysis should be conducted in coordination with the strategy to Institutionalize Complete Streets and should be easily replicable with updated data as bicycle and pedestrian facilities are built and altered in the future. The gaps analysis may also consider area-based census measures such as zero-vehicle households. Once locations are prioritized, implementation partners will need to conduct outreach and community engagement, develop conceptual solutions for identified gaps, and create a framework to match funding with needs.

This action should be developed in coordination with a related interagency effort from the NJ Strategic Highway Safety Plan (SHSP) to work with NJ TRANSIT to inventory conditions at transit stops statewide, including curb ramps, sidewalks, crosswalks, shelters, and lighting to identify and prioritize needs. A limited number of locations will be included in the analysis based on equity factors, crash rate, and transit ridership. **Implementation Partners:** NJDOT (including NJDOT Complete Streets Task Force) in coordination with the NJTPA, NJ TRANSIT, the Bicycle and Pedestrian Advisory Council (BPAC), the New Jersey Bicycle and Pedestrian Resource Center (BRPC), TMAs, and the Association of Planning

Boards & Zoning Boards of Adjustment (New Jersey Planning Officials). NJ TRANSIT has infrastructure efforts underway to upgrade bus and rail facilities including station replacements, facility upgrades, and smaller investments such as new bus shelters and benches at bus stops. Major attractors for bicycle and pedestrian trips such as universities and hospitals may also be able to assist with the gaps analysis by providing data.

Resources and Funding: This action would require staff time and potentially consultant support to conduct the evaluation. Data resources may include bicycle and pedestrian crash data, bicycle and pedestrian plans and studies, walk or bike audit findings, and locally generated datasets such as bike lane and sidewalk inventories.

Key Questions	Steps to Address
What is the best approach to identify gaps in bike and pedestrian infrastructure that potentially inhibit access first/last mile service?	Identify how, when, and which partners would document bicycle and pedestrian infrastructure gaps and their impacts in terms of potentially inhibiting access to transit service.
How can identified bike and pedestrian infrastructure gaps be addresses?	Explore funding sources and innovative ways that operating agencies and right of way owners can potentially work together to address identified gaps.

Next Steps: Identify available data sources to analyze bike and pedestrian infrastructure gaps to access transit in coordination with NJDOT, NJTPA, and NJ TRANSIT. It may be helpful to consult with New Jersey Planning Officials for input from municipal planners on local data sources and the evaluation approach. Supplement available data with local inventories as needed and create a standardized methodology and dataset that local and regional agencies can use to identify gaps.

Timeframe: Short term (6-18 months)

3. Identify Performance Measures for First/Last Mile Solutions

Identify key performance metrics for evaluating publicly funded first/last mile solutions once deployed and incorporate these metrics into any operational plans or vendor contracts. Potential indicators are identified in the Outcomes section of this implementation brief, such as number of jobs and households within ½ mile of first/last mile solutions. There may be opportunity for regional standardization of performance measures to streamline the evaluation and prioritization of future public investments in first/last mile solutions.

Implementation Partners: NJTPA staff could lead this effort with support from NJ TRANSIT, TMAs, counties, municipalities, and first/last mile service providers.

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Resources and Funding: This action would require staff time to develop a performance measurement framework and then to gather data, conduct analysis, and report on performance. Contracts or service agreements with first/last mile service providers should specify the user data that operator must share for the sponsoring agency to maintain performance measures. Some last-mile services are provided by county transportation departments using a combination of county, state, and federal funding. Other last-mile services are operated by private bus companies.

Key Questions	Steps to Address
How is performance of first/last mile solutions currently being evaluated? What reporting is taking place?	Consult with public agencies funding first/last mile solutions including NJDOT, NJ TRANSIT, and municipalities.
How should the performance of first/last mile solutions be evaluated? How might evaluation differ by service or infrastructure solution?	Develop draft performance measures for first/last mile service implementation based on funding requirements and applicable key performance indicators.

Next Steps: NJTPA should establish a working group comprised of NJDOT, NJ TRANSIT, counties, and municipalities that currently administer public funds in support of first/last mile solutions to evaluate current and past reporting metrics. The working group would evaluate how these reporting metrics could be streamlined and expanded into a holistic framework spanning multiple modes, services, and infrastructure types.

Timeframe: Medium term (1-2 years)

4. Develop Incentives for Private Sector Investment in First/Last Services

State-level policies or programs could offer funding or grants for businesses to provide shuttles or other last mile services. It would be beneficial to coordinate with the NJ Business Action Center or NJ Economic Development Authority (NJEDA), which works to attract businesses to the state. There could be financial incentives through NJEDA for businesses to support first/last mile solutions. Stakeholders feel that New Jersey is an expensive state to do business in, and statewide economic development interests prioritize competitiveness in attraction of new business. Partners could also explore reviving the Smart Moves Business Program Tax Credit implemented by NJDOT from 1998 through 2007 or a similar tax credit, though this would require state legislation. When developing state-level incentives, it is important to balance tradeoffs between costs and benefits and keep in mind that municipalities may set their own laws and regulations for shared micromobility programs. For example, the City of New Brunswick, NJ adopted an ordinance[2] in October 2019 that

[2] City of New Brunswick, NJ. 2019. Municipal Code §10.41 – Electric Scooters. Municode Library. https://library.municode.com/nj/new_brunswick/codes/municipal_code?nodeId=TIT10VETR_CH10.41ELSC

regulates the placement, operations, user age restrictions, and other concerns related to shared electric scooter programs.

Implementation Partners: NJEDA can lead this action with support from the NJTPA, TMAs, NJ TRANSIT, NJDOT, and municipalities. The NJ Business Action Center and other state agencies related to economic development may also be involved. An efficient means of coordinating with the state's 565 municipalities may be through a coalition such as the New Jersey State League of Municipalities, which offers sample ordinances and agreements, research, seminars and training, legislative analysis as well as news and bulletins. Coordination with major employers, real estate developers, and micromobility vendors may also inform development of incentives.

Resources and Funding: This action would require a dedicated state funding source for tax credits, grants, or other private sector incentives. Staff time would be required to evaluate existing incentives and opportunities and to coordinate with stakeholders.

Key Question	Steps to Address
What (if any) state and regional incentives exist for businesses to implement employee transportation services including first/last mile solutions?	Evaluate existing and past incentives that could apply to first/last mile solutions as-if or with modifications.
What opportunities exist to incentivize private sector investment in first/last mile solutions?	Consult with municipalities identified in Potential Action 1 as well as TMAs and businesses.

Next Steps: NJEDA should establish a working group comprised of TMA staff, who bring experience working with businesses on first/last mile solutions, NJ TRANSIT, NJDOT, and the NJTPA to develop a work plan for this action. The work plan would include an evaluation of past and existing incentives and potential opportunities. Outreach to businesses may also inform understanding of which incentives would be most impactful.

Timeframe: Long-term (2-6 years)

Outcomes

Tracking outcomes will help the NJTPA better understand the state of implementation of first/last mile solutions and track progress towards goals. The NJTPA has developed a regional performance measures[3] framework to supplement the required federal performance measures to provide a more holistic snapshot of transportation system performance with respect to livability, natural environment and resiliency, mobility, and more. The NJTPA

[3] NJTPA. 2020. "Regional Performance Measures." NJTPA. November. https://www.njtpa.org/RegionalPM.aspx

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regional performance measures most directly related to first/last mile solutions implementation include:

- Percent of work trips that are not drive-alone
- Total transit ridership
- Annual person-hours of delay per capita

The NJTPA can supplement this framework with first/last mile solutions indicators such as decreased transit travel times and others identified in this section. The NJTPA may need to work with NJDOT, NJ TRANSIT, counties, and municipalities to collect and analyze data for the region. Outcomes of implementation include increases in transit accessibility, changes in travel behavior, and equity impacts. Outcomes and potential indicators are outlined in the table below.

Outcomes	Potential Indicators
Transit Accessibility	• Number of jobs within ½ mile of first/last mile solutions • Number of households within ½ mile of first/last mile solutions
Travel behavior	• Decrease in share of "drive-alone" work trips • Increase in transit ridership, including within areas that are currently underserved by transit. • Decrease total transit trip travel times through better connections • Decrease in congestion
Equity impacts	• Title VI or environmental justice populations within ½ mile of first/last mile solutions. This may be imputed from area-based data at the Census tract level and include populations defined as low income, minority, disabled, low English proficiency, over 65 years old, under 18 years old, and/or from zero-vehicle households. • Expansion of mobility options for people of all abilities

Best Practices

Across the country, several regional transportation agencies have developed strategic plans or in-depth studies to advance first/last mile solutions.

First/Last Mile Strategic Plans

LA Metro developed First Last Mile Strategic Plan and Planning Guidelines in 2014, which earned the American Planning Association's National Planning Excellence Award.[4] As a strategic response to first/last mile challenges, the Plan presents the concept of the Pathway,

[4] LA Metro. 2014. "First Last Mile Strategic Plan & Planning Guidelines." LA Metro. March. https://media.metro.net/docs/First_Last_Mile_Strategic_Plan.pdf

a series of active transportation improvements that extend to and from LA Metro's rail and bus rapid transit stations. The plan provides a methodology and approach for identifying Pathway networks within station transit areas, as well as a toolbox with specific transportation improvements and illustrative examples.

The Utah Transit Authority (UTA) conducted a First/Last Mile Study in 2015 to identify a short list of priority strategies that would be most effective in increasing ridership of its fixed rail network.[5] The study included station area audits as well as data analysis of station area connectivity, vehicle and bicycle parking supply, future population and employment growth, future transit-oriented development (TOD) plans, passenger surveys, and ridership characteristics. The study created station typologies and recommended priority first/last mile strategies for each typology based on stakeholder input into a scoring framework.

The Regional Transportation District (RTD) in Denver developed a First Last Mile Strategic Plan[6] in 2019 that included templates for partners to implement solutions on their own.[7] The plan includes recommendations on the applicability of first/last mile solutions by place type but is not intended to be prescriptive. The plan provides a framework from which implementation partners can select set of first/last mile solutions that improve transit access in a variety of contexts.

Best Practices in First/Last Mile Connections

Transit agencies across the country have expanded their operations of bus, rail, and ADA paratransit to integrate micromobility and microtransit services as first/last mile connections. Agencies that have done this successfully include LA Metro (Los Angeles, CA), the Capital District Transportation Association (Albany, NY), the Greater Dayton Regional Transit Authority (Dayton, OH) and the Kansas City Area Transportation Authority (Kansas City, MO). Cost effectiveness is an important consideration with any potential first/last mile vendor partnership.

In North Jersey, shuttles provided by counties and TMAs are already providing first/last mile connections. The EZ Ride Route-10 Shuttle funded by Essex County and NJ TRANSIT operates between a NJ TRANSIT bus stop and employers along the Route 10-corridor, thereby improving workforce access.[8] The Essex County Night Owl, also operated by EZ Ride on behalf of Essex County, links workers with Newark Penn Station for travel to and from jobs at Newark Liberty International Airport in the early morning hours when bus

[5] UTA. 2015. "First/Last Mile Strategies Study." Shared-Use Mobility Center. April. https://learn.sharedusemobilitycenter.org/wp-content/uploads/policy-documents-5/UTAFirst_LastMileFINALCOMP1.pdf
[6] RTD. 2019. "First and Last Mile Strategic Plan." RTD. https://www.rtd-denver.com/sites/default/files/files/2019-07/FLM-Strategic-Plan_06-10-19.pdf
[7] RTD. N.d. "First & Last Mile Strategic Plan." American Public Transportation Association. https://www.apta.com/wp-content/uploads/SMW19_First-and-Last-Mile-Strategic-Plan_Paul-DesRocher.pdf
[8] EZ Ride. N.d. "610: Route 10 Shuttle." EZ Ride. https://ezride.org/routes/610-route-10-shuttle/

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transit is less frequent.[9] Many of these services are supported by the NJ Job Access Reverse Commute program from NJ TRANSIT, supported with state funds. In addition, in Central Jersey, Greater Mercer TMA manages the Route 130 Connection, ZLine, and Zline2 that provide last mile or whole trip commutes to distribution center employment. Similar services are supported by Cross County Connection TMA in South Jersey.

TNC partnerships can provide subsidized individual or pooled rides. LA Metro piloted a program with Lyft that established a $3 flat fare for users travelling to or from select Metro rail stations during peak commuting hours.[10] Another example is King County Metro's microtransit pilot, Via to Transit, which provides shared rides on small transit vehicles to travelers in Seattle with origins or destinations at designated light rail stations.[11] Within the North Jersey region, Jersey City has partnered with the Via to subsidize an on-demand, dynamically routed shuttle service that operates within the downtown core. The service, Via Jersey City, launched in February 2020, and has been open to all Jersey City residents, workers, and visitors with fares set at $2 per ride. [12] In the first quarter of 2020, the service provided more than 35,500 rides, which increased 78% to 63,200 rides in the third quarter of 2020. Most riders reported annual household incomes of less than $50,000.[13] Additionally, the City of Summit partnered with the TNC Lyft to reduce resident parking demand at the NJ TRANSIT Summit Rail Station. Since the partnership began in 2017, Summit has expanded the program to serve residents going to the downtown business district as well as to the train station.[14] When investigating TNC partnerships, agencies should consider the VMT and air quality of impacts of TNC operations in locations where drivers spend a lot time running without passengers while heading back from a destination or cruising while waiting for a fare.

Improving bicycle and pedestrian facilities can also strengthen connections to transit. Tradepoint Atlantic, a logistics center in Maryland, developed a network of off-street bike paths on their property to help workers safely travel between their bus stop and their workplace.[15]

[9] EZ Ride. N.d. "Innovative Night Owl Shuttle Serves Critical Transportation Need for Essex County Night Shift Workers." EZ Ride. https://ezride.org/casestudies/night-owl/
[10] LA Metro. 2020. "Can public transit and TNCs get along? Expanding the reach of transit with Lyft." Metro. March 9. https://thesource.metro.net/2020/03/09/can-public-transit-and-tncs-get-along-expanding-the-reach-of-transit-with-lyft/
[11] King County Metro. N.d. "Via to Transit." King County Metro. https://www.kingcounty.gov/depts/transportation/metro/programs-projects/innovation-technology/innovative-mobility/on-demand/via-to-transit.aspx
[12] Via. 2020. "Jersey City and Via Launch First On-Demand Public Bus Service in the State." Via. February 25. https://ridewithvia.com/news/jersey-city-and-via-launch-first-on-demand-public-bus-service-in-the-state/
[13] Mischa Wanek-Libman. 2020. "Jersey City's on-demand transit success story." Mass Transit. December 3. https://www.masstransitmag.com/alt-mobility/shared-mobility/article/21164999/jersey-citys-ondemand-transit-success-story
[14] Shared-Use Mobility Center. 2019. "City of Summit and Lyft partnership, Summit, New Jersey." https://learn.sharedusemobilitycenter.org/overview/city-of-summit-and-lyft-partnership-summit-nj-2017/
[15] Maryland DOT. N.d. "Community-Oriented Transit Development: The Tradepoint Atlantic Story." Maryland DOT. https://www.mdot.maryland.gov/OPCP/Tradepoint%20Case%20Study%20FINAL.pdf

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Framework for First/Last Mile Analysis

A regional analysis of priority areas for first/last mile solutions was developed as part of the NJTPA Accessibility and Mobility Strategy Synthesis (AMSS), a project to update the congestion management process (CMP) that was conducted concurrently with the TDM & Mobility Plan in 2020-2021. The analysis is based on the location of transit networks, employment centers, and households, and will serve as a regional screening for geographic areas to be explored further for first/last mile solutions. Specifically, the CMP analysis identified high concentrations of workers and jobs within ½ to two miles of rail stations.

Complementing the CMP's regional analysis, this implementation brief provides a framework for first/last mile analysis, including the following elements:

1. A Regional First/Last Mile Opportunity Analysis, which identifies high concentrations of jobs and workers that are two to five miles from rail stations and park & ride lots without access to bus service;
2. A Site-Level Decision Tool, which helps users to select first/last mile solutions at the site level, based on a site's place type and distance to transit, once priority areas have been identified within the region;
3. A Typology of First/Last Mile Solutions by mode, which provides a description of qualitative factors that may influence decisions about first/last mile investments based on the outputs of regional opportunity analysis and the site-level decision tool.

This framework supports sketch-level evaluation of first/last mile solutions suitability for further analysis of at the county, municipality, and/or site level; it does not provide sufficient statistical rigor on its own to justify public investment. For example, an in-depth analysis may require review of fixed-route transit coverage and ridership by day and time of day in station areas as well as cost-benefit analysis.

Regional First/Last Mile Opportunity Analysis

The Regional First/Last Mile Opportunity Analysis identified census blocks in the NJTPA region with high concentrations of workers and jobs within two to five miles of rail stations and park & ride lots. The typology table later in this section shows that the modes best suited to trip distances between two to five miles include shuttles, transportation network companies (TNCs), and carpooling. Meanwhile, active transportation options including walking, biking, and using scooters tend to be limited to trips that are two miles or less. The methodology and results of the Regional First/Last Mile Opportunity Analysis are available in a supplemental memorandum. The results of this analysis can inform the local area analysis at the municipal or county level to aggregate concentrations of workers and jobs into zones, estimate trip productions and attractions, and select potential sites that may be well suited for more detailed investigation of a first/last mile solution using the site-level decision tool described in the next section.

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Site-Level Decision Tool

This brief is accompanied by a Microsoft Excel-based decision tool to estimate the suitability of a site to accommodate first/last mile solutions (including services/modes and infrastructure) based on the place type and the distance between the site and fixed-route transit service. Potential solutions are evaluated as having low, medium, or high suitability. Users can also indicate whether specific first/last mile solutions are already available or existing at the site. The Microsoft Excel file provides instructions on how to use the tool as well as definitions of terminology used. Ultimately, the site-level decision framework should help to determine which first/last mile service types best meet the needs of priority areas and their associated operating and capital costs, while including considerations for state of good repair and ongoing funding.

Typology of First/Last Mile Solutions by Mode

In the next six pages, the following typology table of first/last mile solutions by mode describes characteristics including trip range (in miles), geographic service area, populations served, supportive infrastructure and safety, operational models, partnerships, payment, funding, and environmental impacts. The typology table provides more in-depth and qualitative factors that may aid decision-making about first/last mile investments based on the outputs of the site-level decision tool introduced in the previous section.

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TABLE 1: TYPOLOGY OF FIRST/LAST MILE SOLUTIONS BY MODE

Mode	Trip Range	Service Area	Populations Served	Supportive Infrastructure & Safety	Operational Models	Partnership Configurations	Payment Mechanism	Funding models	Environmental Impacts
Walk	<2 miles	Urban/suburban/rural areas with pedestrian infrastructure serving all destinations accessible to pedestrians. Connect to fixed-route transit.	General population. Accessibility for wheelchair users and other individuals with disabilities warrants special consideration.	Sidewalk quality and connectivity; crosswalks and traffic signals for pedestrians. Lighting. Safety from crime.	N/A	N/A	N/A	N/A	Minimal or positive; no GHG emissions

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Mode	Trip Range	Service Area	Populations Served	Supportive Infrastructure & Safety	Operational Models	Partnership Configurations	Payment Mechanism	Funding models	Environmental Impacts
Scootershare (docked or dockless; electric or mechanical)	<2 miles	Urban and suburban areas with appropriate infrastructure (quiet streets, road shoulder, bike lane or sidewalk infrastructure) serving all destinations accessible by scooter users, including fixed-route transit. Private scooter placement is often at the discretion of scooter companies to maximize profits. Regulations may be needed to balance out scooter locations in a more equitable way.	Commuters; general population Some companies provide adaptive scooter vehicles for users with disabilities (this often requires special booking or reservation procedures).	Appropriate facilities for riders (slow shared streets, bike lanes, shoulders, multi-use paths). Sidewalk quality and connectivity; crosswalks and traffic signals for pedestrians and for drivers about rider presence. Regulations and rules for helmet use of users can further improve safety but may have equity implications.	Dockless or free-floating scooters: Private vendor or public entity owns and/or maintains vehicles. Most systems operate with scooters on sidewalks or parking corrals. Users locate, pay for, and reserve scooters through mobile app and drop off scooter at any other location that meets program requirements (e.g., not in middle of sidewalk). Company employees or contractors replace batteries (if removable) or pick up scooters at night to charge them and then redistribute. Docked scooters*: Private vendor or public entity owns and/or maintains scooters. Docking stations may charge e-scooters and provide central locations for pick up and/or drop off. Users can locate scooter docking stations, pay for and reserve scooter through a mobile app or at a docking station kiosk. Users drop off scooter at any other docking station or other location that meets program requirements. *Most docked scooter systems are hybrid systems between dockless and docked, where scooters can be picked up and dropped off at docking stations, but they are often not required to do so. Some scooter share systems have introduced docking stations to manage scooter drop off and pick up (often in response to complaints about scooter disarray).	Local government jurisdictions and private companies may partner to provide scooters as a mobility option to certain geographic areas with low transit service or high concentrations of certain demographics (e.g., low-income or mobility restricted).	User pays per ride, payment via mobile app. Programs can provide credit-free access, discounted fares, and/or require several vehicles to be available for underserved populations.	Private vendor or public entity provides upfront investments in vehicles. Users pay usage fees or fares that may contribute to funding for operations. Government or other organizational sponsor may provide funds to subsidize cost to user.	Minimal or positive; no GHG emissions, with exception of electric utility power generation

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Bikeshare (docked or dockless; electric or mechanical)	<5 miles	Urban and suburban areas with appropriate infrastructure (i.e., slow shared streets, bike lanes, multi-use paths) serving all accessible destinations by bike, including fixed-route transit. E-bikes make it easier to bike, especially in areas with varied elevations. Regulations may be needed to balance out bike locations in a more equitable way.	Commuters; general population.	Bike infrastructure, including bike lanes, and appropriate signage; docking stations for docked bikeshare systems.	Dockless/free-floating bikes: Private vendor or public entity owns and/or maintains vehicles. Many bikeshare systems have recently begun to operate without docking stations, where users locate, pay for, and reserve bike through mobile app and drop off bike at any location that meets program requirements. In the case of e-bikes, vendor employees or contractors replace batteries (if removable) or pick up bikes at night to charge them and then redistribute. Docked bikes*: Private vendor or public entity owns and/or maintains vehicles. Many bikeshare systems have originated and still operate primarily with docking stations. These docking stations charge e-bikes (if available) and provide central locations for users to pick up and/or drop off. Users can locate bike docking stations on mobile app using GPS, pay for and reserve vehicle through mobile app (or kiosk at docking station) and drop off bike at any other docking station or other location that meets company/city-specified requirements. *Some bikeshare systems are hybrid systems between dockless and docked, where bikes can be picked up and dropped off at docking stations, but users are not required to do so.	Local government jurisdictions and private companies may partner to provide bikes as a mobility option to certain geographic areas with high concentrations of certain demographics (e.g., low-income or mobility restricted). Public subsidy may be provided to reduce membership and/or trip cost for qualifying users/trips.	User pays per ride, payment via mobile app. Can provide credit-free access, have discounted fares, and/or require several devices to be available for underserved populations.	Private vendor or public entity provides upfront investments in vehicles and charges user and receives payment from users. Government or other organizational sponsor may provide funds to subsidize cost to user.	Minimal/positive; no GHG emissions, with exception of electric utility power generation

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Mode	Trip Range	Service Area	Populations Served	Supportive Infrastructure & Safety	Operational Models	Partnership Configurations	Payment Mechanism	Funding models	Environmental Impacts
Personal Bike	<5 miles	Urban, suburban, and rural areas with appropriate infrastructure serving all accessible destinations by bike. Electric bicycles can increase service area.	Commuters; general population	End-of-trip facilities (e.g., bike lockers, locker rooms or showers), improved lanes or road facilities, multi-use paths.	Individual owns or rents their own bike		Users generally assume costs of personal bikes. Some costs eligible for pre-tax incentive.	Potential for a subsidy program, particularly for folding bikes Bicycle purchase and/or maintenance may be subsidized by public/private programs.	Minimal or positive; no GHG emissions.
Carpool	5 to 15 miles	Urban, suburban, or rural areas to access fixed-route transit or Park and Ride lots.	General public thorough a regional ridematching system. Employees through a company program.	High-occupancy vehicle lanes. Preferred carpool parking designations. Well-maintained roadways and signage.	Personal vehicles and informal network of carpoolers (may or may not be connected by mobile application); Organized by government or other transportation organization focusing on employers or specific geographic area (using personal or private vehicles).	Local government jurisdictions, health care providers, public agencies, or private companies may partner to organize or encourage carpools.	User pays per ride or membership model (carpool riders and/or drivers may receive incentive payments or subsidies to participate.)	Personal costs incurred similar to driving a personal vehicle; subsidies or incentives funded by government, employer (may receive tax benefit), or other transportation organization (matching model).	Moderate or negative; typically emits GHG emissions but shared ride reduces per-traveler impact.

Mode	Trip Range	Service Area	Populations Served	Supportive Infrastructure & Safety	Operational Models	Partnership Configurations	Payment Mechanism	Funding models	Environmental Impacts
TNCs and Taxis (ride-hailing)	<15 miles	Urban, suburban, and rural areas to access fixed-route transit	Commuters; general population. Can be targeted toward underserved population groups such as seniors. Wheelchair access or car seat requests are available on most apps.	Pick up/drop off zones. This mode is often associated with double parking and roadblocking, which can create and obstacle for other modes. Accessible vehicles should be available to accommodate user needs and are required by law for publicly funded service.	Vehicles may be provided by drivers' personal vehicles or by TNC or taxi vendors. TNC or taxi vendor provides technology for booking and vehicle dispatch and can support maintenance and operations. Rides may be single-occupant or pooled. Pooled rides must be enabled by vendor technology and sufficiently high density of users.	Local government jurisdictions, health care providers, public agencies, or private companies may partner to provide rides or ride discounts as a mobility option to certain geographic areas with high concentrations of certain demographics (e.g., low-income or mobility restricted).	User pays per ride, payment via mobile app (credit) or cash or cash-equivalents. Programs can offer discounted fares for underserved populations.	Private vendor provides technology and ongoing tech maintenance. Drivers often provide personal vehicle, though private vendor may also provide vehicles. Government or public agency may provide funding to subsidize cost of ride to user.	Moderate or negative; typically emits GHG emissions but shared rides can reduce impact. Deadheading and cruising empty should be accounted for in environmental impact.

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Mode	Trip Range	Service Area	Populations Served	Supportive Infrastructure & Safety	Operational Models	Partnership Configurations	Payment Mechanism	Funding models	Environmental Impacts
Shuttles: Supplements fixed-route public transit network. ***1. Fixed-Route and Fixed-Schedule*** ***2. Deviated Fixed-Route* (Fixed-route service with deviations requested in advance)** ***3. Demand Response* (Service does not operate on a fixed route or schedule. Requires a trip request by the user and may require advance reservation.)**	5 to 15 miles	Suburban and rural areas with minimal transit (possibly serving park and ride lots). Connection to fixed-route public transit networks. Does not include ADA complementary paratransit service, which federally funded public transit agencies must provide within 3/4 of a mile of a bus route or rail station, at the same hours and days, for no more than twice the regular fixed route fare. ADA-paratransit serves as a full-trip solution, not a first/last mile solution.	Commuters; general population. Can be targeted toward underserved population groups such as seniors.	Well-maintained roadways and signage for shuttle stops. Sidewalk quality and connectivity; crosswalks and traffic signals for pedestrians and for drivers to indicate pedestrian presence. Accessible vehicles should be available to accommodate user needs. Technology-enabled demand response services may be considered "Microtransit." Technology needs for demand response systems may include[16]: dashboard and on-going monitoring; ride vendor management; client file, booking, and scheduling; dispatch; web-based tools; telephonics; and reporting.	Paratransit routes and schedules may operate with fixed, deviated, and/or demand response service models. Technology may enable demand response services to be dynamically routed based on user requests. Some demand-response services do not have dynamic routing technology and require users to schedule rides in advance. Demand response and deviated fixed-route services vary widely in how users book the service. Some systems have a mobile app (technology provided by the private sector) to book rides, while others may provide a phone number to a call center. Technology is typically provided by the private sector. Vehicles and drivers may be provided by public or nonprofit agencies, or from a private entity. Operational models can vary widely depending on who owns and maintains vehicles and who develops and supports technology to provide paratransit services. Private sector technology; private sector vehicles, private sector drivers ("turnkey"). Private sector technology; public agency drivers, public agency vehicles. Shuttles on fixed routes and schedules do not require booking.	Local governments, state agencies, transit authorities, TMAs, and/or employers may partner on funding, service planning, and operations of paratransit. In New Jersey, some services are operated by TMAs, some by county transit authorities, and some by charter providers.	User pays per ride, payment via mobile app, transit card, or cash fare. Can provide credit-free access, have discounted fares, and/or require several devices to be available for underserved populations. In some cases, fixed route or on-demand services may be provided by an employer or residential manager (e.g., apartment complex) and individual rides are provided at no direct cost to the user.	Rider fare; subsidies or incentives funded by government (federal/state transit funds paid to the county or TMA), privately funded (partially or fully) by employer or residential manager (may receive tax benefit), or other transportation organization (matching model).	Moderate or negative; emits GHG emissions but, as a shared-use mode, reduces single-occupant vehicle trips

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Resources and Funding

Funding programs, the roles of municipalities and counties, cost sharing considerations, incentives, and voluntary resources for first/last mile solutions are described below.

Funding Programs

Primary funders of this strategy include state and federal funding programs administered by NJDOT, the NJTPA, and NJ TRANSIT. The U.S. Department of Transportation set rules and regulations for transportation services receiving federal funds through both competitive and formula grant programs. Funding for first/last mile transportation services have come from the federal **Congestion Mitigation Air Quality** (**CMAQ**) and the former **Jobs Access Reverse Commute** (**JARC**) funding programs. When the federal JARC program ended in 2012, NJ TRANSIT established the state-funded program NJ-JARC. These state and federal funding opportunities are administered by NJ TRANSIT and the NJTPA, and the first/last mile solutions funded through these programs have primarily been shuttles. New Jersey's TMAs have identified challenges with these funding programs, including the limited three-year grant period for CMAQ funding and the 50% local match required for NJ-JARC being cost-prohibitive for small municipalities and businesses. Within New Jersey, growth of warehouse and distribution centers, along with funding constraints, have caused last-mile shuttles (between transit and worksites) to have more demand and success compared to first-mile shuttles (between residential areas and transit) over the past several decades. In addition to shuttles, Federal Transit Administration grant programs can fund other shared mobility services (including bikesharing, ridehailing, and ridesharing), however investments must be functionally related to transit and eligibility depends on the source and use of funding.[17]

Funding for bicycle, pedestrian, and other complete streets infrastructure has traditionally been separate, through the federal **Transportation Alternatives Set-Aside** funding program or through more general-purpose federal highways funding programs like **Surface Transportation Block Grants** (**STBG**). Through the NJTPA's allocation of STBG funds towards the transportation management association (TMA) program, TMAs provide technical assistance to employers to develop jobs access solutions including first/last mile services. As previously discussed, TMAs serve as a lead partner for this strategy, and some are involved with planning, operations, and promotion of shuttles and other first/last mile strategies.

[17] Federal Transit Administration. 2016. "Shared Mobility FAQs: Eligibility Under FTA grant programs." December 7. https://www.transit.dot.gov/regulations-and-guidance/shared-mobility-faqs-eligibility-under-fta-grant-programs

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Over the past five years, the **Federal Transit Administration** (**FTA**) has offered competitive grants that awarded more than $42 million to 60 innovative mobility projects across the country through the Mobility on Demand Sandbox, Integrated Mobility Innovation, and Accelerated Innovative Mobility grant programs. Many of these projects involved first/last mile solutions, and there may be similar federal competitive grant opportunities in the future that transportation agencies in the North Jersey region could pursue.

Municipalities and Counties

If municipalities or counties serve as local sponsors for transportation services funded through federal programs such as CMAQ, then they are required to provide a 20% local match. The NJ-JARC program, which funds some shuttles operated by TMAs, requires a 50% local match.

Municipalities can require private sector investment in first/last mile solutions through **development regulations**. They can create a transportation improvement district or a common area charge for transportation for developers and employers to contribute to transportation services. This happened with an Amazon distribution center in Mercer County that wanted a shuttle; they worked with the Greater Mercer TMA and the Township of Robbinsville to set one up through a common area charge.

There may be an opportunity to tie first-mile solutions to **municipal requirements for affordable housing**. A part of the state's existing affordable housing requirements is providing a transit connection, and municipalities site affordable housing near existing transit services, where possible, or work with partners to provide transportation (via shuttles, taxi, TNCs, or another service) to affordable housing locations without transit. Municipalities and counties can also support first/last mile solutions through implementation of complete streets policies to create integrated networks of active transportation infrastructure.

Finally, some municipalities and counties may fund first/last mile solutions out of their own **operational budgets**. For example, Jersey City has spent $1.8 million to subsidize an on-demand, dynamically routed shuttle service.

Cost Sharing Considerations

Cost sharing with the **private sector** may include the contributions of employers, property owners, sponsors and advertisers, philanthropic foundations, and/or users to cover operational costs of first/last mile solutions. As discussed in the previous subsection, municipalities can catalyze private sector investment in first/last mile solutions by instituting improvement districts, common area charges, and through development requirements including those related to affordable housing.

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Employers may contribute to funding shuttles and other transportation services to get employees to work and residential property developers may fund transportation to transit stations. Both EZ Ride TMA and Greater Mercer TMA operate or manage privately funded shuttles, and employers also work directly with charter operators. However, New Jersey's TMAs have found that many employers are reticent to contribute to employee transportation, considering the commute to be the employee's responsibility. This has been a particular challenge in New Jersey's large and growing warehousing and distribution sector, where there tends to be a disconnect between corporate leadership and the managers who hire, retain, and recruit staff onsite.

Private foundations contribute funding to shuttles operated by TMAs. For example, the Pascale Sykes Foundation provides over $125,000 per year for the Cross County Connections TMA to plan, implement, and promote three shuttle services. However, this foundation will be closing out their charitable giving, creating a challenge for the sustainability of these services.

User fares may contribute to operational funds needed for first/last mile services. Some micromobility vendors have been able to operate through user fees and subscriptions as their sole revenue source. In some areas with high volumes of pedestrian traffic, shuttles may be able to operate on advertising revenue without user fares or public funding sources. For example, the electric shuttle vendor Circuit has operated free summer shuttles in several municipalities within the Hamptons area of Long Island, funded solely through advertising revenue.

Vendors of mobility services may be willing to enter into cost-sharing agreements with municipalities. For example, the City of Asbury Park issued a request for proposals in early 2021 from interested vendors to operate an e-scootershare program within the city limits, requiring that the service operate at no cost to the city and provide the city with revenue sharing. In April 2021, the City selected the vendor Link, which will pay the city an upfront permit fee of $50,000 to cover costs related to setting up the program, and an ongoing revenue share of $.35 per completed trip. Revenue from this program could potentially be used to subsidize a renewed bike-sharing program after it was dismantled in 2020 due to the COVID-19 pandemic.[18] **Health insurance providers** are a common sponsor of bikeshare systems to provide brand exposure and align with the insurers' missions to improve public health by promoting physical activity. Typically, private sponsorship and user fees are not sufficient to cover bikeshare operational costs and public funding is needed from the hosting

[18] City of Asbury Park, NJ. 2021. "Resolution 2021-217: Award of E-Scooter Share Program for the City of Asbury Park." April 26. http://asburyparknj.iqm2.com/Citizens/Detail_LegiFile.aspx?Frame=&MeetingID=1437&MediaPosition=&ID=3796&CssClass=

municipality and/or from federal funds (STBG or CMAQ) programmed by the MPO or state DOT.

Incentives

The **New Jersey Economic Development Authority** (**NJEDA**) implements programs that provide financing and incentives to businesses and enhances the state's economic competitiveness in eight strategic sectors. NJEDA partners with government agencies, academic institutions, and industry on a coordinated approach to statewide economic development. NJEDA does not currently implement any incentive or support programs related to employee transportation.

NJDOT has previously implemented a Smart Moves Business Program Tax Credit that provided a state corporate tax credit for a portion of expenses incurred by businesses to provide alternative transportation options for employees to get to work, including shuttles or other first/last mile solutions. The tax credit could be valued at up to 10% of the value of the commuter transportation benefits. The program started in 1998 and ended at the end of 2007, when the legislation expired and was not extended.

Voluntary Resources

The **Shared Use Mobility Center** offers web-based resources to support implementation of first/last mile solutions. The Mobility on Demand Learning Center hosts webinar and workshop recordings, case studies, regional profiles, a micromobility policy atlas, and learning modules on topics ranging from electric scooter sharing to shared mobility funding strategies.[19]

The **American Public Transportation Association** maintains a Mobility Innovation Hub with case studies and reports, profiles, and sample legislation on a range of first/last mile solutions including micromobility, microtransit, and TNC partnerships.[20]

[19] Shared-Use Mobility Center. N.d. "Mobility on Demand Learning Center." Shared-Use Mobility Center. https://learn.sharedusemobilitycenter.org/

[20] American Public Transportation Association. N.d. "Mobility Innovation Hub." American Public Transportation Association. https://www.apta.com/research-technical-resources/mobility-innovation-hub/