NJTPA NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY
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Regional Performance Measures

Development of Key Regional Transportation Performance Measures: Methodology and Data Summary Report

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1. Introduction

The Federal performance management rules and transportation planning rule require that State Departments of Transportation (DOTs) and metropolitan planning organizations (MPOs) report on and develop targets in relation to a set of (Federally-identified) national performance measures. These Federally mandated performance measures address highway safety, pavement and bridge conditions, performance of the National Highway System (NHS) in relation to freight and congestion, emissions reductions associated with the Congestion Mitigation and Air Quality Improvement (CMAQ) Program, and transit safety and transit asset management.

In addition to reporting on national measures, the NJTPA intends to develop supplemental performance measures for the region that address important goals and issues for Northern New Jersey. These additional measures address topics that either are not addressed in the national measures or could be measured in different ways to help support investment decision making. These supplemental performance measures can help to support measuring progress toward the goals and objectives of the Regional Transportation Plan (RTP), supporting investment prioritization, and communicating with regional stakeholders and the public.

2. Methodology for Selection of Regional Performance Measures

The project team's approach for identifying supplemental regional performance measures involved a review of documents – from within the NJTPA region, other regions around the country, and national literature – and engagement with a broad array of stakeholders. This approach is described briefly below:

Review of Federally-required Performance Measures

The project team started by reviewing the Federally mandated performance measures for the Federal-aid highway program and Federal transit program. While the rules clearly describe the national performance measures that are to be used, these measures are somewhat complex and can be difficult to explain. It was noted that while the Federal measures are suitable to address some goal areas, some do not specifically cover the NJTPA geography, or only cover sub-segments of the region's transportation network. For instance, some of the national measures (i.e., congestion measures) are specified to be reported on an urbanized area level, rather than based on MPO boundaries. Some measures also only address Interstate highways and/or the non-Interstate National Highway System [NHS], but not all roadways. One such measure is Truck Travel Time Reliability Index (TTTR), which only covers Interstate highways. Consequently, the region might want to consider whether additional value would be provided by increasing the coverage of some measures, such as the freight reliability measure to include non-Interstate NHS roadways.

Review of NJTPA Goals and Existing State and Regional Plans and Programs

The project team explored regional goals and objectives of NJTPA, associated with the Regional Transportation Plan (PLAN 2045) and efforts such as Together North Jersey. These documents were used to identify critical regional issues and priorities related to transportation, housing, the environment, climate change, land use, and economic development, and regional goals that should be supported by performance measures.

Also, the team explored a wide array of other documents, including partner agency plans (e.g., New Jersey DOT, NJ TRANSIT), as well as other documents addressing project-level performance measures, project prioritization criteria, and broader system-level performance measures. It is important to recognize that many measures used at the project-level cannot be used directly at the regional scale (for example, project-level cost-effectiveness is not applicable as a regional system performance measure). Examples of the documents from NJTPA reviewed included:

- Performance Results: Assessing the Impacts of Implemented Transportation Projects – Final Report (2011)
- GO FARTHER: Coordinated Human Services Transportation Plan (2017)
- Project Prioritization Criteria Rule Book (2018)
- Regional Capital Investment Strategy (2017)
- New Jersey Pilot Study: Testing Potential MAP-21 System Performance Measures for Two Corridors (2014)

Review of Best Practices among Other MPOs

The project team performed a scan of best practices on regional performance measurement by metropolitan planning organizations (MPOs) around the country, including the Metropolitan Transportation Commission (MTC) in the San Francisco Bay Area, the Delaware Valley Regional Planning Commission (DVRPC) in the Philadelphia area, East-West Gateway Council of Governments in St. Louis, the Houston Galveston Area Council (H-GAC), the Atlanta Regional Commission (ARC), and others.

Development of Initial Performance Measures List

Based on the above inputs, the project team developed a list of performance measures for the consideration of the Technical Advisory Committee (TAC) members. The performance measures were grouped into the following eight topic areas, which reflect key elements of the region's goals and Together North Jersey's four themes (the text following each topic title below is extracted from the NJTPA regional goals, see https://www.njtpa.org/about-njtpa/goals-objectives):

- **Environment**: Protect & improve natural ecosystems
- **Community**: Create great places; built environment & quality of life
- **Safety**: Reduce fatalities & injuries
- **Condition**: State of good repair
- **Access/Mobility**: Affordable, accessible, coordinated, efficient, connected
- **Reliability**: Reliable system
- **Competitive:** Support for economic activity
- **Resilient:** Safe, secure system

Engagement with TAC members

The project team engaged the TAC members during the first two TAC meetings to gather inputs and ideas about promising potential regional performance measures. The TAC members were asked specific questions on the performance measures they are involved in as well as performance measures they thought that NJTPA should consider reporting. The TAC members then engaged in a brainstorming session to go over a list of performance measures identified by the project team. The TAC members were asked about challenges around the availability of data to analyze the performance measures. The project team discussed performance measures under various topic areas. The TAC members provided valuable inputs that were used to identify and shortlist regional performance measures.

Focus Group Discussion Meetings

As a follow-up to the TAC meeting discussion the project team organized five separate focus group discussions (web meetings) with subject matter experts from partner agencies to explore potential measures. Participants represented a broad array of agencies including the NJTPA, New Jersey DOT, NJ TRANSIT, Port Authority of New York and New Jersey, local governments, and Rutgers University.

The project team noted the gaps in national performance measures and identified missing areas. The project team started each of the focus group meetings with a list of potential regional performance measures and gathered feedback from the focus groups adding and deleting from the list of performance measures. The focus group members were asked specifically about the availability of data and potential data sources. Feedback and follow-up comments were obtained from some of the stakeholders following focus group meetings.

3. Criteria for Shortlisting Promising Regional Performance Measures

Building on the extensive research and engagement of partner and stakeholder agencies, the project team compiled a list of approximately 150 potential regional performance measures. Each of these measures was then assessed based on various criteria, as noted below:

- The measures should *address the regional goals* laid out in NJTPA's planning documents, building on community concerns.
- The measures should reflect best practices in *measuring what matters* to the public. Specifically, the best measures would be those that assess desired performance *outcomes*, rather than outputs or activities.
- The measures should *relate to transportation system performance* and should be able to be affected by NJTPA and partner agencies' transportation investments, operational functions, programs, or policies (as opposed to more general regional indicators, such as economic or public health indicators)[1]
- *Data should be available* (at the state and/or regional levels) to support ongoing tracking of these measures, particularly relying on data that are currently being collected on an annual or periodic basis. If modeling or calculation procedures are needed for reporting on the measures, these procedures should generally be feasible within reasonable resources.
- *Measures should be understandable* to a general public audience with some explanation but should not be so technical or complex that only transportation specialists would understand them.

[1] Note that a separate report focuses on some of the more important and relevant of these general regional indicators.

In some cases, not all of these criteria could be satisfied, but these were generally used as principles for recommending regional measures.

4. Recommended Regional Performance Measures

Based on the approaches described above, including criteria identified for shortlisting promising regional measures, a set of 20 regional measures (as well as variants, such as total roadway fatalities and fatality rate) are recommended for use by NJTPA for on-going tracking of transportation system performance in relation to regional goals.

Table 1. Summary of Recommended Regional Performance Measures

Goal Topic Area	Recommended Performance Measure	Data Period	Desired Direction
Environment	ENV-1: Number of bad air quality days	Annual	Decrease
	ENV-2: On-road mobile source greenhouse gas emissions	Biennial	Decrease
Community	COM-1: % of jobs within a ½ mile of regional transit (commuter rail, light rail, express bus)	Annual	Increase
	COM-2: % of households within a ½ mile of regional transit (commuter rail, light rail, express bus)	Annual	Increase
Safety	SAF-1: Number and rate of roadway fatalities and serious injuries	Annual	Decrease
	SAF-2: Number of bicycle and pedestrian fatalities and serious injuries	Annual	Decrease
Access/Mobility	ACC-1: Share of workers with travel time under 45 minutes	Annual	Increase
	ACC-2: Average % of household income spent on transportation	Annual	Decrease
	ACC-3: Non-SOV mode share (work trips)	Annual	Increase
	ACC-4: Total transit ridership	Annual	Increase
	ACC-5: Annual hours of peak hour excessive delay (PHED) per capita	Annual	Decrease
	ACC-6: Annual vehicle hours of delay per capita	Annual	Decrease
	ACC-7: % of rail transit stations that are ADA-accessible	Annual	Increase
Reliability	REL-1: % of person miles traveled on the National Highway System (NHS) that are "reliable"	Annual	Increase
	REL-2: Percentage of Transit Trips Considered "on-time"	Annual	Increase
Condition	CON-1: % of pavement lane miles considered "acceptable"	Annual	Increase
	CON-2: % of all bridge deck area that is structurally deficient (poor condition)	Biennial	Decrease
	COM-1: Cargo movement at the Port of New York and New Jersey	Annual	Increase

	COM-2: Passenger Traffic Volume at Newark International Airport	Annual	Increase
	COM-3: Truck Travel Time Reliability Index	Annual	Decrease
Resilient	Measures not yet developed. See discussion below.	N/A	N/A

It should be noted that for some goal areas, performance measures could not be developed or less than ideal measures were selected due to lack of available data. This was particularly the case for goals related to community issues (creating great places; supporting the built environment and quality of life) and resiliency. For instance, in order to assess the pedestrian environment, ideally a measure of pedestrian connectivity or share of roadways with sidewalks would be utilized; however, a lack of a regional sidewalk inventory made this measure infeasible with NJTPA's existing resources and data sets. A separate report describes other measures that may be developed in the future, along with the data requirements or potential purchased data sources that could be utilized; it also provides data on other regional indicators that are indirectly related to transportation (e.g., public health, jobs).

For each of the recommended measures, the remainder of this document provides information on each measure (grouped by topic area) organized as follows:

- Overview – A summary of the measure and what issues of importance it addresses.
- Coverage – Whether the measure covers the NJTPA region or other geographic area (e.g., urbanized area), as well as coverage of the system (e.g., all modes, all roads, only Interstates)
- Data Period – Annual, biennial, etc., as well as the periods with currently available data.
- Geographic Scale – The scale at which data are available for use in developing the regional measure.
- Source of Data – The primary source used.
- Alternative Source of Data – If applicable.
- Data Collection Method – How the source data are collected.
- Calculation Methodology – A summary of the methodology used.
- Results – Data tables and charts displaying available data and trends.

ENVIRONMENT: Protect & Improve Natural Ecosystems

ENV-1: Number of bad air quality days

Overview

The number of bad air quality days is based on the Air Quality Index (AQI) developed by the U.S. Environmental Protection Agency (US EPA) to report on daily air quality to the public. AQI is an easy way to understand whether air quality is healthy or unhealthy. The AQI is currently calculated for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution, carbon monoxide, nitrogen dioxide, and sulfur dioxide. The AQI is presented on a numeric scale where a value of 100 represents a concentration equal to the health standard for that pollutant.

Air quality is an outcome of a complex interaction of various factors including emissions from transportation-related mobile and non-transportation sources as well as environmental factors such as wind, sunlight, weather and precipitation. AQI is affected by many factors not directly related to transportation activity, and this is an indirect measure of transportation's contribution to air pollution. Consequently, "on-road mobile source emissions" was also considered as a potential measure. However, the number of bad air quality days was selected since it is easy to understand, addresses multiple pollutants within one measure, and relates to broader air quality-related health concerns of residents.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors	
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*	
0 to 50	Good	Green	
51 to 100	Moderate	Yellow	
101 to 150	Unhealthy for Sensitive Groups	Orange	Bad Air Quality
151 to 200	Unhealthy	Red	
201 to 300	Very Unhealthy	Purple	
301 to 500	Hazardous	Maroon	

Figure 1: Ranges of AQI for Good/ Bad Air Quality (Source: US EPA)

One of the challenges of using AQI as a regional performance measure is that it is affected by factors such as weather patterns and precipitation, as well as non-transportation emissions sources, which transportation investments and policy have no influence over.

Coverage

NJTPA Region

Data Period

Annual; CY 2010 to CY 2017 currently available

Geographic Scale

County-level data (based on individual air monitor data)

Source of Data

US EPA's Website https://aqs.epa.gov/aqsweb/airdata/download_files.html#AQI

US EPA publishes pre-generated data files(.csv) on Daily AQIs by county. These pre-generated data files have AQI data for every day of the year for all the counties in the United States.

Alternative Source of Data

The New Jersey Department of Environmental Protection (NJDEP) publishes an Annual New Jersey Air Quality report in which data are reported for all monitoring stations for which the AQI exceeded 100. Although these use the same data as reported by US EPA, older reports (pre-2014) only report on the station with worst statewide air quality index and the total number of sites where the AQI exceeded 100, which makes breaking out NJTPA counties and/or the region impossible.

Data Collection Method

Air quality is measured at various air quality monitoring stations around the country for carbon monoxide (CO), ozone, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter (PM_{10} and $PM_{2.5}$). These raw measurements are converted to separate AQI values for each pollutant using formulation developed by the EPA[2]. The highest of these AQI values is reported as the AQI value for that day for that station. EPA computes the AQI each day for each monitor for the criteria pollutants and summarizes it in annual and daily summary files available to be downloaded.

Calculation Methodology

The summary annual AQI files have one record per day for each county with the maximum AQI and the identification of the defining parameter (CO, ozone, SO_2, NO_2, PM_{10} or $PM_{2.5}$) and the defining monitoring site.

The downloaded data was filtered to NJTPA's thirteen counties and then analyzed further. For a given year, the number of bad air quality days for the NJTPA region was calculated by summing the number of bad air quality days for which AQI at any of the air quality monitoring stations within the NJTPA region was over 100.

[2] https://www3.epa.gov/airnow/aqi_brochure_02_14.pdf

Results

Table 2. Number of Bad Air Quality Days, for NJTPA Region and by County

	2010	2011	2012	2013	2014	2015	2016	2017
NJTPA Region	**53**	**51**	**32**	**17**	**22**	**31**	**22**	**14**
Bergen	16	13	8	7	6	12	10	7
Essex	17	14	13	2	5	5	3	1
Hudson	13	13	12	2	6	17	2	3
Hunterdon	24	15	10	4	2	4	7	4
Middlesex	27	16	20	1	4	9	12	6
Monmouth	10	10	15	4	1	6	3	1
Morris	9	10	10	6	1	3	3	3
Ocean	26	15	17	3	4	10	6	4
Passaic	10	7	6	2	0	7	5	1
Somerset	0	0	0	0	0	0	0	0
Sussex	0	0	0	0	0	0	0	0
Union	4	7	0	1	5	2	0	1
Warren	5	31	2	6	5	1	3	1

Note that the region is considered to have a bad air quality day if any one county within the region has a bad air quality day. Consequently, the number of bad air quality days for the region is considerably higher than the number of bad air quality days in any one county. The figure below indicates the number of bad air quality days for the NJTPA region for years 2010 to 2017. The Average Summer (June to August) temperature at Newark Liberty International Airport (EWR) is also shown in the figure as higher temperatures in warmer months lead to increase in Ozone formation. A majority of the bad air quality days in the NJTPA area are due to higher levels of Ozone. All the counties within the NJTPA region are part of 8-hour Zone Nonattainment areas (NY-NJ-CT or PA-NJ-MD- DE).

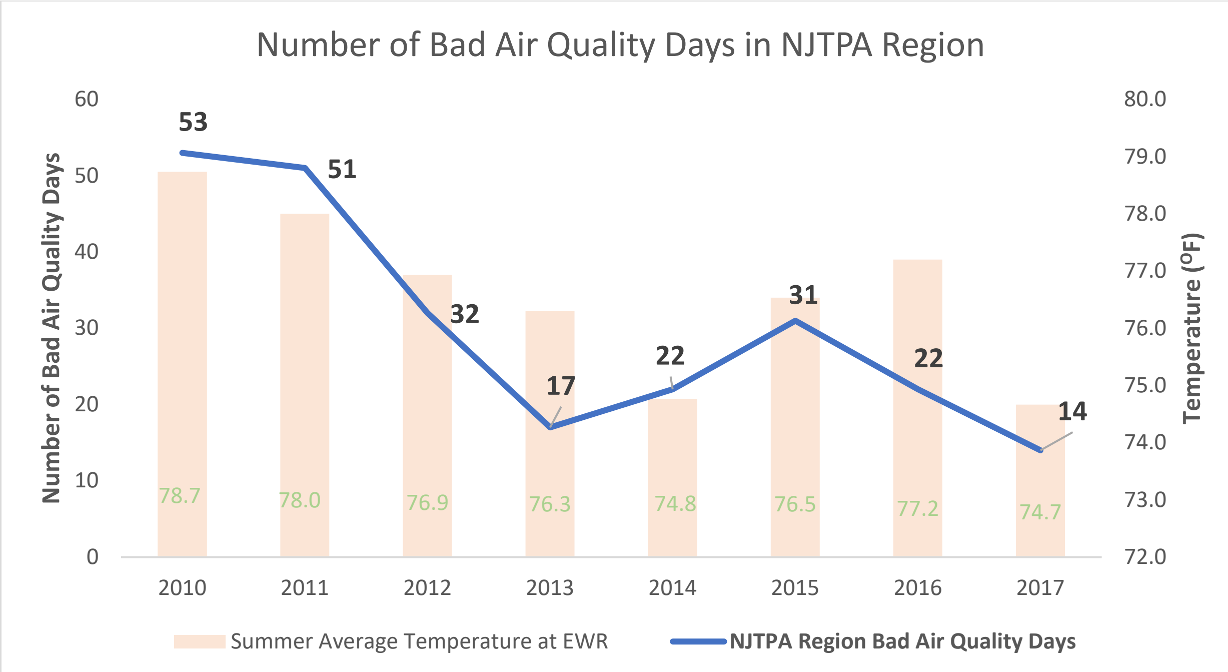


Figure 2: Number of Bad Air Quality Days in NJTPA Counties

ENV-2: On-road mobile source greenhouse gas emissions

Overview

Greenhouse gas emissions contribute to global climate change, which creates risks to the region's residents due to rising seas, stronger storms, and increased health risks. Greenhouse gases are emitted from motor vehicles and other transportation sources as a direct results of fossil fuel combustion (emissions also come from industry, residential, and commercial sectors, and agriculture).

Since regional transportation policies and investments have relatively limited effects on aviation and maritime transportation, it is recommended that this measure focus on on-road mobile source emissions, which include passenger vehicles, freight trucks, and buses. There are two primary ways to track greenhouse gas emissions from on-road mobile sources, both of which have some strengths and limitations: 1) Model these emissions using travel activity data (e.g., vehicle miles traveled), vehicle stock data (e.g., vehicle type, age), and an emissions model (e.g., EPA's MOVES Model); or 2) Calculate carbon dioxide emissions (the most prevalent greenhouse gas) based on data on fuel sales (to estimate fossil fuel combustion) and the carbon content of the fuel.

Although calculating carbon dioxide emissions based on fuel sales data is simpler, it is not an ideal approach in cases where fuel sales trends do not accurately reflect regional fuel combustion trends. This is likely in Northern New Jersey, where many people from New York and other states traveling on the East Coast fill up in New Jersey, and due to changes in fuel taxes that have affected the price of gasoline and fuel sales trends. As a result, even though it is more complex, an approach using travel data, vehicle data, and EPA's MOVES emissions model is recommended to most accurately assess patterns related to on-road mobile source GHG emissions within the region. This approach includes "running" emissions (from motor vehicles operating on roadways), as well as emissions associated with vehicle starts and stops and refueling.

Coverage

NJTPA region, all motor vehicles

Data Period

Biennial – Although emissions can be estimated each year, due to the complexity of analysis it is recommended that the analysis be conducted every two years in connection with regional emissions analysis conducted for conformity associated with the Transportation Improvement Program (TIP).

Geographic Scale

County-level emissions can be generated.

Source of Data

Data are the outputs of travel and emissions modeling. EPA's MOVES model would be need to be run using input files that are commonly used for conformity analysis, with adjustments.

Alternative Source of Data

An alternative source and methodology would be to use fuel sales data along with carbon content of fuels to calculate CO_2 emissions; these data are readily available at the State level but would need to be gathered at the county-level to estimate emissions from fuel sales within the NJTPA region.

Data Collection Method

Data on travel parameters, including vehicle miles traveled (VMT) by road type, speeds, and vehicle information would be collected as currently done as part of the transportation conformity process. Travel demand model outputs from NJTPA's North Jersey Regional Transportation Model – Enhanced (NJRTME) are typically used to calculate trip matrices and inputs such as average speed distributions, road type distributions, and ramp fractions, as well as monthly and hourly VMT fractions. Additional data are used to provide inputs including:

- Vehicle source type population (based on motor vehicle registration data)
- Vehicle age distribution (based on motor vehicle registration data)
- Vehicle type VMT (based on Highway Performance Monitoring System [HPMS] data)
- Fuel input data (based on MOVES default data for New Jersey)
- Truck hoteling hours (based on New Jersey annual data developed by EPA and other sources)
- Meteorology (including monthly temperature and humidity data)

Calculation Methodology

Travel data and other assumptions are input to EPA's MOVES emissions model in order to estimate on-road GHG emissions for pollutants of concern, including carbon dioxide (CO_2), methane (CH_4), N_2O, and Elemental Carbon (EC), the equivalent to black carbon. The MOVES model supports two methods of emissions estimation: the Inventory method calculates the total quantities of emissions for geographic areas (i.e. counties); the Emission Rates method creates a set of emission rate lookup tables that can be applied to VMT and source type population (vehicle population). The NJTPA GHG estimates for this regional performance measure can utilize the Inventory method.

MOVES permits import of all 12 months' combined activity input to derive an annual emissions estimate. The annual GHG emission analysis methodology is similar to conformity analysis conducted for annual PM2.5, and uses a single MOVES run for each county and year to generate a total annual emissions inventory. The data inputs and analysis accounts for all 13 counties in the NJTPA area to sum a regional total. For more information on methodologies, refer to detailed technical memos from NJTPA.

Results

On-road GHG emissions have most recently been estimated for 2017, in association with the conformity determination for NJTPA's FY 2018-2021 TIP, using EPA's MOVES2014a model, as shown below.[3]

Table 3: On-road mobile source greenhouse gas emissions (Co2 Equivalent, Direct Emissions)

County Name	2017
Bergen	4,223,636
Essex	2,700,507
Hudson	1,308,785
Hunterdon	1,065,570
Middlesex	4,271,558
Monmouth	3,111,260

[3] Technical Memorandum from Anna Aleynick, Priyal Pandya and Arkady Nakhimovsky, AECOM to Liz DeRuchie and Jeff Perlman, "NJTPA On-Road Transportation Greenhouse Gas Emissions", June 12, 2018.

County Name	**2017**
Morris	2,726,145
Ocean	2,396,874
Passaic	1,577,959
Somerset	1,854,800
Sussex	655,266
Union	2,393,651
Warren	873,301
NJTPA Regional Total	**29,159,312**

One challenge is that since the EPA's MOVES model has been updated over time, comparisons with prior inventories using previous versions of MOVES or earlier methods are not advisable, as the outcomes are not directly comparable.

COMMUNITY: Create Great Places; Built Environment & Quality of Life

COM-1: % of jobs within a ½ mile of regional transit (commuter rail, light rail, express bus)

Overview

The performance measure attempts to assess the level of transit-oriented development by measuring the number of jobs accessible within walking distance (½ mile) of stops for regional, high capacity transit service such as commuter rail, light rail and express buses. The percentage of jobs is a measure to track over time and is recommended over the number of jobs since it helps to assess the overall share of development in these locations, and is less sensitive to changes in the overall economic picture.

Coverage

NJTPA Region

Data Period

Annual data; currently from 2011 to 2015

Geographic Scale

Census Block

Source of Data

Employment Location Data: The Employment data was downloaded from the US Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES) Workplace Area Characteristics (WAC) Version 7.3 for years 2011 to 2015 (https://lehd.ces.census.gov/data/). The WAC summarizes the employment data by Census block where jobs are located. The total number of jobs (Variable: C000) from "JT00" Job type files (All Jobs) were used for this analysis on a Census block level. In addition to the All Jobs types, the US census Bureau also separately publishes the following job type files for "JT01" for Primary Jobs, "JT02" for All Private Jobs, "JT03" for Private Primary Jobs, "JT04" for All Federal Jobs, or "JT05", for Federal Primary Jobs which were not used for the analysis.

Transit Stop Geography: The Locations of the commuter rail, light rail, express bus stations and stops were obtained from the NJTRME model GIS shapefiles. Bus modes 6 and 7 were considered as Express Bus Modes for this analysis.

Census Block Geography: Census block shapefiles were downloaded from Census TIGER/Line data (https://www.census.gov/geo/maps-data/data/tiger-line.html)

Alternative Source of Data

Employment location data can be purchased from Experian / IHS Markit. The data from these private vendors are available on an employment location level, which is preferable to the Census block level. However, the employment locations, though more precise, are not always more accurate. There is also a cost to acquire these data annually.

Data Collection Method

LEHD data are based on different administrative sources, primarily Unemployment Insurance (UI) earnings data and the Quarterly Census of Employment and Wages (QCEW), and various other censuses and surveys.[4]

Calculation Methodology

The transit and station shapefiles from the NJTRM-E model were combined to create a single shapefile of the transit stops for commuter rail, light rail and express buses within the NJTPA region in a GIS software. Then using spatial analysis, a half mile buffer was created around these stops and saved as a separate shapefile.

The employment location data was downloaded from LEHD files on a Census block level in a CSV format and the joined to Census block shapefile for GIS analysis. The total numbers of Jobs (column C000) were used for the analysis.

The Census block shapefile for the NJTPA region was overlaid with the half-mile buffer shapefile created in a GIS software. The area of overlap of the transit stop buffers with each Census block was calculated using the intersection vector geoprocessing tool. The percentage of area overlap with the half-mile buffer was computed for all the Census blocks. Census blocks with a minimum area overlap of 20% were selected. Jobs located within these Census blocks were assumed to be within half a mile of a transit stop.

This method was selected because jobs are more likely to be clustered within a Census block, so a minimum overlap was used to avoid selecting blocks where only a small fraction of the block was within the buffer area. It is important to recognize the limitations of this approach: the jobs would likely not be distributed evenly within a Census block, and this analysis does not account for road and pedestrian connectivity, or lack thereof, in estimating the half mile area. However, these limitations should not greatly affect comparisons over time.

Results

Table 4. Estimated Percentage of Employment within a Half Mile of Regional Transit

Year	Employment Within Half Mile	Total Employment in NJTPA Region	Percentage of Employment Within Half Mile
2011	1,635,663	2,792,323	**58.6%**
2012	1,604,868	2,786,161	**57.6%**
2013	1,614,148	2,820,231	**57.2%**
2014	1,639,287	2,856,820	**57.4%**
2015	1,659,816	2,886,056	**57.5%**

[4] https://www.census.gov/ces/dataproducts/lehddata.html

COM-2: % of households within a ½ mile of regional transit (commuter rail, light rail, express bus)

Overview

This performance measure attempts to assess another dimension of the level of transit-oriented development by measuring the number of households accessible within walking distance (½ mile) of stops for regional, high capacity transit service such as commuter rail, light rail and express buses. Percentage of households is recommended over the number of households since it helps to assess the overall share of the region's residents in these locations.

Coverage

NJTPA Region

Data Period

Annual; currently available from 2011 to 2017

Geographic Scale

Census Block

Source of Data

Household Location Data:

The household location data was downloaded from the US Census Bureau's Census FactFinder website. The number of households on a Census block group level was downloaded for the years 2013 to 2016 through 5-year ACS (B11016: Household Type by Household Size Number of households), and on a Census block level for the 2010 decennial Census.

The 5-Year ACS reports the household data only on a Census block group level (not at the finer level of Census blocks). For years 2013 to 2016, the 2010 Decennial Census household data was used to determine the distribution of households per the Census blocks inside the block groups of the region. For years 2013 to 2016, the number of households in the Census blocks were synthesized using the distribution thus computed from the 2010 Decennial Census.

Transit Stop Geography: Similar to the employment accessibility measure, the locations of the commuter rail, light rail, express bus stations and stops were obtained from the NJTRME model GIS shapefiles. Bus modes 6 and 7 were considered as Express Bus Modes for this analysis.

Census Block Geography: Census block shapefile was downloaded from Census TIGER/Line data (https://www.census.gov/geo/maps-data/data/tiger-line.html)

Alternative Source of Data

The household location data can be purchased through one of many commercial data vendors such as Experian. Some commercial data vendors have more precise data for the household location (but not necessarily more accurate). However, there is a cost to acquire these data annually. Alternative sources might include local property tax records.

Data Collection Method

The Census Bureau collects information such as name, sex, age, date of birth, race, ethnicity, relationship and housing tenure of households through decennial Censuses, and detailed socioeconomic information through the annual American Community Survey (ACS). The ACS is used to summarize information for the 5-year ACS estimates.

Calculation Methodology

As with the employment accessibility measure, the transit and station shapefile from the NJTRME model were combined to create a single shapefile of the transit stops for commuter rail, light rail and express buses within the NJTPA region in a GIS software. Then using spatial analysis, a half mile buffer was created around these stops and saved as a separate shapefile.

The household location data was downloaded from 5-year ACS (B11016) on a Census block group level in a CSV format for the thirteen county NJTPA Region. The 2010 Census was downloaded in a shapefile format and trimmed to the thirteen county NJTPA region. The 2010 Census shapefile includes the number of households on a Census block level. For the 2013-2016 years, the Census block level number of households were estimated based on the proportional distribution of households in each Census block group in the 2010 Census.

The Census block shapefile for the NJTPA region was overlaid with the half-mile buffer shapefile created in a GIS software. The area of overlap of the transit stop buffer with each Census block was calculated using the intersection vector geoprocessing tool. For the purpose of the analysis, it was assumed that the households are uniformly distributed in the Census blocks. Hence, the number of households proportional to the area of Census block within a half mile of the transit stops were assumed to be within half a mile of a transit stop.

It is important to recognize the limitations of this approach, however, since the residential locations would likely not be distributed evenly within a Census block, and this analysis does not account for road and pedestrian connectivity, or lack thereof, in estimating the half mile area. However, these limitations should not greatly affect comparisons over time.

Results

Table 5. Estimated Percentage of Households within a Half Mile of Regional Transit

Year	Households Within Half Mile	Total Households in the NJTPA Region	Percentage of Households Within Half Mile
2013	1,210,783	2,375,737	51.0%
2014	1,214,907	2,379,644	51.1%
2015	1,218,362	2,383,143	51.1%
2016	1,222,110	2,389,871	51.1%
2017	1,225,140	2,398,184	51.1%

SAFETY: Reduce Fatalities & Injuries

SAF-1: Number and rate of roadway fatalities and serious injuries

Overview

These regional performance measures for safety are the same as the Federal safety performance measures that supports the Highway Safety Improvement Program (HSIP), but also include the annual number and rate of fatalities and serious injuries, in addition to a 5-year rolling average. The total number of roadway fatalities and serious injuries are computed for the NJTPA region using the same data and approach as used for Federal reporting.

Coverage

NJTPA Region, all public roadways

Data Period

Annual; currently available 2007 to 2018

Geographic Scale

Data are available at the county level, and specific geographic location level.

Source of Data

The roadway fatality and serious injury data was obtained from NJDOT.

The VMT data at the county level was also obtained from NJDOT for the purposes of developing fatality and serious injury rates.

Alternative Source of Data

N/A

Data Collection Method

NJDOT collects traffic crash reports from police departments via the TR-1 form. The data are checked and scrubbed before entering into the NJDOT crash database.

Calculation Methodology

Rates are calculated for each year by dividing the number of fatalities (or serious injuries) by that year's VMT. Five-year rolling averages are calculated from the annual rates.

Results

Table 6. Number of Annual Roadway Fatalities and Serious Injuries in the NJTPA Region, 2007 to 2018

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	439	365	357	378	381	394	334	340	356	368	367	339
Serious Injuries	1,171	1,106	1,009	992	910	837	711	672	790	689	708	858

Table 7. 5-Year Rolling Averages of Roadway Fatalities and Serious Injuries in the NJTPA Region

5 yr. Rolling Average	2007-2011	2008-2012	2009-2013	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Fatalities	384.0	375.0	368.8	365.4	361.0	358.4	353.0	354.0
Serious Injuries	1,037.6	970.8	891.8	824.4	784.0	739.8	714.0	743.4

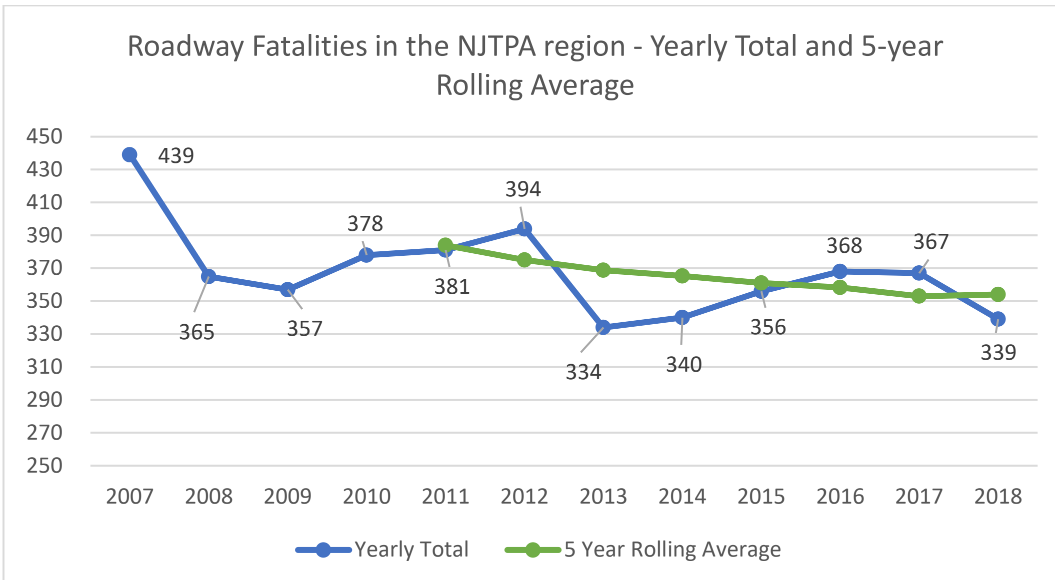


Figure 3: Roadway fatalities in the NJTPA Region; Yearly total and five-year rolling average

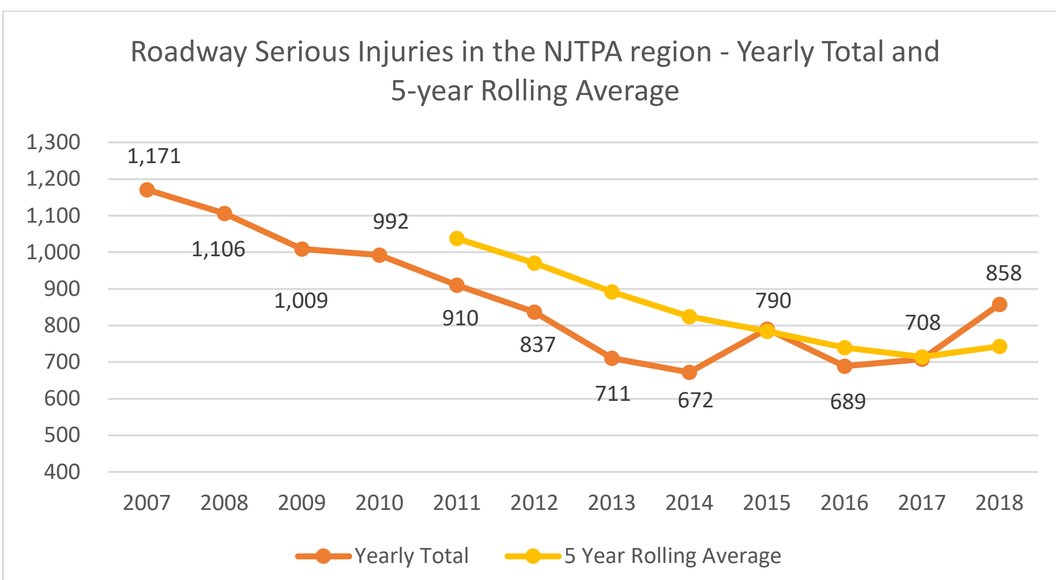


Figure 4: Roadway Serious Injuries in the NJTPA Region; Yearly total and five-year rolling average

Table 8. Rate of Annual Roadway Fatalities and Serious Injuries in the NJTPA Region, 2007 to 2018

Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Fatalities per 100 Million VMT	0.80	0.69	0.68	0.72	0.72	0.73	0.62	0.63	0.65	0.66	0.66	0.61
Injuries per 100 Million VMT	2.14	2.08	1.91	1.88	1.71	1.56	1.32	1.24	1.45	1.24	1.27	1.54

Table 9. Rate of 5-Year Rolling Averages of Roadway Fatalities and Serious Injuries in the NJTPA Region

5 yr. Rolling Average	**2007-2011**	**2008-2012**	**2009-2013**	**2010-2014**	**2011-2015**	**2012-2016**	**2013-2017**	**2014-2018**
Fatalities per 100 Million VMT	0.722	0.708	0.694	0.684	0.67	0.658	0.644	0.642
Injuries per 100 Million VMT	1.944	1.828	1.676	1.542	1.456	1.362	1.304	1.348

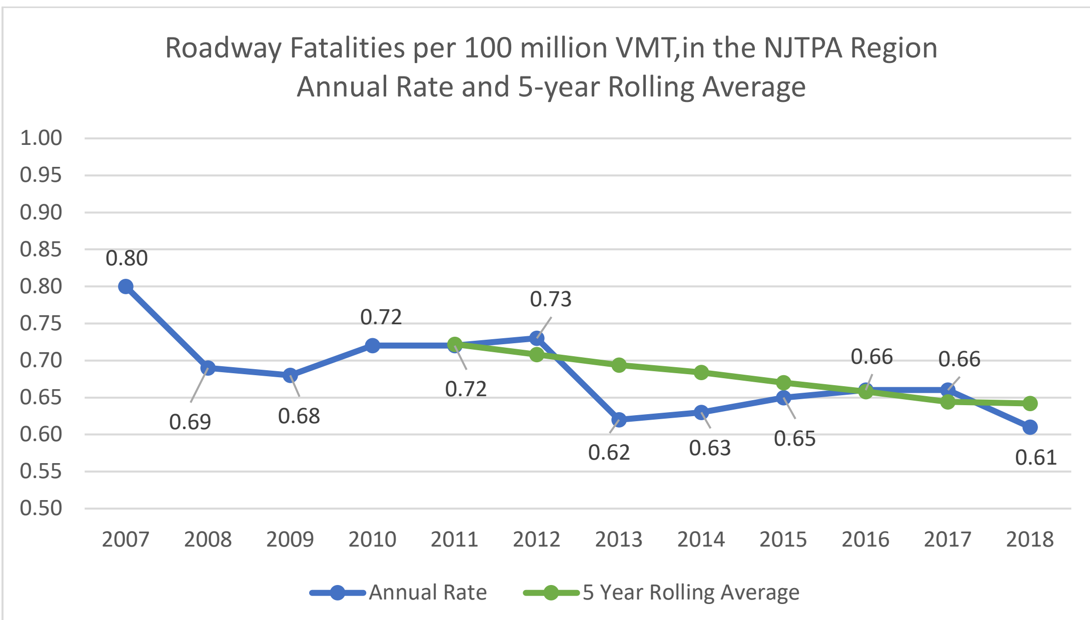


Figure 5: Roadway fatalities per 100 million vehicle miles traveled, NJTPA Region

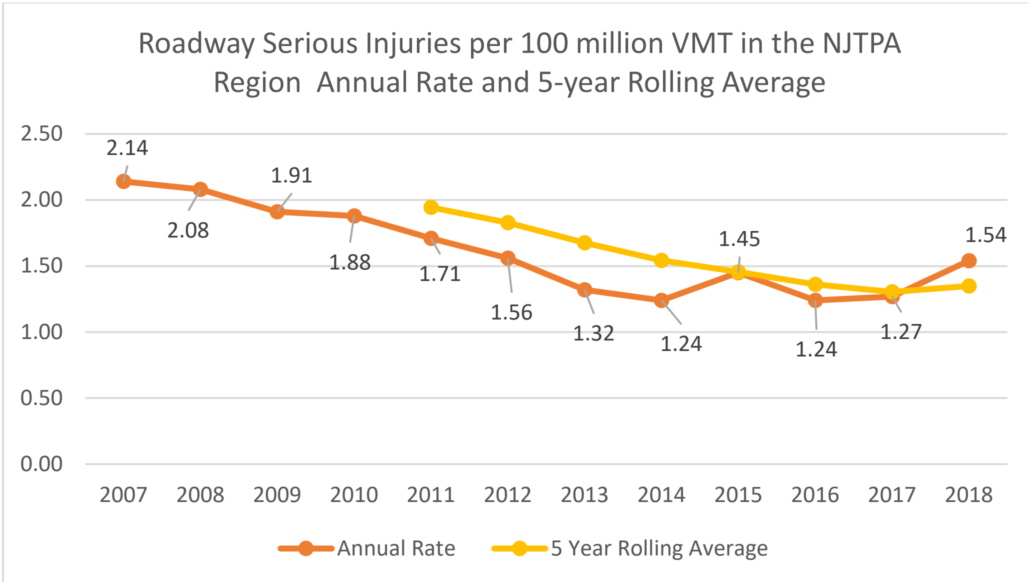


Figure 6: Roadway serious injuries per 100 million vehicle miles traveled, NJTPA Region

SAF-2: Number of bicycle and pedestrian fatalities and serious injuries

Overview

The regional performance measure for bicycle and pedestrian safety is the same as the Federal safety performance management measure that supports the Highway Safety Improvement Program (HSIP). The total number of bicycle and pedestrian fatalities + serious injuries were computed for the NJTPA region using the same data and approach as used for Federal reporting.

Coverage

NJTPA Region, all public roadways

Data Period

Annual; currently available 2007 to 2018

Geographic Scale

Data are available at the county-level, and specific geographic location level

Source of Data

The bicycle and pedestrian fatality and serious injury data was obtained from NJDOT.

Alternative Source of Data

N/A

Data Collection Method

NJDOT collects traffic crash reports from police departments via the TR-1 form. The data are checked and scrubbed before entering into the NJDOT crash database.

Results

Table 10. Number of Non-motorized Bicycle and Pedestrian Fatalities and Serious Injuries in the NJTPA Region, 2007 to 2018

Measure	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	112	106	125	113	113	118	99	119	138	107	134	137
Serious injuries	213	228	224	239	210	195	146	139	161	146	150	162
Non-Motorized Fatalities+ Serious Injuries	325	334	349	352	323	313	245	258	299	253	284	299

Table 11. 5-Year Rolling Average of Bicycle and Pedestrian Fatalities and Serious Injuries in the NJTPA Region

Measure	2007-2011	2008-2012	2009-2013	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Fatalities	113.8	115	113.6	112.4	117.4	116.2	119.4	127
Serious injuries	222.8	219.2	202.8	185.8	170.2	157.4	148.4	151.6
Non-Motorized Fatalities+ Serious Injuries	336.6	334.2	316.4	298.2	287.6	273.6	267.8	278.6

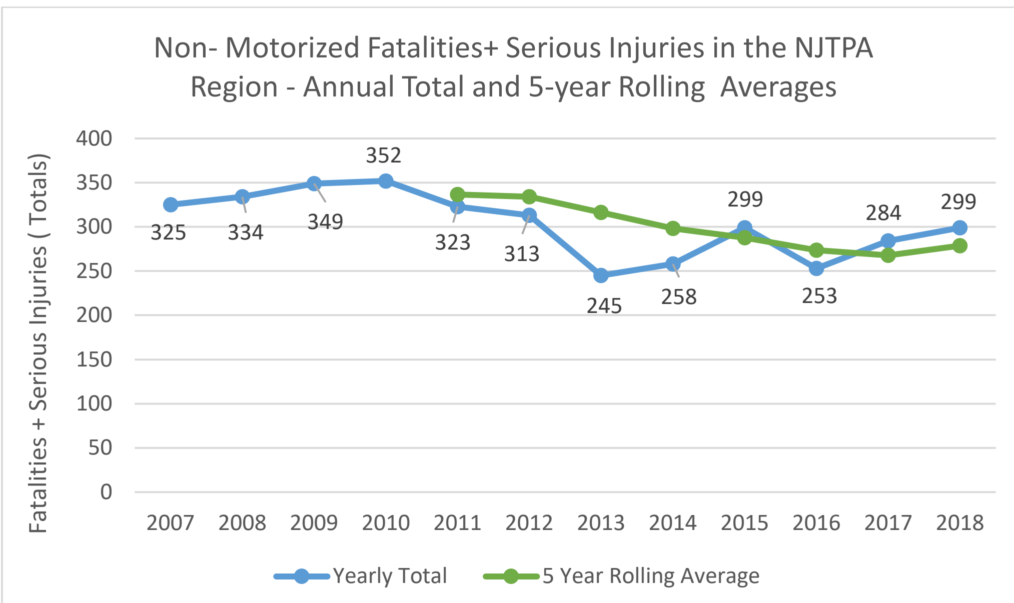


Figure 7: Non- Motorized Fatalities+ Serious Injuries in the NJTPA Region - Annual Total and 5-year Rolling Averages

ACCESS/MOBILITY: Affordable, Accessible, Coordinated, Efficient, Connected

ACC-1: Share of workers with travel time under 45 minutes

Overview

Travel time to work for the region is an indicator of access to jobs, which relates to mobility and economic competitiveness. When broken down by mode, travel time also provides some insights into regionally important planning topics such as

- Traffic congestion
- How far workers live from their jobs (which in turn relates to housing affordability near job centers and urban sprawl)
- Transit service frequency and speeds

A way to look at travel time is by examining the percent of commutes below a certain threshold travel time. Forty-five (45) minutes is often viewed as a good threshold for a reasonable trip time.

Coverage

NJTPA Region (residents who live in the NJTPA counties, even if they work outside the region)

Data Period

Annual data; currently from 2011 to 2017

Geographic Scale

County level

Source of Data

American Community Survey (ACS)

Alternative Source of Data

N/A

Data Collection Method

The ACS is based on a sample of the housing units, interviewed each year over a twelve-month period to obtain the estimates of workers 16 years and over who did not work at home.

The travel time estimates are based on five years ACS table B08134 -Means of Transportation to Work by Travel Time to Work).

Calculation Methodology

Share of workers (%) with travel time under 45 min:

Total counts of commuters on each mode of travel with commutes under 45 minutes were summed for each of the NJPTA counties (by mode) to give an overall NJTPA value for each year. Then the share of commuters with trip below 45 minutes was computed based on the total number of trips for that mode in the NJTPA region.

Results

Table 12: Share of Commuting Trips <45 minutes, NJTPA Region, 2011-2017

Mode	2011	2012	2013	2014	2015	2016	2017
All Modes	74.7%	74.4%	74.1%	73.5%	73.2%	72.9%	72.6%
Drive alone	80.3%	80.0%	79.8%	79.2%	79.1%	78.9%	78.8%
2 Person Carpool	77.0%	77.5%	77.3%	77.2%	77.6%	78.2%	78.6%
3+ Person Carpool	71.7%	71.3%	70.4%	70.6%	71.0%	70.8%	71.8%
Bus or Trolley Bus	42.7%	41.8%	41.0%	40.0%	38.9%	37.4%	36.2%
Streetcar or Trolley Car	39.6%	39.4%	39.2%	39.3%	38.5%	38.8%	38.4%
Railroad or Ferry Boat	14.0%	14.1%	14.1%	13.7%	13.0%	12.8%	12.6%
Walk	97.7%	97.5%	97.6%	97.7%	97.5%	97.6%	97.6%
Taxi, Motorcycle, Bicycle and other	84.6%	84.2%	83.9%	84.1%	83.4%	83.8%	83.9%

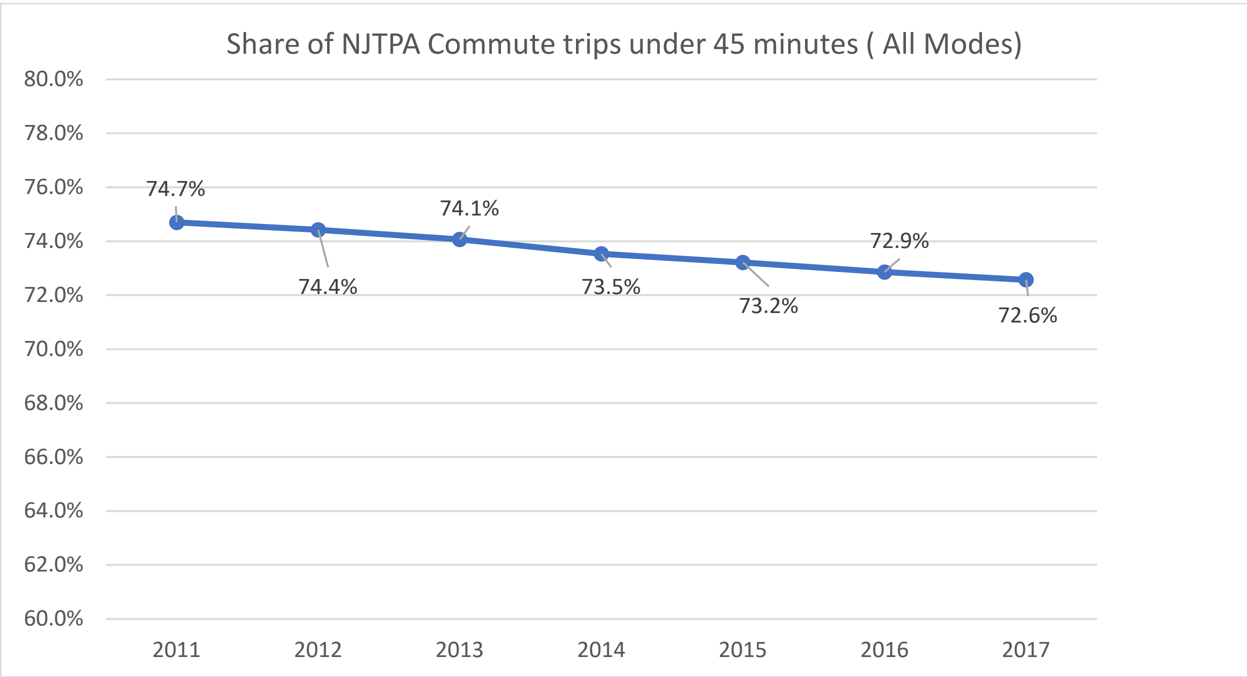


Figure 8: Share of NJTPA Commute trips under 45 minutes (All Modes)

ACC-2: Average % of household income spent on transportation

Overview

Transportation is one of a typical household's largest expenses after housing. Having affordable travel options helps residents of all income levels to access work, education, medical care, shopping, and social and recreational activities within budgets. Typically, daily transit costs are lower than the costs associated with owning and operating a private motor vehicle and reducing auto dependency through improved transit options may reduce the amount of income that households spend on transportation. Household transportation costs are affected by a combination of vehicle ownership costs and fees, road tolls and parking fees, vehicle insurance and registration fees, transit and taxi fares, and fuel prices.[5] Reducing the share of income spent on transportation will provide more income for other expenses.

Coverage

New York-Newark Metropolitan Statistical Area (with potential breakout for Northern New Jersey, defined as encompassing the 13 county NJPTA area plus Mercer County*)

*Note: ICF is still assessing the feasibility providing the breakdown of data for the Northern New Jersey area, or using statewide New Jersey data.

Data Period

Annual (based on Consumer Expenditure Survey years); currently 1986-87 to 2016-17

Geographic Scale

Metropolitan Statistical Area

Source of Data

Bureau of Labor Statistics (BLS), Consumer Expenditure Surveys (CES)

Alternative Source of Data

The Center for Neighborhood Technology (CNT) produces a Housing and Transportation (H+T) Affordability Index, which provides a perspective on affordability that includes both the cost of housing and the cost of transportation at the neighborhood level. The H+T Index allows the user to separate out the cost of transportation, and transportation costs as a share of income at various scales, including neighborhood, county, and MPO level. These transportation costs are calculated based on a transportation cost model based on a multidimensional regression analysis, in which formulae describe the relationships between three dependent variables (auto ownership, auto use, and transit use) and independent household and local environment variables. Neighborhood level (Census block group) data on median household income, household size, commuters per household, household residential density, walkability and street connectivity, transit connectivity and access, and employment access and diversity were utilized as the independent or predictor variables. These data are drawn from sources including the American Community Survey (ACS), U.S. Census Longitudinal Employment-Household Dynamics

[5] Panou, K. and Proios, G. Modeling Transportation Affordability with Cumulative Density Function of Mathematical Beta Distribution. Transportation Research Record, 2397(1), pp.53-60. Transportation Research Board, Washington DC. 2013.

(LEHD) Origin-Destination Employment Statistics (LODES), and U.S. Census TIGER/Line Files, and average annual expenditures and characteristics of all consumer units, from the CES.[6]

Data Collection Method

The Consumer Expenditure Survey is a nationwide household survey conducted by the U.S. Bureau of Labor Statistics to find out how Americans spend their money. The data are estimates derived from two separate surveys, the Interview Survey and the Diary Survey. The Quarterly Interview Survey is designed to collect data on large and recurring expenditures that consumers can be expected to recall for a period of 3 months or longer, such as rent and utilities, and the Diary Survey is designed to collect data on small, frequently purchased items, including most food and clothing. Together, the data from the two surveys cover the complete range of consumers' expenditures. The sample is a two-step process in which a random sample of geographic areas is selected from the U.S., and then a random sample of households is selected inside those selected areas. The geographic areas are small clusters of counties called primary sampling units (PSUs). Data are collected for BLS by the U.S. Census Bureau.

Calculation Methodology

The share of household income spent on transportation is calculated simply by dividing the estimated average annual household transportation costs (which include estimated expenditures on vehicle purchases; gasoline, other fuels, and motor oil; other vehicle expenses; and public and other transportation) by the average annual income before taxes.

In addition, while BLS does not provide state-level data or subarea data summaries, BLS provides information on state-level weighting procedures, which may be used to help produce state-level estimates. Presently, the state-level weighting process is in an experimental phase, per BLS, and state-level weights are being made available to Consumer Expenditure Survey microdata users to gauge interest and usefulness. New Jersey is one of three states in which state-level weighting information is provided.[7]

Results

Table 13: Average Percent of Income Spent on Transportation, New York-Newark MSA

Year	Average annual transportation expenditures	Average income before taxes	Percentage of income spent on transportation
2008-09	$8,495	$81,509	10.4%
2009-10	$7,944	$78,441	10.1%
2010-11	$7,843	$77,886	10.1%
2011-12	$8,031	$80,222	10.0%
2012-13	$8,235	$80,862	10.2%
2013-14	$8,442	$82,749	10.2%
2014-15	$8,002	$87,198	9.2%

[6] Center for Neighborhood Technology. H+T Index Methods. https://htaindex.cnt.org/about/HTMethods_2016.pdf.
[7] Bureau of Labor Statistics. CE Experimental Research Products: State Weight Files. https://www.bls.gov/cex/csxresearchtables.htm#stateweights.

2015-16	$7,280	$87,106	8.4%
2016-17	$7,907	$88,313	9.0%

BLS also developed a State profile for New Jersey and estimated transportation expenditures; as expected, the New Jersey transportation expenditure figures are higher than the New York-Newark MSA figures. Note that these transportation costs may fluctuate based on a variety of factors, including fuel prices, vehicle insurance prices, changes in vehicle purchasing patterns, or changes in transit use patterns.

The CNT data allow an analysis of transportation costs at a more detailed geographic scale, but the methodology differs significantly, based on the models used to estimated transportation costs, which include auto ownership, auto use, and transit costs. For instance, CNT estimated that on average 18% of household income goes toward transportation within the NJTPA area. A representation of transportation costs per income across the NJTPA region is presented below.[8]

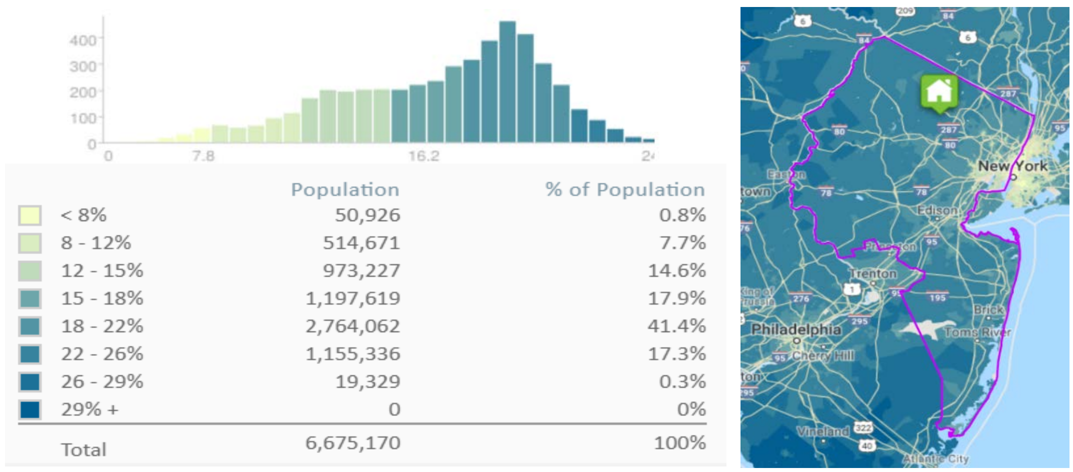


Figure 9. Transportation Costs % Income across NJTPA MPO region, based on CNT Analysis

[8] Center for Neighborhood Technology. H+T Index. https://htaindex.cnt.org/map/index.php?mapR=109,-74.1723667,40.735657,9,mpo,389. Accessed February 20, 2019.

ACC-3: Non-SOV mode share (work trips)

Overview

The commute mode share within NJTPA region measures the percentage of workers aged over 16 years who commute using different transportation modes. Commute mode share reflects how well infrastructure, policies, investments, and land-use patterns support different types of travel to work.[9]

One of the Federal performance measures for the Congestion Mitigation and Air Quality Improvement (CMAQ) Program is % of Non SOV travel applied to urbanized area; NJTPA is part of the urbanized area of New York- Newark, NY-NJ-CT. (In addition, a small portion of the NJTPA region is in the Philadelphia urbanized area; the area is so small as to not warrant tracking as a regional measure for the NJTPA.) Urbanized area % non-SOV travel is that travel that is not occurring by driving alone in a motorized vehicle, including telecommuting. The regional performance measure for non-drive alone mode share is similar to the federal CMAQ performance measure but covers the NJTPA region instead of the urbanized area region.

Coverage

NJTPA Region

Data Period

Annual; currently available 2010 to 2017

Geographic Scale

County Level

Source of Data

American Community Survey (ACS)

Alternative Source of Data

N/A

Data Collection Method

The American Community Survey (ACS) is based on a sample of the housing unit addresses is interviewed each year over a twelve-month period. This survey provides an estimate of workers over 16 years of age. The ACS asks for the mode usually used by the respondent to get to work. For more than one mode of transportation, respondents select the mode used for most of the distance traveled.

Average travel times by mode was computed based on 5-Year ACS table DP03- SELECTED ECONOMIC CHARACTERISTIC. The data on mode share to work was downloaded for the 13 counties of the NJTPA region for the years 2011 to 2017.

Calculation Methodology

The number of commuters from all 13 counties of the NJTPA region using different modes of transportation were summed to calculate the percentage mode share of various modes. The non-drive

[9] https://www.transportation.gov/mission/health/commute-mode-share

alone (Non-SOV) mode share was computed by deducing the Drive alone mode share from 100% (100% - %Drive Alone).

Results

Table 14: Mode shares (work trips), NJTPA Region, 2010 to 2017

	2010	2011	2012	2013	2014	2015	2016	2017
Drive Alone	69.6%	69.6%	69.6%	69.6%	69.6%	69.5%	69.3%	69.1%
Non-Drive Alone (Non-SOV)	30.4%	30.4%	30.4%	30.4%	30.4%	30.5%	30.7%	30.9%
Carpool	8.8%	8.7%	8.6%	8.4%	8.3%	8.1%	8.0%	7.9%
Public Transit*	12.4%	12.5%	12.5%	12.7%	12.8%	13.0%	13.2%	13.5%
Walk	3.5%	3.4%	3.4%	3.3%	3.2%	3.3%	3.3%	3.2%
Other Means**	2.2%	2.1%	2.1%	2.0%	2.0%	1.9%	1.9%	1.9%
Work at Home	3.6%	3.7%	3.8%	4.0%	4.1%	4.2%	4.4%	4.4%

* Public Transit excluding Taxicab

** Other Means include Taxicab, Motorcycle, and Bicycle

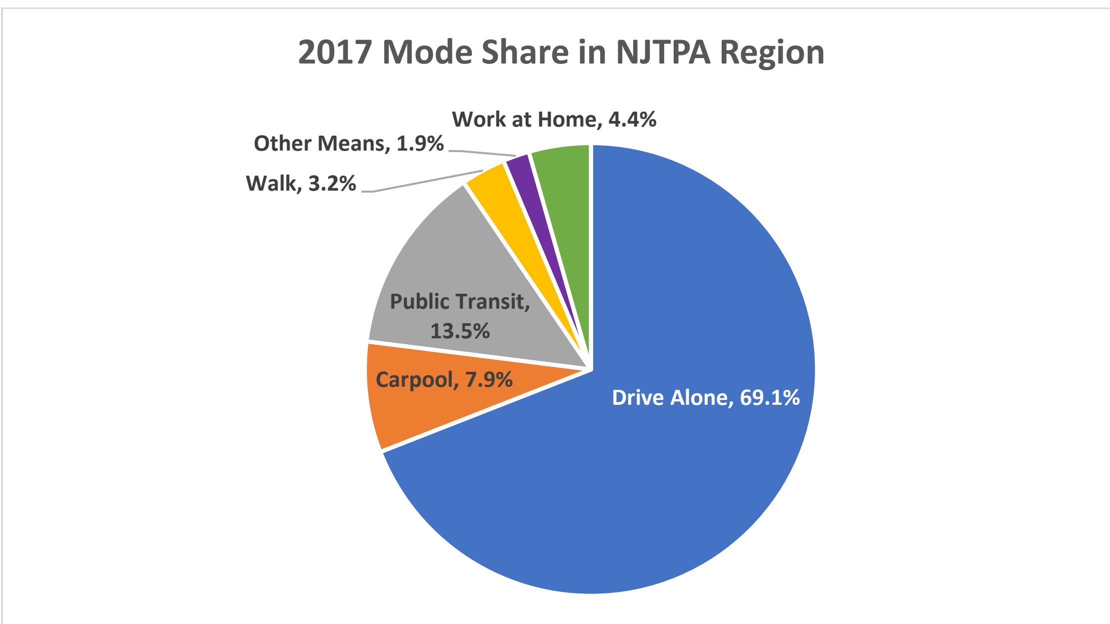


Figure 10: 2017 Transportation Mode Share, NJTPA Region

ACC-4: Total transit ridership

Overview

Total regional transit ridership measures the total number of unlinked passenger trips on all modes of public transportation, including buses, light rail, heavy rail, and commuter rail. This measure is distinct from transit mode share since it counts transit trips taken for all trip purposes, not just work trips. An increase in transit ridership supports positive outcomes including improved air quality, reduced greenhouse gas emissions, and reduced traffic congestion.

Coverage

NJ TRANSIT and PATH coverage area, NJTPA Region

Data Period

Annual data, collected from 2012 to 2017

Geographic Scale

Regional

Source of Data

Federal Transit Administration (FTA) reports Unlinked Passenger Trips for transit agencies across the nation in the Monthly Module Adjusted Data Release to the National Transit Database (NTD).

https://www.transit.dot.gov/ntd/data-product/monthly-module-adjusted-data-release

Alternative Source of Data

PATH Ridership:

Path ridership reports from PATH's website https://www.panynj.gov/path/statistics.html

NJ TRANSIT:

Annual reports published by NJ TRANSIT

Data Collection Method

PATH collects passenger trips based on station turnstile entry counts.

NJ TRANSIT collects actual ridership data for directly operated buses as well as demand response and vanpool services. For commuter rail, light rail and buses operated under license agreement, NJ TRANSIT estimates the ridership data using sampling procedures determined to meet 95% confidence and +-10% precision levels.

Calculation Methodology

Transit agencies around the nation are required to collect monthly ridership data on their systems and report to FTA. The ridership is reported as the number of unlinked passenger trips. Unlinked passenger trips are defined as the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination.[10] The monthly ridership numbers were summed up on an annual level.

Results

Table 15: Total transit ridership, of providers serving the NJTPA region NJTPA region

Provider	Service	2010	2011	2012	2013	2014	2015	2016	2017
NJ Transit	Commuter Rail	80.9	80.2	80.8	83.5	88.1	90.4	89.7	87.1
NJ Transit	Light Rail	20.9	21.3	18.5	18.8	19.6	20.2	21.3	20.8
NJ Transit	Bus	165.4	161.2	167	168.5	168.1	161.1	156.5	152.9
NJ Transit	**Total**	**267.1**	**262.7**	**266.4**	**270.8**	**275.8**	**271.7**	**267.6**	**260.9**
PATH	**Heavy Rail**	**82.9**	**86.1**	**80**	**82.2**	**83.1**	**85.5**	**88.3**	**92.9**
NJ TRANSIT +PATH	**Total**	**350**	**348.8**	**346.4**	**353**	**358.9**	**357.2**	**355.9**	**353.8**

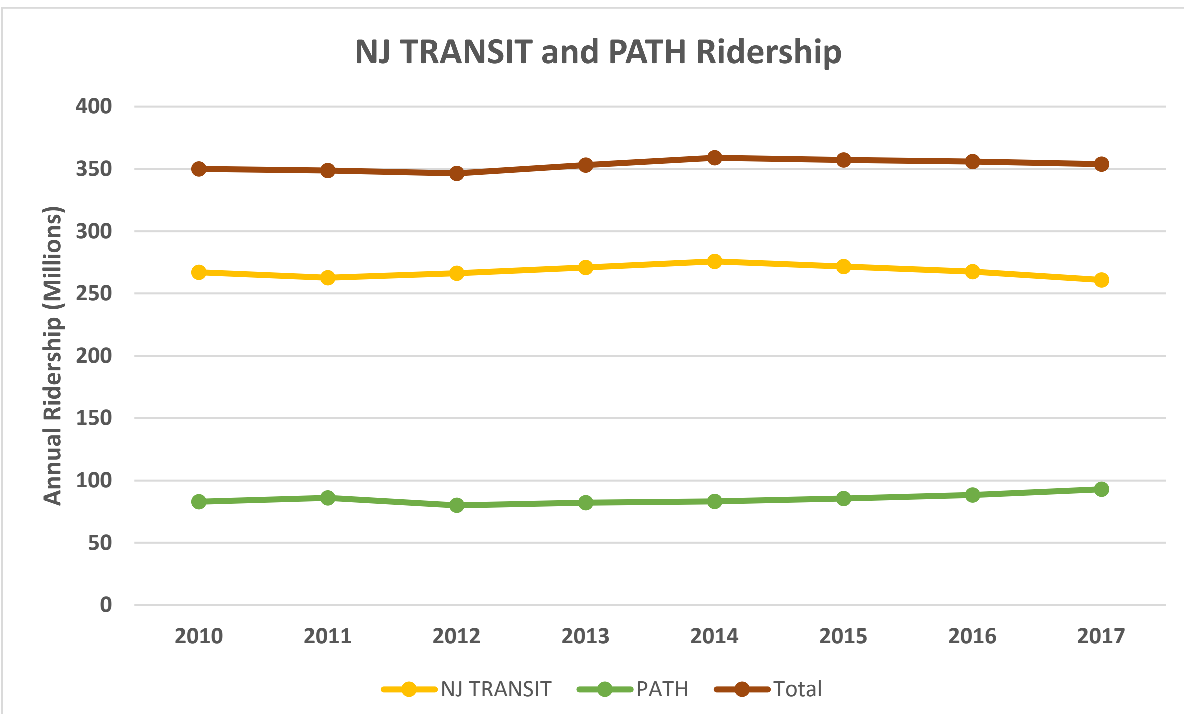


Figure 11: NJ TRANSIT and Path Ridership

[10] https://www.apta.com/resources/statistics/Pages/ridershipreport.aspx

ACC-5: Annual hours of peak hour excessive delay (PHED) per capita

Overview

This regional measure is based on the Federal performance measure but is scaled to the New Jersey portion of the NY-NJ-CT Urbanized Area Zone (UAZ). Excessive Delay is the extra amount of time spent in congested conditions defined by speed thresholds that are lower than the normal delay threshold. For the purpose of this performance measure, the speed threshold was considered to be 20 MPH or 60% of the posted speed limit, whichever is greater.

Peak hour excessive delay (PHED) is calculated for the peak periods for the following hours for weekdays:

- 6 AM to 10 AM
- 3 PM to 7 PM

Geographic Scale

Regional

Coverage

New Jersey Portion of NY-NJ-CT Urbanized Area Zone (UAZ)

Data Period

Annual; 2017 and 2018

Source of Data

SUNY Albany's AVAIL Labs Performance Measures Dashboard for New Jersey. AVAIL Labs makes use of the following data to compute the PHED:

- Travel times from FHWA's National Performance Management Research Data Set (NPMRDS) for travel time data
- Posted Speed limits and vehicular volumes from HPMS
- Average vehicle occupancy from FHWA
- Population from 5 Year-ACS

Data Collection Method

The travel time data is made available by the NPMRDS V2 (INRIX) and is collected through passenger probe data obtained from a number of sources including mobile phones, vehicles, and portable navigation devices. Freight probe data is obtained from the American Transportation Research Institute leveraging embedded fleet systems.[11]

Calculation Methodology

The NPMRDS data was analyzed by SUNY Albany's AVAIL Labs using the following methodology,

[11] https://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/vpds/npmrdsfaqs.htm#q9

As a first step towards calculating the PHED for the NJ portion of NY-NJ-CT UAZ, all the segments on the NHS within the UAZs are to be determined.

For All applicable travel time segments in the NJ part of the NY-NJ-CT UAZ first calculate **Excessive Delay Threshold Travel Time (EDTTTs**); Excessive Delay Threshold Travel Time is the maximum amount of time, to the nearest second, for a vehicle to traverse through travel time segments before excessive delay would occur

$$Excessive\ Delay\ Threshold\ Travel\ Time_s = \left(\frac{Travel\ Time\ Segment\ Length_s}{Threshold\ Speed_s}\right) \times 3{,}600$$

Where,

- The EDTTT is rounded to nearest whole second;
- The travel time segment length is rounded to nearest thousandths of a mile
- Threshold speed is the larger of the following: 20 MPH or 60% of the posted speed limit

Then the **travel time segment delay** is determined for each 15-minute bin of each reporting segment for every hour and every day in a calendar year as follows,

$$RSD_{s,b} = Travel\ Time_{s,b} - EDTTT_s$$

Where,

- $RSD_{s,b}$= travel time segment delay for segment s and 15-minute bin b (RSD is not to exceed 900 seconds)
- Travel $Time_s$, the $_b$= travel time of all vehicles on segment s and 15-minute bin b

Then the **Excessive delay**, the additional amount of time to traverse a travel time segment in a 15-minute bin as compared to the time needed to traverse the travel time segment when traveling at the excessive delay travel speed threshold, shall be calculated to the nearest thousandths of an hour as follows:

$$Excessive\ Delay_{s,b} = \begin{cases} \frac{RSD_{s,b}}{3{,}600}\ when\ RSD_{s,b} \geq 0 \\ or \\ 0\ when\ RSD_{s,b} < 0 \end{cases}$$

The excessive delay is in hours (rounded to the nearest hundredth).

The PHED metric (Total Excessive Delay in person-hours) is calculated as below;

$$Total\ Excessive\ Delay_s = AVO \times \sum_{d=1}^{TD} \sum_{h=1}^{TH} \sum_{b=1}^{TB} \left(ED_{s,b,h,d} \times \frac{hourly\ volume}{4}\ s,h,d \right)$$

Where,

s = reporting segment

d = a day of the reporting year

TD= total number of days in a year

h = hour of the day (pre-defined peak hours only)

TH = total number of hour intervals in day d

b= 15-minute bin for hour h

TB= total number of 15-minute bins with travel times present in peak hour h

AVO = Average Vehicle Occupancy

Then the **Excessive Delay** for all links in the UAZ is calculated as below,

Excessive $Delay_{s,b,h,d}$= excessive travel time (hundredths of an hour) for segment s, bin b, peak hour h, and day d

Finally, the PHED Measure is calculated as below

$$Annual\ Hours\ of\ PHED\ per\ capita = \frac{\sum_{s=1}^{T} Total\ Excessive\ Delay_s}{Total\ Population}$$

Results

Table 16: PHED for NJ Part of the NY-NJ-CT Urbanized Area

Year	**2017**	**2018**
Population	6,267,063	6,267,063
Person Hours of Excessive Delay (PHED)	92,959,547	93,679,151
PHED / Capita	**14.8**	**14.9**

ACC-6: Annual vehicle hours of delay per capita

Overview

Annual vehicle hours of delay per capita is a good indicator of total traffic congestion in the region, but measured in relation to all people in the region, rather than in relation simply to time of drivers stuck in delay. As a result, strategies that shift people to transit, telecommuting, or other options will generally yield a lower amount of vehicle hours of delay per capita, even if the amount of delay per driver has not changed significantly.

Geographic Scale

Regional

Coverage

NJTPA Region / Roadways (TMC Segments) Covered by RITIS NPMRDS Probe Data

Data Period

Annual; currently available 2016 to 2017

Source of Data

Vehicle hours of delay from RITIS NPMRDS' USER Delay Cost Analysis Tool

Population from 5-Year ACS Table B01003: Total Population

Data Collection Method

The NPMRDS is a probe data set commissioned by FHWA and produced by the CATT Lab for use for free by DOTs and MPOs for use in their MAP-21 performance reports. The NPMRDS is powered strictly by probe readings, so if no vehicles are on a segment during a particular 5-minute reporting period, the NPMRDS has an empty record for that period. [12]

Calculation Methodology

The USER Delay Cost Analysis Tool developed by RITIS makes use of observed speed probe data and the Volume, speed limit and percentage of Commercial vehicle data from HPMS to determine delays on the specified set of roadways over a selected period of time. The tool was used to compute vehicle hours of delay on all the roadways (TMC Sections) in the NJTPA 13 county region available through NPMRDS datasets for year 2016 and 2017. The delay was computed for vehicles (Passenger Vehicles and Trucks) against the free flow speed for segments whose speeds fall 20 mph or more below free flow. The percentage of commercial vehicles were computed based on HPMS data. For segments that do not have percent CV information, the defaults of 90% passenger and 10% commercial were used. The Vehicle hours of delay over the all the roadway segments (TMCs) were summed up for the entire year (every one-hour time periods) for 2016 and 2017.

The population for the NJTPA region was obtained from 5-Year ACS Table B01003: Total Population. Then the Annual VHD per Capita was computed by dividing Total Annual VHD by NJTPA population (Total Annual VHD/ NJTPA Population)

[12] https://www.ritis.org/tools#npmrdscoveragemap

Results

Table 17: Annual vehicle hours of delay per capita

	2016	2017
Total Annual VHD	129,464,955	136,181,524
NJTPA Population	6,772,148	6,800,589
Annual VHD Per Capita	**19.12**	**20.02**

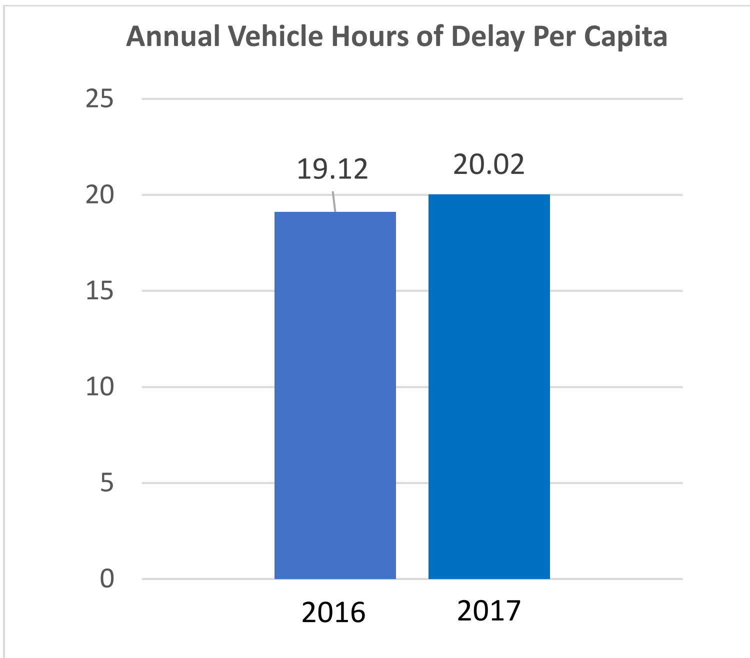


Figure 12: Annual vehicle hours of delay per capita, NJTPA region

ACC-7: % of rail transit stations that are ADA-accessible

Overview

The % of rail transit stations that are accessible under the Americans with Disability ACT (ADA) is an indicator of accessibility accorded by regional public transit to persons with disability. For a station to comply with ADA accessibility requirements, it must meet accessibility standards established by the U.S. DOT. The requirements include but are not limited to accessible path of travel, boarding ramps, and bridge plate, functional elevators, curb ramps, wheelchair spaces, level boarding etc. [13] These accessible features also often benefit people who do not have a disability, including parents with strollers, youth, and the elderly.

Coverage

NJ TRANSIT and PATH Coverage Area

Data Period

Annual; collected CY 1996- CY 2016

Geographic Scale

By transit agency

Source of Data

U.S. DOT, FTA National Transit Database (NTD) contains the number of stations ADA accessible as well as Non-ADA accessible each year for every rail transit agency across the United States. The database also has information such as the number of elevators and escalators provided by the agencies. A station directory is available at https://www.transit.dot.gov/ntd/ntd-data

The Bureau of Transportation Statistics (BTS) summarizes the ADA Accessibility station data from NTD into a time series table and computes the percentage of stations not ADA accessible. The table can be found at https://www.bts.gov/content/ada-accessible-rail-transit-stations-agency . Based on the summarized data from BTS, the number of and percentage of stations ADA accessible were computed for NJ TRANSIT (Commuter Rail and Light Rail) as well as for PATH train stations.

Data Collection Method

Transit agencies report on ADA compliance to NTD.

Calculation Methodology

The total number of ADA-accessible stations was taken from the National Transit Database for the following systems: Port Authority Trans-Hudson Corporation (PATH), New Jersey Transit (light rail), and New Jersey Transit (heavy rail). The percentage of ADA-accessible stations was calculated for each system, as well as for an aggregate across all three systems.

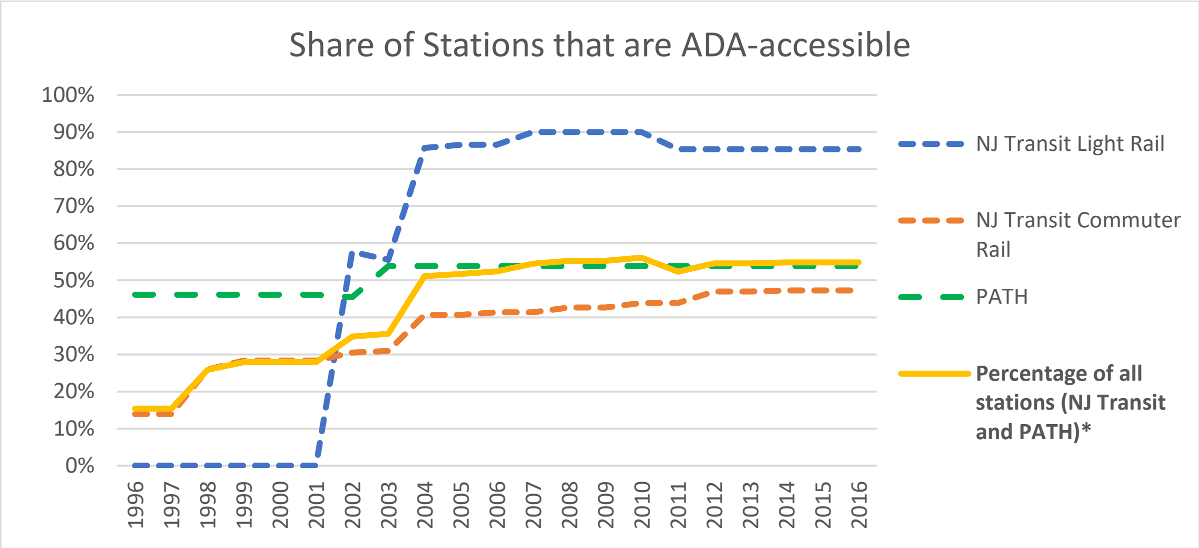
[13] https://adata.org/factsheet/ADA-accessible-transportation

Results

Table 18: Percentage of rail transit stations that are ADA-accessible

Year	NJ TRANSIT Light Rail	NJ TRANSIT Commuter Rail	PATH	Percentage of all stations (NJ TRANSIT and PATH)*
1996	0%	14%	46%	15%
1997	0%	14%	46%	15%
1998	0%	26%	46%	26%
1999	0%	28%	46%	28%
2000	0%	28%	46%	28%
2001	0%	28%	46%	28%
2002	58%	31%	45%	35%
2003	56%	31%	54%	36%
2004	86%	41%	54%	51%
2005	87%	41%	54%	52%
2006	87%	41%	54%	52%
2007	90%	41%	54%	54%
2008	90%	43%	54%	55%
2009	90%	43%	54%	55%
2010	90%	44%	54%	56%
2011	85%	44%	54%	52%
2012	85%	47%	54%	55%
2013	85%	47%	54%	55%
2014	85%	47%	54%	55%
2015	85%	47%	54%	55%
2016	85%	47%	54%	55%

*weighted average based on the total number of stations in each system



*weighted average based on the total number of stations in each system

Figure 13: Share of stations that are ADA-accessible

RELIABILITY: Reliable System

REL-1: % of person miles traveled on the National Highway System (NHS) that are "reliable"

Overview

The Regional performance measure for roadway reliability is similar to the federal performance measure of roadway reliability and covers the NJTPA region. The measures are the percent of person-miles traveled on the relevant portion of the NHS that are reliable. Person-miles consider the users of the NHS.

Coverage

NJTPA Region

Data Period

Annual; currently available 2016 to 2017

Geographic Scale

Interstate and non-Interstate part of the NHS

Source of Data

RITIS NPMRDS

Data Collection Method

The NPMRDS is a probe data set commissioned by FHWA and produced by the CATT Lab for use for free by DOTs and MPOs for use in their MAP-21 performance reports. The NPMRDS is powered strictly by probe readings, so if no vehicles are on a segment during a particular 5-minute reporting period, the NPMRDS has an empty record for that period. [14]

Calculation Methodology

RITIS NPMRDS computes the performance measure for roadway reliability using the probe data using the following method

For each segment on the Interstate and for Non- Interstate part of NHS calculate Level of Travel Time Reliability as follows separately for the four time periods

$$LOTTR_i = \frac{80th\ Percentile\ Travel\ Time_i}{50th\ Percentile\ Travel\ Time_i}$$

Where, i = time period

1) 6 AM to 10 AM for Weekdays
2) 10 AM to 4 PM for Weekdays
3) 4 PM to 8 PM for Weekdays
4) 6 AM to 8 PM for Weekends

[14] https://www.ritis.org/tools#npmrdscoveragemap

The segment must exhibit LOTTR below 1.5 during all the four time periods to be deemed reliable.

Then, the Interstate (and Non-Interstate part of NHS) Travel Time Reliability Measure (TTRM) is computed as below

$$TTRM = \frac{\sum_{r=1}^{R} SL_i \times AV_i \times OF_j}{\sum_{t=1}^{T} SL_i \times AV_i \times OF_j}$$

Where,

SL = Segment length

AV = annual traffic volume on segment; AADT X Directional factor X 365 (366 for leap year); the default directional factor is 0.5 for splitting AADT by direction.

OF = Occupancy Factor on the NHS within NJTPA area.

R = total number of Reliable Interstate reporting segment (LOTTR < 1.5 for all 4 periods) within the NJTPA area

T = Total number of segments on the Interstate within NJTPA area

Results

Table 19: % of person miles traveled on the National Highway System (NHS) that are "reliable"

Year	2016	2017	2018
Interstate	84.00%	80.40%	80.30%
Non-Interstate NHS	82.50%	82.20%	84.30%

* Results Retrieved on 2/14/2019 from RITIS NPMRDS

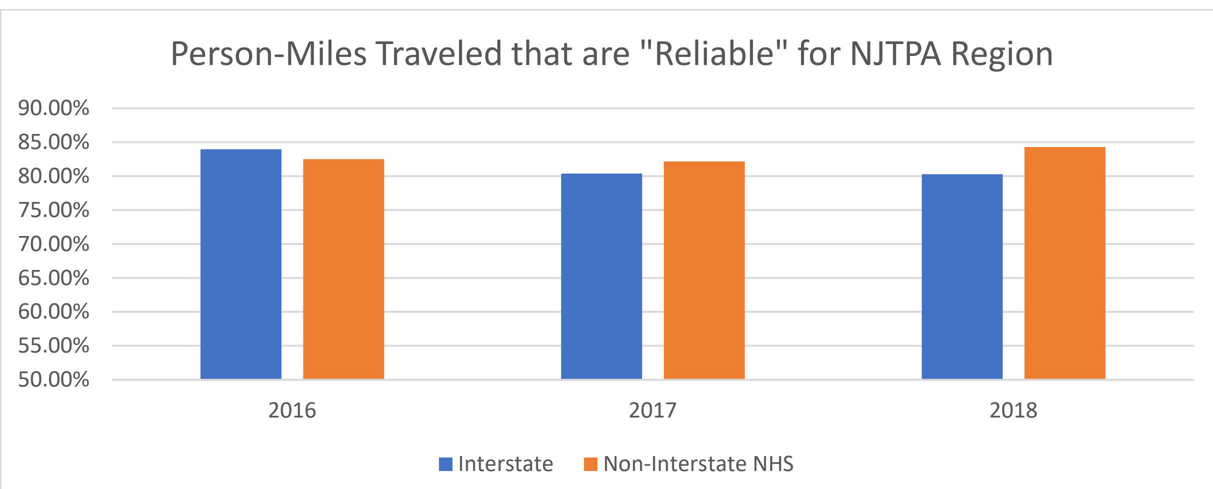


Figure 14: Percent of Person-Miles Traveled on NHS that are "Reliable", NJTPA Region

REL-2: Percentage of Transit Trips Considered "on-time"

Overview

For public transportation, the on -time performance refers to schedule adherence to time-tables set by the transit agency. It is a common practice to express on-time performance as percentage of arrivals on time at the termination point of the service. The ability of a transit agency to adhere to the schedule is dependent on some external factors outside the control of the transit agency such as congestion due to accidents or weather-related delays.

Coverage

NJ TRANSIT coverage area

Data Period

Annual; currently available 2010 to 2017; PATH data for 2017 to 2018

Geographic Scale

Transit agency

Source of Data

NJ TRANSIT Annual Reports and PANYNJ's Annual Report

Alternative Source of Data

N/A

Data Collection Method

NJ TRANSIT also uses a computer-based train dispatching system called Train Management and Control (TMAC) at its Rail Operations Center. TMAC provides NJ TRANSIT with the ability to accurately record a train's arrival at its final destination.

NJ TRANSIT monitors on-time performance of Light Rail using information management systems in its control centers. Train departure and arrival times are automatically tracked by computer systems that compare terminal departure and arrival times to the times posted in the public timetable.

NJ TRANSIT records on-time performance at the following bus terminals:

- Atlantic City Bus Terminal
- Hoboken Terminal
- Newark Penn Station
- Port Authority Bus Terminal
- Walter Rand Transportation Center

PANYNJ tracks the on-time performance for PATH trains , on-time performance data for PATH was not available for years prior to 2017.

Calculation Methodology

NJ TRANSIT uses different thresholds to measure the on-time performance of buses, commuter rail, and light rail[15].

- NJ TRANSIT considers a train to be on time if it arrives at its final destination within five minutes and 59 seconds of its scheduled time.
- A Hudson-Bergen Light Rail train is counted as not on time if it leaves its origin terminal ahead of schedule or arrives at its final destination terminal more than four minutes and 59 seconds late. A River LINE train is late if it arrives at its final destination terminal more than five minutes and 59 seconds late.
- Any bus that departs the terminal within five minutes and 59 seconds of its scheduled departure is considered on time. In addition to terminal-based on-time performance monitoring, NJ TRANSIT uses Automatic Passenger Counting software to assess Timepoint Schedule Adherence for every scheduled timepoint on all bus routes throughout the system, on a quarterly basis.

For PATH, Trains operating within three minutes of scheduled departure and arrival times during a 24-hour period for both weekday and weekend service are considered to be on -time.

Result

Table 20: Transit on-time performance

Year	Rail	Light Rail	Bus	PATH
2010	94.8	97.6	94	NA
2011	94.3	97.3	92.9	NA
2012	95.7	97.9	91.2	NA
2013	96.2	98.0	90.6	NA
2014	93.7	98.2	90.4	NA
2015	93.5	95.2	90.7	NA
2016	94.4	98.1	90.7	NA
2017	91.7	97.3	90.4	98.6
2018	NA	NA	NA	96.4

[15] 2017 NJ Transit Annual Report. https://data.nj.gov/Transportation/2017-New-Jersey-Transit-Annual-Report/rhyd-k92v/data

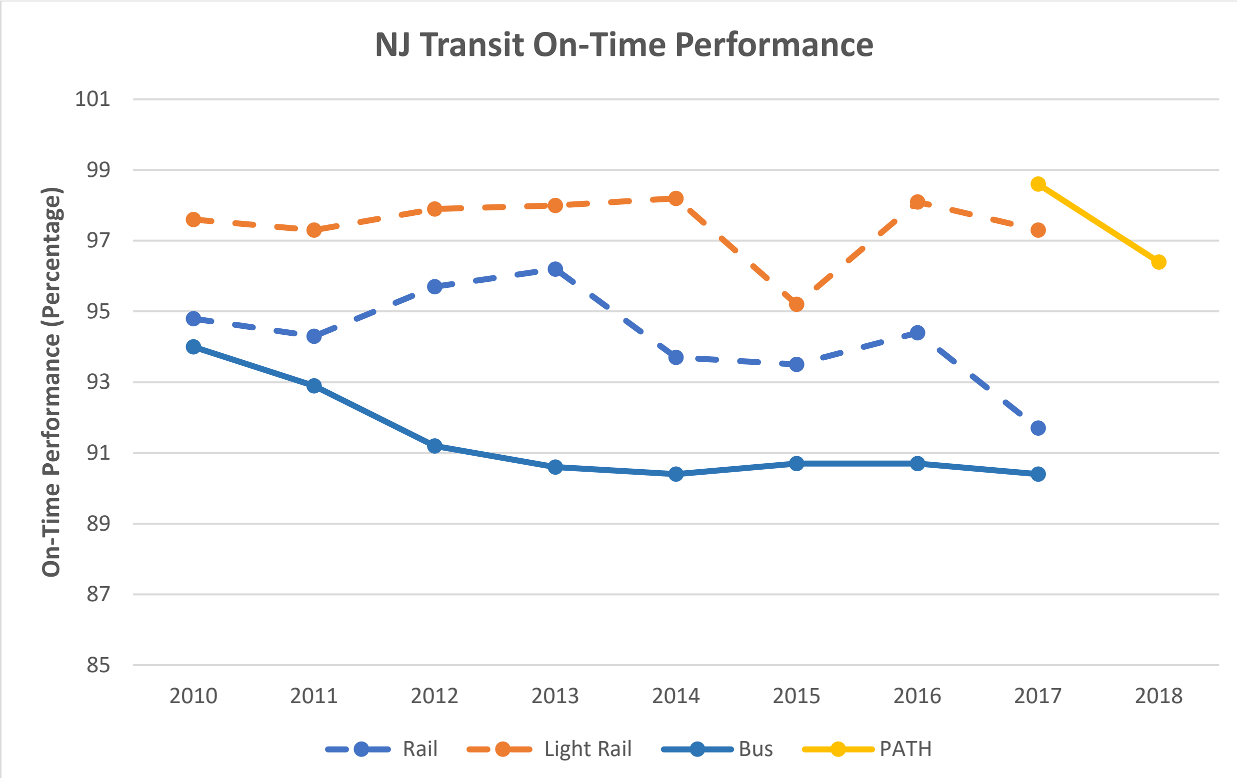


Figure 15: Transit On-Time Performance

CONDITION: State of Good Repair

CON-1: % of pavement lane miles considered "acceptable"

Overview

The Federal performance measure for pavement condition covers the roadways on the NHS system (Interstate and non-Interstate NHS roadways), using metrics based on the percentage of pavement under Good and Poor condition to compute the percentages of pavements (both Interstate and non-Interstate NHS) in both good and poor condition.

The pavement condition takes into account different road distresses such as roughness, rutting, faulting and cracking of the pavement. The Federal definition of Good and Poor, however, differs from what NJDOT used for its own asset management and investment decisions. For instance, under the Federal measure, multiple metrics must be assessed as Poor in order for the pavement segment to be considered Poor. In contrast, NJDOT considers conditions to be Deficient (or Poor) if either roughness (based on the International Roughness Index) or Surface Distress Index (which considers cracking, patching, shoulder deterioration, shoulder drop, faulting, joint deterioration, and rutting) does not meet specified acceptable criteria. This measure uses the NJDOT definition of Acceptable pavement condition, and is applied to all roadways on the NJDOT network, which includes roadways both on and off the NHS, including those maintained by the NJ Turnpike/Parkway (but not county-level routes).

Coverage

Regional, NJDOT network of roadways

Data Period

Annual; currently available for 2016

Geographic Scale

Regional, with a county-level breakdown; based on data for individual facility

Source of Data

NJDOT maintains the pavement condition data (in tenth-mile segments) in the pavement management system (PMS).

Data Collection Method

NJDOT collects pavement condition data by collecting the condition data on an annual or biannual basis for different road distresses such as roughness, rutting, faulting and cracking.

Calculation Methodology

For computing the performance measure on pavement condition the NJDOT's guidance on incorporating both the Average International Roughness Index and Surface Distress Index was used. This methodology uses a complex logical equation to sort all road segments into one of the three pavement quality categories used in these indices: Good, Fair, and Deficient. The rating schema is as follows:

Condition Criteria

Condition Status	Condition Index Criteria (IRI = International Roughness Index, in/mi; SDI = Surface Distress Index, 0 – 5 Scale)	Engineering Significance
Deficient (Poor)	IRI > 170 *OR* SDI ≤ 2.4	**These roads are overdue for treatment.** Drivers on these roads are likely to notice that they are driving on a rough surface, which puts stress on their vehicles. These pavements may have deteriorated to such an extent that they affect the speed of free flow traffic. Flexible pavements may have large potholes and deep cracks. These roads often show significant signs of wear and deterioration, and may have significant distress in the underlying foundation. Roads in this condition will generally be most costly to rehabilitate.
Fair / Mediocre	(95 ≤ IRI ≤ 170 *And* SDI > 2.4) *OR* (IRI < 95 *And* 2.4 < SDI < 3.5)	**These roads exhibit minimally acceptable ride quality** that is noticeably inferior to those of new pavements and may be barely tolerable for high-speed traffic. These pavements may show some signs of deterioration such as rutting, map cracking and extensive patching. Most importantly, roads in this category are in jeopardy and should immediately be programmed for some cost-effective treatment that will restore them to a good condition and avoid costly rehabilitation in the near future.
Good	IRI < 95 *AND* SDI ≥ 3.5	**These roads exhibit good ride quality** with little or no signs of deterioration. A proactive preventive maintenance strategy is necessary to keep roads in this category as long as possible.

Source: NJDOT Pavement Management System presentation

“Acceptable” pavement is either in “Good” or “Fair” condition (i.e., not “Deficient”).

A separate database containing the location (County and MPO) for each pavement segment was joined to the PMS data. The total lane miles for each county with different pavement quality (Deficient, Fair and Good) were computed by cross tabulation in MS excel.

In addition, the traffic volume data (Average Daily VMT) on the roadways is also stored in the PMS. The linear road miles by pavement quality may be weighted by the Average Daily VMT in order to estimate percentage of VMT on roads with different pavement quality. Note: These figures have not yet been calculated, but could be calculated in order to develop percentage of VMT, or using occupancy data, to estimate percentage of passenger miles traveled on roads of each condition level.

Results

Table 21: Pavement at different condition levels based on NJDOT criteria, 2016

Geography	Lane Miles of Various Pavement Quality					
	Total Lane Miles			Percentage of Lane Miles		
	Deficient	Fair	Good	Deficient	Fair	Good
Bergen	787	467	672	40.9%	24.2%	34.9%
Essex	524	273	243	50.4%	26.3%	23.4%
Hudson	452	123	71	70.0%	19.0%	11.0%
Hunterdon	628	698	408	36.2%	40.3%	23.5%
Middlesex	944	644	698	41.3%	28.2%	30.5%
Monmouth	1,178	985	865	38.9%	32.5%	28.6%
Morris	866	566	787	39.0%	25.5%	35.5%
Ocean	707	746	1,136	27.3%	28.8%	43.9%
Passaic	258	274	215	34.5%	36.7%	28.8%
Somerset	525	423	679	32.3%	26.0%	41.7%
Sussex	605	796	714	28.6%	37.6%	33.8%
Union	676	301	241	55.5%	24.7%	19.8%
Warren	551	801	460	30.4%	44.2%	25.4%
NJTPA	**8,701**	**7,097**	**7,189**	**37.9%**	**30.9%**	**31.3%**

Table 22: Pavement considered acceptable based on NJDOT criteria, 2016

Geography	Lane Miles Considered Acceptable	Percentage of Lane Miles Considered Acceptable
Bergen	1,139	59.1%
Essex	516	49.6%
Hudson	194	30.0%
Hunterdon	1,106	63.8%
Middlesex	1,342	58.7%
Monmouth	1,850	61.1%
Morris	1,353	61.0%
Ocean	1,882	72.7%
Passaic	489	65.5%
Somerset	1,102	67.7%
Sussex	1,510	71.4%
Union	542	44.5%
Warren	1,261	69.6%
NJTPA	**14,286**	**62.1%**

CON-2: % of all bridge deck area that is in good or fair condition

Overview

The Federal performance measure for the bridge condition only covers the bridges on National highway system (NHS). The Federal performance uses a metric based on the percentage of deck area under Good, Fair and Poor condition to compute the percentages of NHS bridges classified in Good and Poor condition.

NJDOT collects the bridge inspection to generate deterioration trends, assess the condition of the bridges, and bridge reconstruction needs and maintenance priorities.[16] NJDOT maintains the bridge inspection data in a Bridge Management system (BMS) with a repository of bridge assets as well as historic data on bridge inspection. NJDOT's BMS contains inspection data for all the bridges in the state (beyond the NHS). For the purpose of the performance measure the bridges with deck area in poor condition are considered structurally deficient.

Coverage

All bridges in the NJTPA region (bridges available in NJ BMS)

Data Period

Biennial; currently available for 2010-2018

Geographic Scale

Regional, with a county-level breakdown; based on data for individual facility

Source of Data

Bridge Management System (BMS) Inspection data collected from 2010-2018.

Data Collection Method

NJDOT collects bridge inspection data for the bridges in New Jersey

Calculation Methodology

Only the bridges in the NJTPA region were used for the analysis (field: MPO Name = NJTPA) in the BMS database. The field deck area in the BMS was not used for the computation of the performance metric as the content of the field were not very reliable (confirmed after discussion with NJDOT's Structural Evaluation and Bridge management team). The Bridge deck area were computed as recommended by FHWA as below,

Calculated Deck Area = structure length x deck width

And, If deck width = 0 (for culverts), then

Calculated Deck Area = structure length x approach road width

The BMS reports the condition of the bridges (individual components: Deck, Superstructure, Substructure) and Culvert based on a 1-9 rating.

[16] https://www.state.nj.us/transportation/about/asset/pdf/bridge.pdf

The overall condition ratings of the bridges were computed as minimum rating for Deck, Superstructure or Substructure of the bridge. The condition of the bridges and culverts were computed based on the overall condition of the bridge or the condition rating of the culvert using the following thresholds as recommended by FHWA for a similar NBI Rating scale:

Poor <=4	4< Fair < 7,	Good >= 7

The percentage of NJTPA Bridges and Culverts by deck area classified as Good, Fair and Poor conditions were computed.[17]

Results

Table 23: % of all bridge decks structurally deficient (poor condition)

Year	Good	Fair	Poor	Good +Fair	Number of Bridges
2010	27.4%	59.0%	13.5%	86.5%	5991
2012	25.4%	61.9%	12.7%	87.3%	5991
2014	23.4%	65.5%	11.1%	88.9%	5991
2016	22.7%	68.0%	9.4%	90.6%	5991
2018	22.7%	69.9%	7.4%	92.6%	6023*

*The 2018 data includes inspection data on bridges in the NJTPA region that cross borders with New York and Pennsylvania

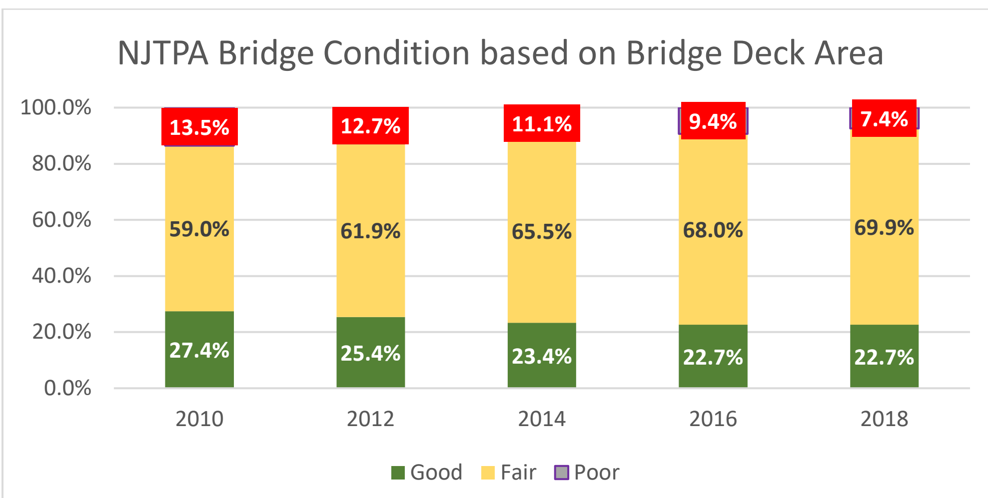


Figure 16: NJTPA bridge condition based on bridge deck area

[17] The Bridges crossing the New Jersey border to New York and Pennsylvania were not part of the NJDOT's BMS at the time of the analysis (December 2018). The data on these bi-state bridges were received separately in a tabular format for 2018. No historic condition data was available for these bridges through the BMS. Among the 46 Border bridges only 32 bridges were considered to be part of the NJTPA region. As with the national measure, the entire length of these bridges were considered in computing the bridge deck area.

COMPETITIVE: Support for Economic Activity

COM-1: Cargo movement at the Port of New York and New Jersey

Overview

The Port of New York and New Jersey is the gateway to one of the most concentrated and affluent consumer markets in the world. It is the largest port on the East Coast, and the third-largest in the nation.[18]

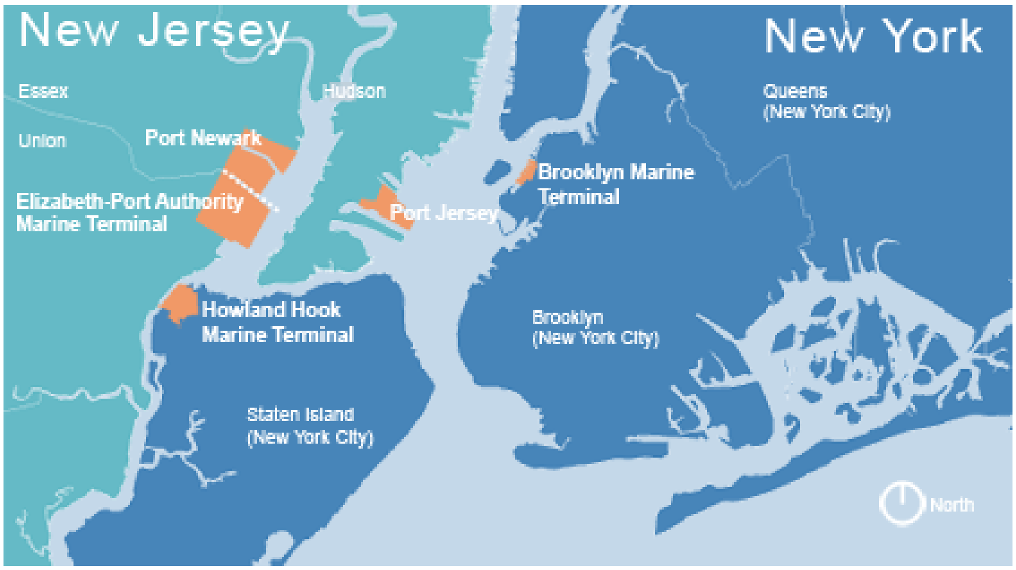


Figure 17: Container Terminals in Port of NY & NJ (Source: PANYNJ)

The port has the following three major container terminals in New Jersey:

- Port Newark Marine Terminal
- Elizabeth-Port Authority Marine Terminal
- Port Jersey Marine Terminal

And the following two container terminal in New York:

- Howland Hook Marine Terminal
- Red Hook Marine Terminal

Cargo capacity is measured using an inexact unit, namely, twenty-foot equivalent unit (TEU). TEU is based upon volume of a standard size intermodal container (twenty foot in length), a standard-sized metal box which can be easily transferred between different modes of transportation, such as ships, trains and trucks. Cargo movement is one indicator of regional economic activity.

Coverage

Port of NY and NJ (Five Container Terminals)

Data Period

Annual; currently available 2005-2018

[18] http://www.panynj.gov/port/about-port.html

Geographic Scale

Port

Source of Data

Port Authority of New York and New Jersey, Historical Trade Statistics Summary

Data Collection Method

PANYNJ collects the cargo data.

Calculation Methodology

This performance measure did not involve any new calculations, simply a compilation of PANYNJ data.

Results

Table 24: Port Activity (for NY and NJ) Number of Containers and TEUs

Year	Containers (Millions)	TEUs (Millions)
2005	2.80	4.79
2006	2.99	5.09
2007	3.10	5.30
2008	3.07	5.27
2009	2.65	4.56
2010	3.08	5.29
2011	3.20	5.50
2012	3.21	5.53
2013	3.17	5.47
2014	3.34	5.77
2015	3.66	6.37
2016	3.60	6.25
2017	3.85	6.71
2018	4.10	7.18

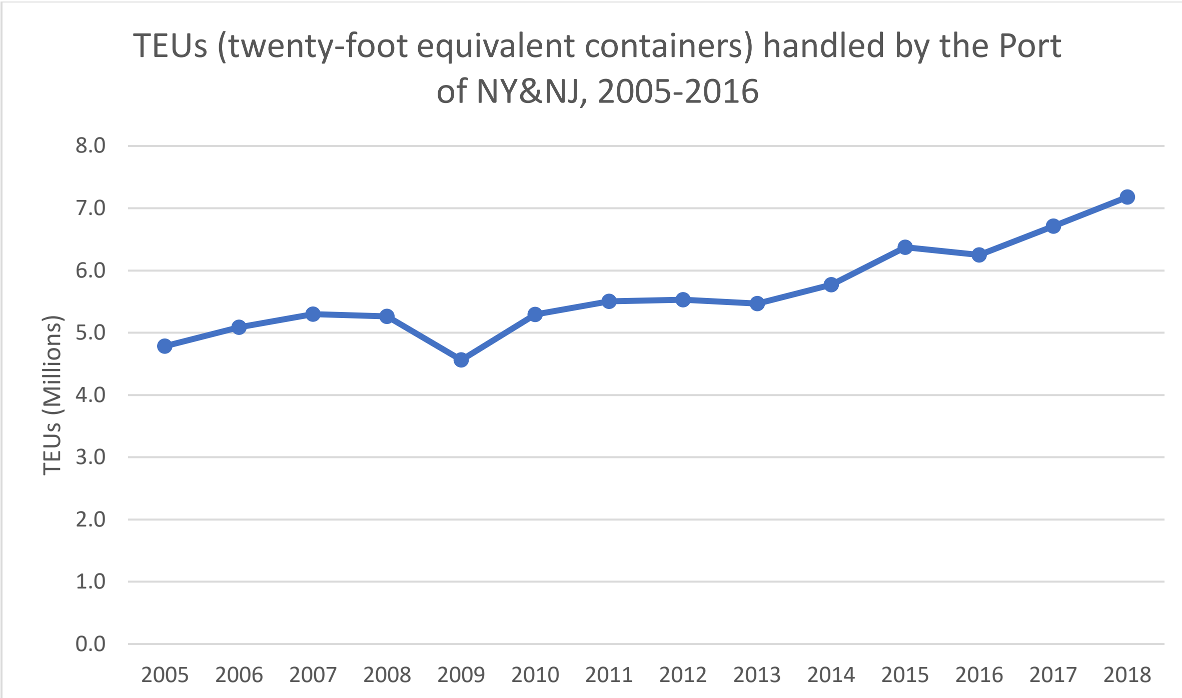


Figure 18: TEUs (twenty-foot equivalent containers) handled by the Port of NY & NJ, 2005-2016

COM-2: Passenger Traffic Volume at Newark International Airport

Overview

Newark International Airport (EWR) is one of the largest passenger airports on the east coast of the United States. The Port Authority of New York and New Jersey (PANYNJ) operates the airport under a lease from the City of Newark. Newark Airport has three passenger terminals – Terminal A, B, and C.

Coverage

NJTPA Region

Data Period

Annual; currently available 2004 to 2017

Geographic Scale

Newark Airport

Source of Data

2017 Airport Traffic Report (ATR) from PANYNJ

Alternative Source of Data

Bureau of Transportation Statistics, Airport Snapshot data

https://www.transtats.bts.gov/airports.asp?pn=1

Data Collection Method

The data is collected from the airlines.

Calculation Methodology

PANYNJ reports on passenger volumes for all the regional airports operated by the agency every year in the Airport Traffic Report. The passengers consist of both Domestic and International. All Schedules, Charter and Commuter service was considered for the purposes of passenger volume.

Result

Table 25: Passenger Traffic Volume Newark Airport

Year	Scheduled	Charter	Commuter	Total
2004	27,139,959	132,952	4,620,238	31,893,149
2005	27,956,632	33,166	5,089,233	33,079,031
2006	30,150,206	24,041	5,460,301	35,634,548
2007	30,947,968	39,748	5,379,494	36,367,210
2008	29,360,962	56,447	5,943,327	35,360,736
2009	27,073,707	36,285	6,250,131	33,360,123
2010	26,639,402	36,158	6,518,630	33,194,190
2011	27,569,909	46,483	6,081,100	33,697,492
2012	27,413,626	39,922	6,530,479	33,984,027
2013	28,057,325	35,559	6,923,353	35,016,237
2014	28,896,516	48,089	6,666,082	35,610,687

2015	30,375,933	62,076	7,055,531	37,493,540
2016	33,306,986	106,568	7,149,739	40,563,293
2017	36,409,409	57,922	6,766,830	43,234,161

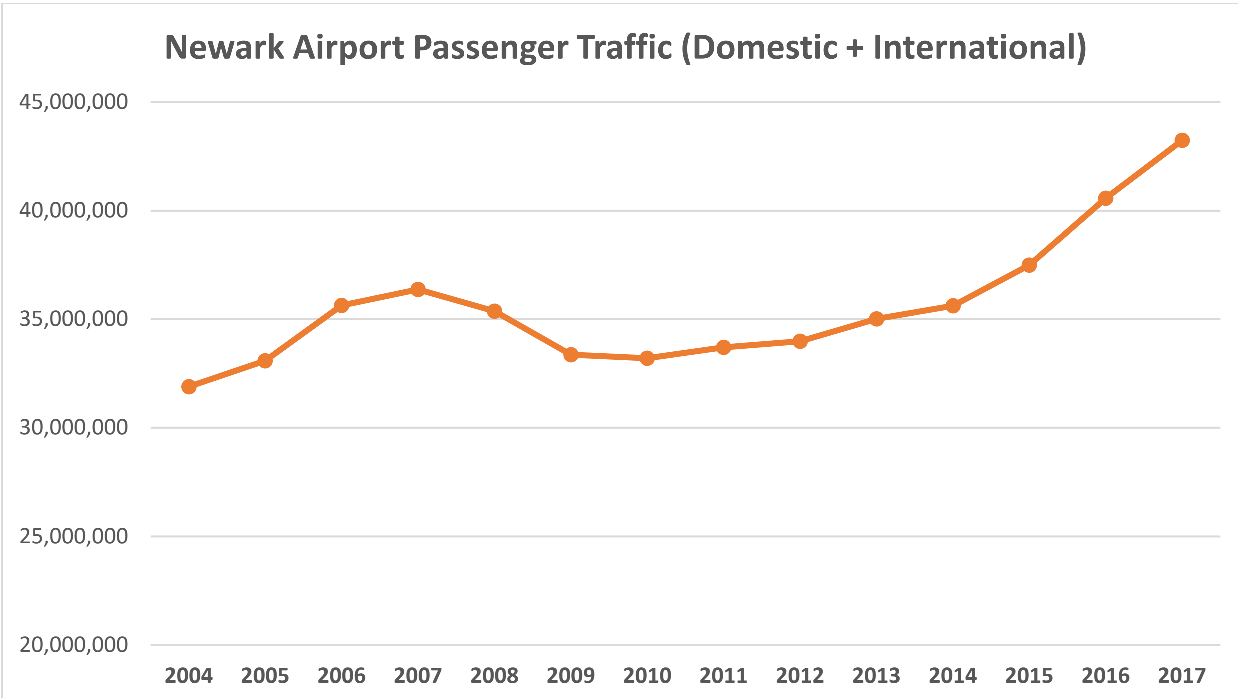


Figure 19: Traffic Volume Newark Airport Passengers

COM-3: Truck Travel Time Reliability Index

Overview

The regional performance measure for truck travel time reliability is the same as the Federal performance measure for freight reliability on the Interstate system, applied to the NJTPA region. The truck travel time reliability index is calculated using data on travel times, and a higher index represents a higher level of unreliability; the desired direction is a decrease in the index value.

Coverage

NJTPA Region

Data Period

Annual; currently available for 2016 to 2017

Geographic Scale

Interstates within NJTPA Region

Source of Data

RITIS NPMRDS

Alternative Source of Data

N/A

Data Collection Method

The NPMRDS is a probe data set commissioned by FHWA and produced by the CATT Lab for use for free by DOTs and MPOs for use in their MAP-21 performance reports. The NPMRDS is powered strictly by probe readings, so if no vehicles are on a segment during a particular 5-minute reporting period, the NPMRDS has an empty record for that period. [19]

Calculation Methodology

RITIS NPMRDS makes use of the probe data travel time from INRIX. NPMRDS analytics allows creating PM3 dashboards for State, MPO, or UZA. A dashboard for NJTPA was created.

RITIS NPMRDS computes the performance measure for each Interstate segment within NJTPA region Truck Travel Time Reliability Ratio (TTTR) for the five time periods by dividing the 95thpercentile time by the normal time (50thpercentile) as below

$$\frac{\text{Longer Truck Travel Time (95th)}}{\text{Normal Truck Travel Time (50th)}} = \frac{\text{\# seconds}}{\text{\# seconds}} = \text{Truck Travel Time Reliability (TTTR) Ratio}$$

The five time periods are as follows

1) 6 AM to 10 AM for Weekdays
2) 10 AM to 4 PM for Weekdays
3) 4 PM to 8 PM for Weekdays

[19] https://www.ritis.org/tools#npmrdscoveragemap

4) 6 AM to 8 PM for Weekends
5) 8 PM to 6 AM Overnight (all days)

Then the TTTR Index is computed by multiplying each segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.

$$\text{TTTR Index} = \frac{\sum \text{ All segment length weighted TTTR}}{\sum \text{All segment lengths}}$$

Results

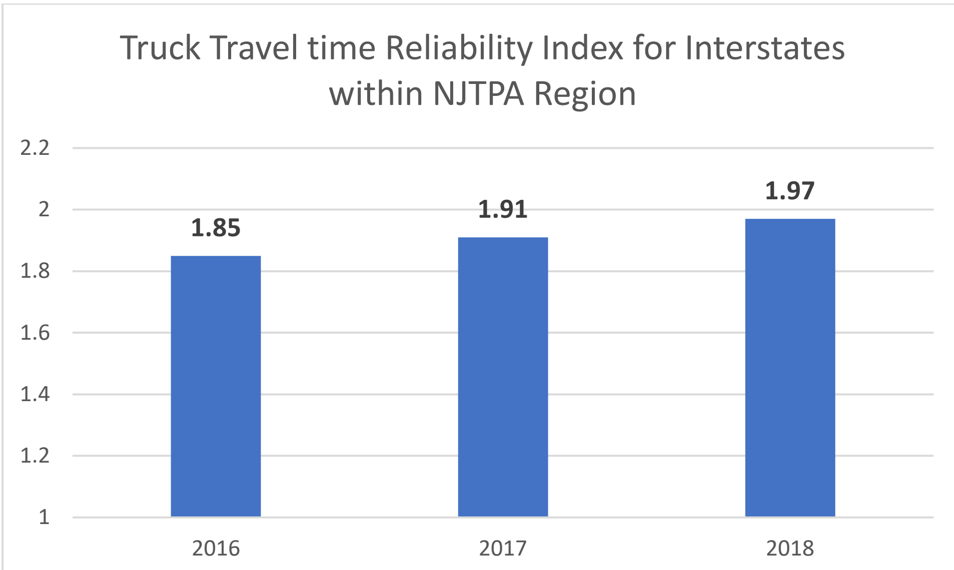


Figure 20. Truck Travel Time Reliability Index for Interstates within the NJTPA Region, 2016 to 2018

RESILIENT: Safe, Secure System

While resiliency is a critical issue for Northern New Jersey, no measures of resiliency have been specifically developed at this time due to data limitations and challenges measuring resiliency of the region's transportation system. However, some possible measures include:

- Population in areas of high flood risk (a measure of vulnerability)
- Employment in areas of high flood risk (a measure of vulnerability)
- Hours of roadway lane miles closed due to flooding, other weather conditions, or unplanned events (a measure of impacts to the system)

These measures and others are discussed in a separate report on emerging and potential future measures for development.