Transit Priority Toolkit: Key Messages and Evaluation Methods

American Cities Climate Challenge – Transit Priority Working Group

May 2021
TOOLKIT INTRODUCTION: WHAT IS THIS DOCUMENT AND HOW TO USE IT
The Bloomberg Philanthropies American Cities Climate Challenge aims to **accelerate and deepen** U.S. cities’ efforts to create the **greatest climate impact**, as well as **showcase the benefits climate action brings for cities**.

Reduce building energy use + Increase renewable energy + Reduce driving + Electrify vehicles = Cities reach Paris climate goals
CLIMATE CHALLENGE CITIES WANTED TO ACCELERATE TRANSIT PRIORITY PROJECT IMPLEMENTATION

- The Portland Bureau of Transportation—along with their partners at TriMet—initiated this project.
- PBOT and TriMet staff worked with Climate Challenge partners Nelson\Nygaard, NRDC, and NACTO to recruit representatives from four other city/transit agency pairs to scope and oversee the development of this toolkit.
- In 2019 and 2020 alone, the 25 Climate Challenge cities implemented more than 20 miles of bus-only lanes.
PURPOSE OF THE TRANSIT PRIORITY TOOLKIT

• Identify methodologies and tools to evaluate the benefits of transit priority projects

• Identify an approach to tell the story about the benefits of transit priority projects

• Give cities an easy-to-use resource to engage with internal staff, stakeholders, decision makers, and the public
## PROJECT ELEMENTS

<table>
<thead>
<tr>
<th>Project Element</th>
<th>Description</th>
<th>Outcomes</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Group Meetings</td>
<td>Engaged transit priority staff at cities and transit agencies from Atlanta,</td>
<td>- Gathered input on project needs</td>
<td>September 2020 through</td>
</tr>
<tr>
<td></td>
<td>Honolulu, Los Angeles, Portland, and Washington, D.C.</td>
<td>- Determined Transit Priority Toolkit focus areas</td>
<td>February 2021 (4 meetings)</td>
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<tr>
<td>Peer Review</td>
<td>Conducted interviews with city and transit agency staff from Seattle,</td>
<td>- Gained insights into transit priority programs, evaluation methods,</td>
<td>October 2020</td>
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<tr>
<td></td>
<td>San Francisco, Minneapolis, and Boston</td>
<td>messaging, COVID response, etc.</td>
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<tr>
<td>Transit Priority Toolkit</td>
<td>Developed a Power Point presentation with links to native files and</td>
<td>- Provided methods, messages, and case studies for each transit priority</td>
<td>May 2021</td>
</tr>
<tr>
<td></td>
<td>spreadsheets</td>
<td>metric for use by cities and agencies locally</td>
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</table>
THE NEED FOR THIS TOOLKIT

The Working Group identified the following challenges for this toolkit to help solve

- Communication and Storytelling
  - Contextualize small travel time savings for individual trips to reflect aggregate benefits
  - Show how downtown transit priority projects can lead to systemwide benefits
  - Explain reliability impacts in terms of benefits to individual riders
  - Provide data visualization and infographics that can help communicate transit priority benefits internally with staff and externally to the public and other key stakeholders

- COVID Response and Equity
  - Develop messaging to support transit priority treatments during a time of changed travel patterns
  - Document how to measure and communicate some of the ways in which transit priority investments can make transportation systems more equitable
WHEN TO APPLY THE TOOLKIT

This toolkit helps tell the story to build the case for transit priority projects and evaluate project benefits

Conduct Operational Analysis
- Analyze transit delay

Identify Solutions
- Identify transit priority projects
- Design project

Build the Case
- Develop methodology to communicate potential benefits
- Create graphics to illustrate the story

Implement Projects
- Finalize design
- Build out project

Evaluate the Benefits
- Evaluate project benefits
- Create graphics to illustrate the story

This toolkit is not a:
- Design manual
- Project identification tool
- Public outreach guide
WHAT TYPES OF TRANSIT PRIORITY DOES TOOLKIT APPLY TO?

- Bus Lane
- BAT Lane
- Transit Signal Priority
- Queue Jump

Source: NACTO
HOW TO USE THIS TOOLKIT

• Toolkit format
  o The Working Group selected six topic areas for the project team to focus on
  o Each topic area is associated with one or two performance metrics
  o Each metric includes (where applicable):
    ▪ A definition of the metric
    ▪ Methods for analyzing data to calculate the metric
    ▪ Visual storytelling strategies
    ▪ Case studies from the peer review

• Toolkit organization
  o The toolkit is a menu of options for data analysis and communication
  o Agencies and cities can pick and choose graphics and methods as appropriate to their local and project context
  o Native files have been provided so that agencies can tailor graphics to their project context and audience
  o Text throughout the toolkit is editable so that messages can be modified and adapted as needed
HOW TO USE THIS TOOLKIT

Understanding the level of detail provided

Working Group participants provided feedback on the type of information they thought would be most useful for each metric.

Therefore, for some metrics, the toolkit focuses on storytelling and **making the case**.

Other metrics were intended to have a focus on data and analysis approaches to **monitor and measure performance**.

The graphic on the right shows where each metric fits in on this spectrum between **building the case** and **monitoring and evaluate the benefits**.

1. Reliability
2. Delay and Passenger Delay
3. Travel Time Savings and Delay Reduction
4. Access to Jobs and Opportunities
5. People Throughput
6. Changing Travel Patterns
TRANSIT PRIORITY TOOLKIT: KEY MESSAGES AND EVALUATION METHODS
SYSTEMWIDE BENEFITS

• The Toolkit provides an overview of six key metrics to demonstrate the performance of transit priority projects and how to best tell the story.

• In discussions with the Working Group, it became apparent that there is a need to both justify a transit priority project’s benefits at a specific location, as well as the cumulative benefits throughout the system.

• For example, small travel time savings in a downtown environment can help ensure the bus avoids delay downtown and arrives on time for passengers outside of downtown.

• The graphic on the following page is intended to illustrate the systemwide benefits of small localized projects.
WHO BENEFITS FROM TRANSIT PRIORITY IMPROVEMENTS?

Transit priority projects benefit the entire transportation system and everyone who travels through it.

A bus-only lane in downtown saves the bus time and keeps it running on schedule...

...which means the bus saves time along the entire route. People outside of downtown benefit from an on-time departure, too.

As transit travel times become more competitive with driving, more people take the bus, relieving traffic congestion all over the city.
TOOLKIT CONTENTS

1. Reliability
2. Delay and Passenger Delay
3. Travel Time Savings and Delay Reduction
4. Access to Jobs and Opportunities
5. People Throughput
6. Changing Travel Patterns
INTEGRATING EQUITY AT EACH STEP

Identify high-need populations

- Use Census or other available data to identify locations with high-need populations according to local context, for example:
  - People of color
  - Lower-income people, or people in poverty
  - Households without access to a vehicle
- Overlay these areas with the high delay corridors or the proposed reliability improvement projects to assess needs and impacts for high-need populations.
- Assess the metrics in Sections 1 through 4 with a focus on the high-need areas.
- Consider other context-relevant data or demographics in the analysis.

Portland
The City of Portland Bureau of Transportation (PBOT) has an Equity Matrix that guides investment and is used to rank projects, programs and procedures.

It uses three demographic variables: race, income and limited English Proficiency.

Atlanta
The Atlanta Regional Commission (ARC) developed the Equitable Target Area (ETA) Index to identify environment justice populations and to make informed decisions and investments.

The ETA Index is calculated using five variables: age, education, housing cost, poverty rates and race.
1. RELIABILITY

Defining the Metric

Reliability refers to the concept of consistency - the bus arrives at the same time or at predictable intervals, day after day. Reliable service helps to meet passenger needs and expectations so riders can plan for when the bus will pick them up and know how long the journey will take. Reliability builds confidence in the bus; riders know they can get where they’re going on time.

How do you measure it?

- Reliability is measured as the variability of travel time based on automatic vehicle location (AVL) data.
- Agencies often communicate travel time data using actual run times and arraying the times in percentiles, e.g. the 80th percentile value means 80% of trips are equal to or faster than that value. Schedules are often based on the 80th or 90th percentile to be conservative so passengers aren't late.
- There is a fine distinction between measuring reliability and measuring delay. Delay is often accounted for in schedules and is caused by traffic. But reliability refers to the amount of variability in travel times, day after day, that can cause people to lose confidence in the bus.
There is a distinction between delay and reliability, as illustrated in this graphic using run time percentiles.

When the bus is the most unreliable – i.e. when the 90th percentile trip (or the worst day out of ten) is significantly slower than the average trip – riders lose confidence and search for other ways to travel.
1. RELIABILITY

Analyzing the data: reduced delay can lead to changing the schedules

Transit priority provides consistent travel times.

Consistently lower travel times reduce all the run time percentiles and give agency schedulers the ability to adjust transit schedules (such as increasing frequency).
Washington Street, Boston

- The MBTA piloted a bus-only lane from Roslindale Village to Forest Hills (1 mile) from 5-9 am in May 2018. The project was made permanent in June 2018.
- Automatic vehicle location (AVL) data was used to track changes in run time:
  - Run times during the average condition (50th percentile or median) decreased by 2 minutes
  - Run times during the worst times of the morning peak (the 90th percentile) decreased by 5-7 minutes

![Graph showing change in inbound run time on the Washington Street bus lane, Jan-Mar 2018 vs Jan-Mar 2019. Bus lane flattened the curve, reducing the worst travel times.](https://www.mbtabackontrack.com/blog/103)
1. RELIABILITY

Telling the story: root causes of bus delay and unreliability

1. Rush hour delays everyone on the road. It’s built into bus schedules.

2. Unexpected incidents and heavier than normal traffic are hard to plan for and can cause the bus to be late.

3. Streets have limited capacity and aren't designed to accommodate the unexpected.

4. When traffic is unpredictable, the bus is late and passengers are either on transit for longer than planned or stuck waiting.

Make transit a reliable choice
1. RELIABILITY

Telling the story: the issue with unreliability

A bus trip can take different amounts of time from day to day. Schedules are conservative on purpose.

People would rather arrive early at their destination than late.

Buses are usually on time . . .

. . . but people don’t want to be late even some of the time.
1. RELIABILITY

Telling the story: how unreliability affects passengers

1. I plan for extra time traveling.
   - I take an earlier bus to make sure I arrive on time
   - 15 minutes of extra travel time x 5 days a week = 75 minutes of extra time a week
   - Time that could be better spent on something else

2. It can cost me money.
   - I'm late for work and could lose my job
   - I get a late pickup fee at childcare
   - I'm charged a no-show fee at the doctor
   - 15 minutes of extra travel time x 5 days a week = 75 minutes of extra time a week
   - Time that could be better spent on something else

3. It adds stress to my day.
   - The bus arrives so crowded that I have to wait for the next one
   - I miss my transfer
1. RELIABILITY

Telling the story: the benefits of reliability

1. I spend more time at home with loved ones.

2. I spend less time waiting for the bus.

3. When the bus is reliable, I'm more likely to leave my car at home.

4. Emergency vehicles are able to respond to emergencies without delay.

Make transit a reliable choice
1. RELIABILITY

Telling the story: reliability improvements affect bus schedules

1. Adding transit priority means a faster trip and less crowding on buses.

2. People need realistic information so they can plan ahead and not be late.

3. Agencies monitor the bus at several different times to set the schedule.

4. Once travel times are consistently faster, the schedule can be changed.
2. DELAY & PASSENGER DELAY

Defining the metric

Delay is the additional travel time passengers experience during slower/congested conditions relative to faster/free-flow conditions. This measure is calculated based on many trips over multiple days and weeks. It is not something that can be observed from one trip.

“Passenger delay” is a separate metric that weights the delay by the passenger load or ridership of a route. It is the cumulative delay experienced by all passengers.

How do you measure it?

- There are multiple methods to measure delay. Each method is based on differences between percentile travel times (e.g. 80th percentile, 50th percentile, 20th percentile).
- Use AVL data of observed run times between any two locations (stop pairs, timepoints, or route endpoints) to calculate the percentile travel times.
- Passenger delay is calculated by multiplying the delay value by the on-board load between those two locations. At the route-level, passenger delay can be calculated using total route ridership.
- Delay can be categorized as running delay (time stuck in traffic) and signal delay (additional travel time caused by signal), and merge delay (time spent merging back into traffic from a bus stop). Running delay can be mitigated with bus lanes and queue jumps. Signal delay can be mitigated with transit signal priority. Merge delay can be mitigated with in-lane stops and bus lanes.
### 2. DELAY & PASSENGER DELAY

#### Analyzing the data

The following is a list of different ways to measure delay. These are examples used by members of the Working Group and is not an exhaustive list.

<table>
<thead>
<tr>
<th>Delay methods</th>
<th>Description</th>
<th>Benefits</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-20 (by hour or trip)</td>
<td>Compares the range of travel times for individual trips or by hour.</td>
<td>Ability to identify which times of day have more variability, regardless of what occurs at other times of day.</td>
<td>Fails to easily identify where transit faces speed and reliability challenges all day (i.e. no increase in delay during peak hours could be masking all-day delay)</td>
</tr>
<tr>
<td>90-10 (by hour or trip)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90-50 (by hour or trip)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-20 (all day)</td>
<td>Compares slower trips (80/90) to the fastest trips (20/10) during the day.</td>
<td>Identifies the locations that experience more severe congestion; useful for identifying where bus lanes or BAT lanes are most likely to be beneficial.</td>
<td>Does not identify reliability challenges that individual trips experience day-to-day.</td>
</tr>
<tr>
<td>90-10 (all day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 (peak) – 20 (off-peak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 (peak) – 10 (off-peak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 (peak) – 50 (off-peak)</td>
<td>Compares typical conditions at peak to typical conditions off-peak.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Equity:** It’s also helpful to analyze delay with the additional perspective of demographics and equity. For example, are there parts of the network with higher delay that are more likely to impact passengers who are from disadvantaged or low-income communities?
2. DELAY & PASSENGER DELAY

Telling the story

Passenger delay is people’s time lost on transit. It shows the locations where the most people experience the most delay. Bus travel times vary throughout the day and week. People’s time lost is calculated by multiplying the minutes of delay by the passengers onboard.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Travel Time Range</th>
<th>Delay Minutes</th>
<th>Passengers</th>
<th>Total Time Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early A.M.</td>
<td>12 MIN - 20 MIN</td>
<td>8</td>
<td>20</td>
<td>160 MIN</td>
</tr>
<tr>
<td>Mid-Day</td>
<td>18 MIN - 28 MIN</td>
<td>10</td>
<td>40</td>
<td>400 MIN</td>
</tr>
<tr>
<td>P.M. Peak</td>
<td>22 MIN - 40 MIN</td>
<td>18</td>
<td>60</td>
<td>1,080 MIN</td>
</tr>
</tbody>
</table>
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Defining the metric

Travel time savings is the amount of time that can be saved (or reduced) with a transit priority project. Transit priority projects may either result in faster travel speeds and/or reduced variability in travel times.

How do you measure it?

- Each transit priority treatment varies in its effectiveness. But the travel time savings can be assumed to reduce the average travel times or speed up the slowest run times without impacting the average or fastest trips.
- The estimated savings are based on observed speeds and run times, as well as assumptions for savings for each project. The data can be from other projects already implemented, as well as data from other cities.
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: Using planning-level travel time savings

The following page lists the potential savings for various transit priority interventions. These savings should be used as a preliminary estimate. Each location is unique, and savings can vary considerably based on traffic volumes, number of lanes, intersection spacing, signal cycle times, and additional local contexts. It is recommended agencies use data gathered from local precedents to inform travel time savings estimation.
# 3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: estimated travel time savings per treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Savings</th>
<th>Example</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit signal priority (TSP); signal coordination</td>
<td>8-12% of travel time; 15-80% of signal delay</td>
<td>Adding TSP along a corridor that takes 60 minutes can reduce travel time to 54-56 minutes</td>
<td>TCRP 165 pg 6-44</td>
</tr>
<tr>
<td></td>
<td>3 sec per TSP</td>
<td>Adding TSP to 33 intersections results in approximately 1 minute of savings</td>
<td>TCRP 118 pg S-9</td>
</tr>
<tr>
<td>In-lane stops (filling in bus pullouts)</td>
<td>7% increase in speed (for corridor-wide application)</td>
<td>Travel speeds at 20 mph can increase 1-2 mph with in-lane stops</td>
<td>TCRP 165 pg 6-51</td>
</tr>
<tr>
<td>Stop consolidation</td>
<td>Elimination of acceleration, deceleration and door close/open for each stop removed.</td>
<td>▪ At top speed of 15 mph, removing 3-4 stops results 1 minute of savings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Acceleration: 3.3 ft/sec/sec</td>
<td>▪ At top speed of 20 mph, removing 3 stops results in 1 minute of savings</td>
<td>TCRP 165 pg 6-4 &amp; 6-6</td>
</tr>
<tr>
<td></td>
<td>▪ Deceleration: 4.0 ft/sec/sec</td>
<td>▪ At top speed of 25 mph, removing 2-3 stops results in 1 minute of savings</td>
<td></td>
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<tr>
<td></td>
<td>▪ Door open + close: 2-5 sec (avg 3.5 sec)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queue jump</td>
<td>5-15% of travel time through intersection</td>
<td>3-10 seconds of savings for each minute of travel time to get through an intersection</td>
<td>TCRP 165 pg 6-48</td>
</tr>
<tr>
<td></td>
<td>6 sec per queue jump</td>
<td>Approximately 1 minute of savings with 10 queue jumps</td>
<td>TCRP 118 pg S-9</td>
</tr>
<tr>
<td>Bus lane</td>
<td>Travel time savings:</td>
<td>Approximately 1 minute of savings for every 1-3 miles of bus lane</td>
<td>TCRP 165 pg 6-39 &amp; 6-40</td>
</tr>
<tr>
<td></td>
<td>▪ 20-60 seconds per mile</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>▪ 35-45% of travel time</td>
<td></td>
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<tr>
<td></td>
<td>Reduction in variation of travel:</td>
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<tr>
<td></td>
<td>▪ 12-30% change in the coefficient of variation (i.e. the standard deviation divided by the mean)</td>
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</tbody>
</table>
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: using existing travel time and delay to estimate delay and travel time reductions for bus lanes and BAT lanes

The following two pages provide additional methods for estimating travel time savings and delay reductions. Unlike the values from above, these methods use an agency’s own travel time and delay values (from AVL) to provide an estimate along specific corridors or locations. These methods only apply to segments or corridors with planned bus or BAT lanes.

Equity: It’s also helpful to compare existing and expected travel times from an equity and demographics standpoint. For example, are there parts of the network that serve more disadvantaged or low-income communities? What are the travel time savings for those passengers compared to the general population?
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: potential delay reduction per treatment (bus/BAT lanes)

Use data for the segment or portion of the route where the transit priority treatment is located.

1. Calculate Delay
Delay is the difference between median travel times (the 50th percentile) and unusually slow travel times (the 80th percentile). Delay varies throughout the day.

Observed Travel Time
- 90th Percentile
- 80th Percentile
- 50th Percentile
- 20th Percentile

10 minutes of delay
12 minutes of delay

D E L A Y

Travel Time (minutes)

Trip Start Time
6 am 8 am 10 am 12 pm 2 pm 4 pm 6 pm 8 pm 10 pm 12 am
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: potential delay reduction per treatment (bus/BAT lanes)

2. Calculate Delay Reduction
   Multiply the delay by 60-80%, depending on the type of transit priority treatment.

Use data for the segment or portion of the route where the transit priority treatment is located.

- 10 minutes x 80% = 8 minutes delay
- 12 minutes x 80% = 9.6 minutes delay
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: potential delay reduction per treatment (bus/BAT lanes)

3. Calculate New 80th Percentile

Apply the delay reduction to 80th percentile travel times.

New 80th percentile travel time = median travel time + 9.6 minutes of delay

New 80th percentile travel time = median travel time + 8 minutes of delay
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: potential **travel time savings** per treatment (bus/BAT lane)

- Use data for the segment or portion of the route where the transit priority treatment is located.
- This calculation is only applicable for corridors that have time during the day when traffic is light, and conditions are generally free-flowing. This method cannot be used for corridors with chronic congestion and slow speeds.

1. Limit analysis to normal operating conditions, excluding outliers like late night and early morning.
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: potential **travel time** savings per treatment (bus/BAT lane)

- Use data for the segment or portion of the route where the transit priority treatment is located.
- This calculation is only applicable for corridors that have time during the day when traffic is light, and conditions are generally free-flowing. This method cannot be used for corridors with chronic congestion and slow speeds.

2. Identify fastest median travel time to represent the optimum conditions that can realistically be achieved.
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Analyzing the data: potential travel time savings per treatment (bus/BAT lane)

- Use data for the segment or portion of the route where the transit priority treatment is located.
- This calculation is only applicable for corridors that have time during the day when traffic is light, and conditions are generally free-flowing. This method cannot be used for corridors with chronic congestion and slow speeds.
3. TRAVEL TIME SAVINGS & DELAY REDUCTION

Telling the story: small savings today can ensure larger savings long-term

- Use priority treatments now to get ahead of future congestion and protect existing transit run times.
- Even small savings that don’t have significant immediate impacts on frequency and operating cost can postpone when additional vehicles/operators may be needed to maintain current frequency.
Telling the story: preserve roadway space to guard against future delay and make transit a more attractive travel option.
Travel Time Savings – Examples from various cities

- Flower Street, Los Angeles; Streetfilms & TransitCenter (YouTube)
- Flower Street, Los Angeles; LA Metro (Twitter)
- Howell Street, Seattle; King County Metro (YouTube)
- Forbes Creek Drive, Kirkland, WA; King County Metro (YouTube)
- SW Main St, Portland; PBOT (YouTube)
- Portland Rose Lanes; PBOT (YouTube)
- Downtown DC Bus Lanes; Streetfilms (YouTube)
- Select Bus Service, New York City; SBS Studies (NYCDOT)
People’s access to jobs and opportunities is a key equity metric and one that can help guide the implementation of a transit priority project. For example, documentation of how many jobs are accessible within a 45-minute transit ride for people living along a specific corridor. By implementing the transit priority project, agencies can help demonstrate that small travel time savings can have a big impact on the increase in number of jobs and opportunities available to high need populations.

How do you measure it?
- Identify high-need populations (see page 16)
- Calculate the number of jobs (or other types of destinations) that are accessible within a specific travel time, for example 30- or 45-minutes.
- Estimate the travel time improvements for a transit priority project and demonstrate the change in number of jobs that are accessible within the specified travel time.
I work, shop, and rely on services within a 30-minute bus ride of my home.

4. ACCESS TO JOBS AND OPPORTUNITIES

Telling the story: reliability and reduced travel times brings more opportunity to those who need it.

Serve people who need transit the most.
4. ACCESS TO JOBS AND OPPORTUNITIES

Telling the story: reliability and reduced travel times brings more opportunity to those who need it

With faster buses, I can reach places it took too long to get to before.
Communicating Equity Impacts – Portland, OR

- Transit priority projects were identified on delayed corridors throughout the city.
- Travel time savings associated with these treatments were estimated. Run times were adjusted accordingly into a city-wide GTFS model.
- Visualizations show how much farther (in red) a person can get by transit in 45 minutes with the transit priority projects from a location with high needs.
5. PEOPLE THROUGHPUT

Defining the metric

People throughput is the amount of people that can move through an intersection or along a corridor. It measures people rather than vehicles. Because transit can carry more people per square foot than personal vehicles can, a greater volume of people can be accommodated in a transit lane than in a general-purpose lane.

How do you measure it?

• The amount of people that can be carried by transit is based on the on-board load and frequency.
• The transit throughput should be compared to the vehicle throughput to gauge percent of people that pass through the corridor on transit.
5. PEOPLE THROUGHPUT

Analyzing the data: calculate passenger throughput

Calculating throughput is specific to each corridor, as the variables that determine throughput are location-dependent. The formulas below are the ways to calculate throughput for each lane.

Roadway throughput (people per hour)

<table>
<thead>
<tr>
<th>Lane type</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose lane</td>
<td>Vehicles per hour × passengers per vehicle</td>
</tr>
<tr>
<td>General purpose lane with bus in mixed traffic</td>
<td>( Vehicles per hour × passengers per vehicle ) + ( Buses per hour × passengers per bus )</td>
</tr>
<tr>
<td>Bus lane</td>
<td>Buses per hour × passengers per bus</td>
</tr>
</tbody>
</table>

A sample spreadsheet to calculate people throughput is provided here: Passenger throughput.xlsx
5. PEOPLE THROUGHPUT

Telling the story: increase roadway capacity through mode shift

Example Throughput for BAT Lane

**PRESENT**
People moved per hour

**FUTURE**
People moved per hour

Note: Numbers shown are for illustrative purposes.
5. PEOPLE THROUGHPUT

Telling the story: increase roadway capacity through mode shift

Example Throughput for Bus Only Lane

Note: Numbers shown are for illustrative purposes.
5. PASSENGER THROUGHPUT

Telling the story: use limited space more efficiently

126 people move through this roadway during each light cycle. **80 in transit.**

235 people on a road with transit-only lanes move through this roadway during each light cycle. **204 in transit.**
6. CHANGING TRAVEL PATTERNS

Defining the metric

When a traffic lane is changed to a different use like a bus lane, cities have found that a certain amount of traffic goes away. Drivers change their travel patterns – taking a different route, traveling at a different time of the day, or switching to the bus. Bus lane projects are evaluated based on traffic impacts. Integrating assumptions about changes to travel patterns into analysis adds a more realistic look at impacts.

Traffic volumes reduced greatly during COVID-19, but cities are finding that while peaks have flattened, there is more traffic during the “off-peak.” Transit priority now gets more people on board. Bus lanes guard against future increases in congestion, and ensure trips taken during the traditional off-peak times are quick and efficient.

How do you measure it?

• Compare the traffic volumes before and after a project is implemented. If traffic volumes decreased after implementation, the volume reduction means peoples’ travel patterns changed.

• Look at increases in midday or early afternoon traffic volumes to understand how delay to transit riders may have increased during COVID.
Traffic Reduction – Boston

- Brighton Avenue in Allston, MA was a high-ridership corridor with 14,000 daily riders.
- This corridor was selected for transit priority given delay, ridership levels, and community support.
- The MBTA implemented bus-bike lanes in 2019; these can also be used by school buses.
- The agency found some of the traffic reduced after implementation. General traffic declined by 13% (note that side street impacts were not quantified). There was also an 8-9% increase in bus ridership.
- These outcomes helped the agency create new assumptions for traffic modeling on other corridors. Instead of assuming existing traffic levels remain the same post-project, the city and MBTA assumes some traffic may evaporate. Traffic volume assumptions of 80% / 90% / 100% are being used to create traffic scenarios to present to the public and leadership.

Source: Livable Streets
6. CHANGING TRAVEL PATTERNS

Telling the story: when a traffic lane is converted to a new use, travel patterns change.

I think I’ll take the bus
I’ll run my errands closer to home, instead.
I could do this an hour later
I’ll take a different route
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- Washington Metropolitan Area Transportation Authority (WMATA)
- Metropolitan Atlanta Rapid Transit Authority (MARTA)
- City of Atlanta

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- Los Angeles County Metropolitan Transportation Authority (LA Metro)
- City and County of Honolulu

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ADDITIONAL READING

Practitioners Guide to Measuring Accessibility
State Smart Transportation Initiative (SSTI)

Better Bus Studies
New York City DOT

Rose Lane Project: Implementing Transit Priority Projects in Portland
City of Portland Bureau of Transportation

Transit Street Design Guide
NACTO
https://nacto.org/publication/transit-street-design-guide/
https://nacto.org/tsdg/making-transit-count/

The Path to Partnership: How Cities and Transit Systems Can Stop Worrying and Join Forces
TransitCenter