Improve Transit Service

What is it?
Transit service can be improved by increasing service hours and frequency and by expanding transit route coverage. Improvements that address routing, coverage, scheduling, and frequency can enhance mobility and accessibility by reducing travel times and increasing the number of destinations that are accessible by transit. To the extent that service improvements encourage a mode shift away from single occupancy vehicles, they can also reduce vehicle miles traveled (VMT) and the associated air and greenhouse gas (GHG) emissions, and increase physical activity and quality of life.

What are the benefits?
- **Mobility**: Reduces travel time for transit users and can help reduce congestion and VMT by encouraging a mode shift to transit.
- **Accessibility**: Improves ease of access and connectivity by enhancing the availability of transit as a viable mode, especially outside of peak hours.
- **Environmental**: Reduces the emission of criteria air pollutants and GHG that are harmful to the environment and human health by encouraging shifts to more sustainable modes.
- **Quality of Life**: Improves transit ridership and physical activity for commuters, who walk to and from transit stops.

Where is it being used?
When the economy is healthy and funds allow, transit agencies often increase frequency of service and coverage in response to rises in ridership demand.

Examples of transit agencies in the Pacific Northwest that have increased service are listed below. Note that while these agencies are known to have increased service at some point in the past, the recent economic downturn has required many of them to cut service.

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1. Corvallis Transit System
   Corvallis, OR

2. EmX BRT, Eugene, OR

3. Community Transit, Snohomish County, WA

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In this summary, the best available data on program effectiveness is used. Whenever possible, information is provided for the referenced examples; however, that information is not always available.

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1. [https://www.corvallisoregon.gov/](https://www.corvallisoregon.gov/)
2. Photo courtesy of CH2M HILL
3. [https://www.communitytransit.org/news](https://www.communitytransit.org/news)
4. In this summary, the best available data on program effectiveness is used. Whenever possible, information is provided for the referenced examples; however, that information is not always available.
TriMet, Portland, Oregon
Corvallis Transit System, Corvallis, Oregon
Community Transit, Snohomish County, Washington
Whatcom Transportation Authority, Whatcom County, Washington
C-TRAN, Clark County, Washington

How effective is it?

Transit service changes are often implemented in conjunction with other programs (concurrent modifications in fare structures, station amenity improvements, implementation of parking fees), which makes it difficult to isolate the effectiveness of service changes alone. The following findings provide a mix of national averages and local examples of transit service programs that have improved service hours/frequency and/or routing/coverage.

Transit Service Hours and Frequency

- On average, for every 1% increase (decrease) in transit service frequency, ridership can be expected to increase (decrease) by a corresponding 0.5%. However, for every 1% increase in transit service frequency between residential areas and a central business district, ridership can be expected to increase by 0.9%.

- On routes headed to Portland, Oregon, from Vancouver, Washington, C-TRAN decreased headways during the AM peak period by 8 to 9 minutes and increased service hours from 6:18 PM to 9:33 PM during the PM peak. The result was an average ridership increase of 0.33% for every 1% increase in service.

- The GHG reduction effectiveness reported for improved transit service frequency in the OSTI Greenhouse Gas Toolkit was 0.02% to 0.6% reduction in GHGs in 2030. Because the reduction in GHGs would be derived entirely from a decrease in VMT, a 1:1 ratio regarding the percentage of GHG reduction to the percentage of VMT reduction can be assumed.

While specific quantitative impacts can be hard to isolate, the following underlying patterns relate to some of the circumstances surrounding transit service modifications:

- The level of ridership is typically most sensitive to frequency changes in areas that have infrequent service and on transit lines in middle and upper income service areas.

- Where transit headways are already short and in low income service areas, ridership tends to be less affected by frequency changes and may be more sensitive to fare changes.

- Off-peak riders typically have a higher sensitivity to frequency changes than do peak period riders.

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9 While GHG reductions are different than VMT reductions, a 1:1 ratio of percent GHG reduction to percent VMT reduction is assumed for the programs that derive GHG reductions entirely from reducing VMT (such as TROs/TMAs). This assumption is consistent with assumptions in the OSTI GHG Toolkit source document, Moving Cooler, Appendix B. Page B-7.
• The hours transit service is offered can be just as important as the frequency of service.

Transit Service Routing and Coverage

• The mid-range of ridership response to the expansion of bus transit, by itself or with fare changes, is a 0.6% to 1% increase in ridership for every 1% of increase in transit service.\(^{11}\)

• In a study estimating the impacts of new and expanded bus service on equivalent VMT there was, on average, a 0.13% annual decline in VMT after a 21% increase in transit service in larger cities; while in smaller cities, there was a 0.03% annual decline in VMT as a result of a 63% increase in transit service.\(^{12}\)

• In a 1970s transit service demonstration study, a 42% increase in bus service miles in Portland, Oregon, resulted in a 36% increase in ridership (a 0.88% increase in ridership for every 1% increase in service).\(^{13}\) In a similar study, a 166% increase in bus service miles in Eugene, Oregon, resulted in a 271% increase in ridership (a 1.34% increase in ridership for every 1% increase in service).\(^{14}\)

• In Portland, Oregon, a major realignment of radial routes into a grid system combined with additional factors resulted in a 0.29% increase in ridership for every 1% increase in service.\(^{15}\)

• In a 1990s study of transportation control measures (TCM) in California, fixed route transit projects reduced VMT between 21,000 and 4.7 million per year per project, while shuttle transit projects reduced VMT between 10,000 and 835,000 per year per project. Transit projects were also found to reduce the emission of criteria air pollutants. Overall, public transit projects were found to be less effective in reducing VMT and emissions than either demand management or vanpooling TCMs.\(^{16}\)

How much does it cost to implement?

While transit service improvements can increase fare box revenues, this is typically offset by the expense of providing additional service. However, some transit service improvements are more cost-effective than others. For example, increasing off-peak service frequency is typically less expensive on a per hour/mile basis than increasing peak service frequency.\(^{17}\) Additionally, bus routing and coverage improvements are likely to be less expensive than other improvements designed to increase ridership (express buses, new park and ride facilities, rail projects).\(^{18}\) However, full development of a new transit route typically takes 1 to 3 years, so a major cost consideration when extending service is sustaining operations during the time that ridership is being established. In general, bus routes that serve multiple transportation needs are the most likely to be successful and cost-effective.\(^{19}\) See Table 1 for


findings from the California TCM study regarding cost-effectiveness of fixed route and shuttle transit service.  

Table 1. Cost-effectiveness Ranges of California Fixed Route Transit and Shuttle TCMs

<table>
<thead>
<tr>
<th></th>
<th>Cost Per Trip Eliminated</th>
<th>Cost Per VMT Eliminated</th>
<th>Cost Per Pound Eliminated (Criteria Air Pollutants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Route Service</td>
<td>$0.22 - $35.00</td>
<td>$0.03 - $2.20</td>
<td>$3.06 - $1,117.00</td>
</tr>
<tr>
<td>Shuttle Service</td>
<td>$3.68 - $75.60</td>
<td>$0.05 - $27.70</td>
<td>$6.52 - $610.00</td>
</tr>
</tbody>
</table>


Implementation resources

The following are resources for implementing transit service improvements:

- **Best Practices in Transit Service Planning**: This study, prepared by the Florida Department of Transportation Research Center, provides best practices for transit agencies looking to increase transit service frequency and coverage and includes guidelines from around the country for planning routes to ensure maximum ridership: [https://www.nctr.usf.edu/pdf/77720.pdf](https://www.nctr.usf.edu/pdf/77720.pdf).

- **Metropolitan-Level Transportation Funding Sources**: This study identifies transportation funding sources potentially available for metropolitan planning organizations that wish to generate new local sources of revenue to finance increased transit service (or expenditures): [http://narc.org/uploads/File/Transportation/Library/NCHRP_Metro_Funding.pdf](http://narc.org/uploads/File/Transportation/Library/NCHRP_Metro_Funding.pdf).

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