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Exhibit B

2021 TSMO Strategy Appendices

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Appendix A

**List of TSMO Projects
Planned in 2010**

2010 TSMO Planned Projects

Project	Timeframe	Goals				Capital \$ Planned by 2020	OM \$ Planned by 2020
		Reliability	Safety and Security	Quality of Life	Traveler Information		
Region Wide Projects							
Operate and Maintain Regional ITS Communications Network	Ongoing	x				\$ -	\$ 1,000,000
Active Traffic Management RCTO	1-5 years	x				\$ 350,000	\$ -
Transit Priority Treatment Performance Measurement	1-5 years	x				\$ 200,000	\$ 2,000,000
Region-wide Access Management Strategies	6-10years		x			\$ 500,000	\$ -
Enhance Regional Traffic Signal System	1-5 years	x				\$ 12,000,000	\$ 500,000
Implement Freight Data Collection System	6-10years	x				\$ 50,000	\$ 500,000
Congestion Pricing/ High Occupancy Toll Lanes	1-5 years			x		\$ 5,000,000	\$ -
Active Traffic Management Pilot Project	6-10years	x				\$ 5,000,000	\$ 500,000
Next Generation Transit Signal Priority System	6-10years	x				\$ 500,000	\$ 500,000
24-Hour Transportation Operations Coverage	Beyond 10 years	x			x	\$ -	\$ -
Automated Speed Enforcement	Beyond 10 years		x			\$ 1,000,000	\$ -
Portland OR Regional Transportation Data Archive Listing (PORTAL) Enhancements	Ongoing				x	\$ -	\$ 1,000,000
Multi-modal traveler data and tools	Ongoing				x	\$ -	\$ 1,500,000
Park & Ride Traveler Information	Ongoing				x	\$ 500,000	\$ 1,500,000
TripCheck Travel Information Portal (TTIP) Enhancement	1-5 years				x	\$ 3,000,000	\$ 20,000,000
Arterial Performance Measure	1-5 years	x				\$ 750,000	\$ 1,000,000
Transit Performance Measurement System	1-5 years			x		\$ 350,000	\$ 500,000
Incident Management	1-5 years	x				\$ 2,000,000	\$ 2,000,000
Expand Incident Management Teams/Training	1-5years		x			\$ -	\$ 5,000,000
Integrate Voice and Data Networks	6-10years		x			\$ 10,000,000	\$ 2,500,000
Emergency Responders GIS System Upgrades	6-10years		x			\$ 200,000	\$ 250,000
Dynamic Routing and Preemption Pilot Project	Beyond 10 years	x				\$ 500,000	\$ -
Collaborative Marketing	Ongoing			x		\$ -	\$ 9,750,000
Employer Services	Ongoing			x		\$ -	\$ 10,000,000
Rideshare Services	Ongoing			x		\$ -	\$ 3,600,000
Measurement	Ongoing	x				\$ -	\$ 1,500,000
TSMO Program	Ongoing	x				\$ -	\$ 3,350,000
Parking Management Strategy	1-5 years			x		\$ 100,000	\$ -
Parking Management Pilot Program	1-5 years			x		\$ -	\$ 1,000,000
Smartcard fare system RCTO	1-5 years	x				\$ 100,000	\$ -
Smartcard fare system pilot project	1-5 years	x				\$ 12,000,000	\$ -
Youth transit pass program	6-10years			x		\$ -	\$ 500,000
Youth transit pass program	1 year (6-10 years)			x		\$ -	\$ 15,000,000
Regional Incentive/Disincentive System	Beyond 10 years	x				\$ 9,000,000	\$ -
Region-Wide Totals						\$ 63,100,000	\$ 84,950,000

2010 TSMO Planned Projects

Project	Timeframe	Goals				Capital \$ Planned by 2020	OM \$ Planned by 2020
		Reliability	Safety and Security	Quality of Life	Traveler Information		
Corridor Projects							
1. Portland Central City to Vancouver	Varies	x	x	x	x	\$ 7,030,000	\$ 43,210,000
2. Portland Central City to Tualatin		x	x	x	x	\$ 15,760,000	\$ 17,302,000
3. Tualatin to Wilsonville		x	x	x	x	\$ 2,900,000	\$ 10,448,000
4. Portland City Central Loop		x	x	x	x	\$ 7,615,000	\$ 14,705,900
5. Portland Central City to Gateway		x	x	x	x	\$ 17,830,000	\$ 9,828,330
6. Gateway to Troutdale, Wood Village, and Fairview		x	x	x	x	\$ 20,650,000	\$ 17,507,000
7. Tualatin to Oregon City		x	x	x	x	\$ 650,000	\$ 1,262,000
8. Oregon City to Gateway		x	x	x	x	\$ 13,900,000	\$ 21,247,000
9. Gateway to Clark County		x	x	x	x	\$ 6,420,000	\$ 3,510,000
10. Portland Central City to Milwaukie		x	x	x	x	\$ 4,480,000	\$ 9,175,000
11. Milwaukie to Clackamas		x	x	x	x	\$ 1,400,000	\$ 3,847,000
12. Interstate 205 to Rock Creek Junction		x	x	x	x	\$ 4,160,000	\$ 4,097,000
13. Rock Creek Junction to US 26		x	x	x	x	\$ 3,400,000	\$ 1,172,000
14. Oregon City to Willamette Valley		x	x	x	x	\$ 5,390,000	\$ 792,000
15. Troutdale/Wood Village/Fairview to Damascus		x	x	x	x	\$ 15,400,000	\$ 2,060,000
16. Rivergate to Interstate 5		x	x	x	x	\$ 10,475,000	\$ 4,735,000
17. Interstate 5 to Columbia Shore South		x	x	x	x	\$ 8,300,000	\$ 5,183,330
18. Portland Central City to Columbia County		x	x	x	x	\$ 600,000	\$ 3,752,000
19. Beaverton to Tigard		x	x	x	x	\$ 11,200,000	\$ 22,595,000
20. Tigard/Tualatin to Sherwood		x	x	x	x	\$ 13,000,000	\$ 4,800,000
21. Portland Central City to Beaveron		x	x	x	x	\$ 15,410,000	\$ 10,020,000
22. Beaverton to North Plains		x	x	x	x	\$ 29,150,000	\$ 7,417,000
23. Forest Grove to North Plains		x	x	x	x	\$ 950,000	\$ 2,667,000
Corridor Totals						\$ 216,070,000	\$ 221,332,560

Notes:

Costs do not include projects in the 11+ year timeframe

Assumes projects in timeframe "1-5 years" and "through 10 years" were all active for 10 years, and projects in the timeframe "6-10 years" were active for 5 years. Projects in the "11+ years" timeframe were not included in this total.

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Appendix B
SAC Member List

2021 TSMO Strategy Stakeholder Advisory Committee

Margi Bradway, Metro's Deputy Director of Planning & Development

Kate Freitag, ODOT's Region 1 Traffic Engineer, TransPort Chair

Millicent Williams, former Portland Bureau of Transportation's Deputy Director

Wendy Cawley, Portland Bureau of Transportation's City Engineer

Joe Marek, Clackamas County's Transportation Safety Program Manager

Lisha Shrestha, Division Midway Alliance's Executive Director

Debra Dunn, Synergy Resources Group's President and Founder, Oregon Environmental Council Board Member

Avi Unnikrishnan, Ph.D., Portland State University's Professor, Dept. of Civil and Environmental Engineering

Matt Ransom, Southwest Washington Regional Transportation Council's Executive Director

Geoff Bowyer, ODOT's Region 1 Traffic Management Operations Center

Jon Santana, TriMet's Interim Executive Director of Transportation

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Appendix C

Vision & Goals Memo + Objectives Memo

Memorandum

Date: March 16, 2021
To: Caleb Winter, Metro and Scott Turnoy, ODOT
From: Briana Calhoun, Kara Hall, and Chris Grgich, Fehr & Peers
Subject: **DRAFT Vision & Goals for the 2021 Transportation Systems Management and Operations Strategy**

PT20-0045 ODOT Key 21411

Metro, the Oregon Department of Transportation (ODOT), and their partner agencies are collaborating to develop the 2021 Regional Transportation Systems Management and Operations Strategy (2021 TSMO Strategy).

The 2021 TSMO Strategy will position the region to collaboratively manage the transportation system in a rapidly changing environment while achieving regional goals such as safety, equity, vibrant communities, shared prosperity, and a healthy environment.

This memorandum presents two components essential to creating a Strategy that meets the needs of the region, the vision and goals.

The **vision** presented below, is an aspirational statement that is clear on what TSMO stakeholders are trying to achieve through investments and collaboration.

This is followed by six **goals**, which provide strategic direction for collaboration and investment decisions to make progress toward the vision over the next 10 years.

Input gathered during the first Stakeholder Advisory Committee (SAC) workshop was used to inform development of the draft vision and goals. During the meeting, committee members were asked to share what components of the existing transportation system the Strategy should protect, what it should create, and what it should avoid. Input provided during the workshop resulted in the identification of four themes that the vision and goals should address:

- **Equity:** all people can travel and all voices are heard
- **Safety:** all people can travel without harm
- **Access and Choice:** all people can access and choose different modes when traveling
- **Coordination and Collaboration:** continued communication across agencies and state lines, within agency departments, and with the public

2021 TSMO Strategy Vision

Following the SAC workshop, several vision statements were developed for consideration by the Project Management Team (PMT). Collaboration with the PMT, resulted in selection of the draft vision statement below as the aspirational statement that sets the path for what this strategy will achieve over the long-term.



Collaborate to provide reliable, agile, and connected travel choices so that all users are free from harm, and to eliminate the disparities experienced by people of color and historically marginalized communities.

2021 TSMO Strategy Goals

With Metro staff input, Fehr & Peers developed six goals to provide broad strategic direction for what TSMO stakeholders are trying to achieve through investments and collaboration. The goal themes and statements are presented in **Table 1**. We drafted these goals to advance the vision for the 2021 TSMO Strategy and show they align with other regional plans, contributing to consistent policy within the region. Two goals, **Eliminate Disparities** and **Plan for the Future** were not part of the 2010-2020 TSMO Plan; however, they are supported by ODOT's Oregon Transportation Plan (OTP) and Oregon Highway Plan (OHP) and/or Metro's Regional Transportation Plan (RTP).



Table 1. Draft Goals

2021 TSMO Strategy Goals	Similar Goals	2018 RTP Pillar
<p>Free from Harm: Create a transportation system where all users are free from harm.</p>	<ul style="list-style-type: none"> • 2010 TSMO Plan • Metro RTP • ODOT OTP 	<ul style="list-style-type: none"> • Safety & Equity
<p>Regional Partnerships/Collaboration: Collaborate as effective stewards of the transportation system.</p>	<ul style="list-style-type: none"> • 2010 TSMO Plan • Metro RTP • ODOT OTP 	<ul style="list-style-type: none"> • Accountability, Safety, & Reliability
<p>Eliminate Disparities: Eliminate the disparities in the transportation system experienced by people of color and historically marginalized communities.</p>	<ul style="list-style-type: none"> • Metro RTP 	<ul style="list-style-type: none"> • Equity
<p>Connected Travel Choices: Connect all people to the goods, services, and destinations they need through a variety of travel choices.</p>	<ul style="list-style-type: none"> • Metro RTP • ODOT OTP • ODOT OHP 	<ul style="list-style-type: none"> • Congestion & Climate
<p>Reliable Travel Choices: Provide a transportation system that is reliable for all users.</p>	<ul style="list-style-type: none"> • 2010 TSMO Plan • Metro RTP • ODOT OHP 	<ul style="list-style-type: none"> • Reliability & Congestion
<p>Prepare for Change: Manage the system to be agile in the face of growth, disruptions, and changing technology.</p>	<ul style="list-style-type: none"> • Metro RTP • ODOT OTP 	<ul style="list-style-type: none"> • Climate & Resilience

Memorandum

Date: July 28, 2021
To: Caleb Winter, Metro and Scott Turnoy, ODOT
From: Briana Calhoun, Kara Hall, and Chris Grgich, Fehr & Peers
Subject: **Objectives for the 2021 Transportation Systems Management and Operations Strategy**

PT20-0045 ODOT Key 21411

Introduction

Metro, the Oregon Department of Transportation (ODOT), and their partner agencies are collaborating to develop the 2021 Regional Transportation Systems Management and Operations Strategy (2021 TSMO Strategy).

The 2021 TSMO Strategy will position the region to collaboratively manage the transportation system in a rapidly changing environment while achieving regional goals such as safety, equity, vibrant communities, shared prosperity, and a healthy environment.

This memorandum introduces the objectives developed for the six goals of the 2021 TSMO Strategy. The objectives, presented below, are the first step in defining how the region will achieve the goals. Development of the objectives will be followed by the identification of Performance Metrics, Targets, and Actions.



2021 TSMO Strategy Goals

With input from the Stakeholder Advisory Committee, the Project Management Team (PMT), and Metro staff, six goals were drafted for the 2021 TSMO Strategy. The goals, which provide strategic direction for collaboration, network operation, and investment decisions to make progress toward the vision for the next 10 years are presented in Table 1. See Table A1, included as an attachment to this memorandum, for more detail on how the six goals align with other regional plans and contribute to consistent policy within the region.



Table 1. 2021 TSMO Strategy Draft Goals

2021 TSMO Strategy Goals

Free from Harm: Create a transportation system where all users are free from harm.

Regional Partnerships/Collaboration: Collaborate as effective stewards of the transportation system.

Eliminate Disparities: Eliminate the disparities in the transportation system experienced by black, indigenous, (and) people of color and low income individuals.

Connected Travel Choices: Connect all people to the goods, services, and destinations they need through a variety of travel choices.

Reliable Travel Choices: Provide a transportation system that is reliable for all users.

Prepare for Change: Manage the system to be agile in the face of growth, disruptions, and changing technology.



2021 TSMO Objectives

To initiate development of objectives for the 2021 TSMO Strategy, Fehr & Peers compiled existing objectives and policies documented in regional and statewide plans that aligned with the six goals developed for the strategy update. Plans reviewed include:

- 2010 Regional TSMO Plan (Metro)
- 2018 Regional Transportation Plan (Metro)
- Oregon Transportation Plan (ODOT, 2006)
- Oregon Highway Plan (ODOT, 1999)

This review of other regional and statewide plans served as a source of example policies and facilitated a comparison between existing policy and objectives to confirm that objectives being developed for the 2021 TSMO Strategy contribute to consistent policy within the region and state. To see how existing policies and objectives align with the goals for the 2021 TSMO Strategy see **Tables B1-3** in **Attachment B**.

The draft objectives, presented below, were informed by input from the Stakeholder Advisory Committee (SAC) through two workshops. Each workshop focused on three goals and provided the opportunity for the SAC members to collaborate and draft objectives for each goal. This input was then compiled by Fehr & Peers to develop draft objectives that capture the key themes that emerged during the SAC workshop.

The final objectives will reflect collaboration with Metro Staff and the PMT before being presented back to the SAC.



Free from Harm

Goal	Draft Objectives
<p>Create a transportation system where all users are free from harm.</p>	<p>Manage the transportation system to reduce negative health impacts so that public health risk does not adversely effect people's mode choice.</p>
	<p>Ensure black, indigenous, (and) people of color and low income individuals benefit from safety improvements.</p>
	<p>Provide a transportation system where human error does not result in serious injury or loss of life.</p>
	<p>Ensure people of color and low income communities can safely access multiple low stress mode choices and routes within the transportation system by improving access to transit stops, pedestrian, and bicycle facilities.</p>

Regional Partnerships/Collaboration

Goal	Draft Objectives
<p>Collaborate as effective stewards of the transportation system.</p>	<p>Collaborate to provide consistent travel experiences across jurisdictional boundaries through integrated payment and scheduling systems, integrated corridor management, and data sharing between agencies.</p>
	<p>Collaborate with emergency management when prioritizing investments on key emergency response routes.</p>
	<p>Collaborate with and educate travelers.</p>
	<p>Improve interagency collaboration to ensure efficient operations by identifying and addressing barriers in communication when making decisions about network operation or expansion.</p>



Eliminate Disparities

Goal	Draft Objectives
<p>Eliminate the disparities in the transportation system experienced by black, indigenous, (and) people of color and low income individuals.</p>	<p>Prioritize reaching underrepresented groups when providing traveler information and community outreach and ensure that modal access and traveler information is free from technological and financial barriers.</p>
	<p>Identify and correct disparities when planning, operating, and maintaining the transportation system (e.g., transit access, GHG exposure, allocation of funds).</p>
	<p>Identify and increase awareness of the unique travel experiences of people of color and low income individuals.</p>
	<p>Reduce the transportation cost burden experienced by black, indigenous, (and) people of color and low income individuals.</p>

Connected Travel Choices

Goal	Draft Objectives
<p>Connect all people to the goods, services, and destinations they need through a variety of travel choices.</p>	<p>Connect decentralized travel options to facilitate viable destinations in Regional Centers, Town Centers, and employment areas outside downtown Portland.</p>
	<p>Prioritize the completion and expansion of planned transit and active mode networks when investing discretionary revenues especially to destinations with limited travel choices.</p>
	<p>Connect goods and delivery services to people and businesses by providing for and managing last mile connections for goods delivery.</p>
	<p>Increase availability and accessibility of low-cost transportation options for low income individuals and people of color.</p>



Reliable Travel Choices

Goal	Draft Objectives
Provide a transportation system that is reliable for all users.	Manage recurring and non-recurring congestion to improve travel time reliability for all users, including active transportation, transit and freight.
	Expand travel time reliability improvements for people of color and historically marginalized communities burdened with long travel distances.
	Manage critical freight corridors to create reliable routes for freight movement between key destinations.
	Communicate expected changes in reliability so that travelers can make informed travel choices.

Prepare for Change

Goal	Draft Objectives
Manage the system to be agile in the face of growth, disruptions, and changing technology.	Plan and design a flexible transportation network that can adapt to new technology and travel choices that are consistent with the region's desired land use and transportation outcomes.
	Manage projects and resources to be responsive to changes in land use planning and growth patterns.
	Minimize long term disruptions to the transportation system by creating resiliency to climate change and economic shifts.
	Provide public agency staff with the data, tools, models, and training needed to assess long-term disruptive transportation trends.



Table A1. Goals Summary

2021 TSMO Strategy Goals	Similar Goals	2018 RTP Pillar
<p>Free from Harm: Create a transportation system where all users are free from harm.</p>	<ul style="list-style-type: none"> • 2010 TSMO Plan • Metro RTP • ODOT OTP 	<ul style="list-style-type: none"> • Safety & Equity
<p>Regional Partnerships/Collaboration: Collaborate as effective stewards of the transportation system.</p>	<ul style="list-style-type: none"> • 2010 TSMO Plan • Metro RTP • ODOT OTP 	<ul style="list-style-type: none"> • Accountability, Safety, & Reliability
<p>Eliminate Disparities: Eliminate the disparities in the transportation system experienced by black, indigenous, (and) people of color and low income individuals.</p>	<ul style="list-style-type: none"> • Metro RTP 	<ul style="list-style-type: none"> • Equity
<p>Connected Travel Choices: Connect all people to the goods, services, and destinations they need through a variety of travel choices.</p>	<ul style="list-style-type: none"> • Metro RTP • ODOT OTP • ODOT OHP 	<ul style="list-style-type: none"> • Congestion & Climate
<p>Reliable Travel Choices: Provide a transportation system that is reliable for all users.</p>	<ul style="list-style-type: none"> • 2010 TSMO Plan • Metro RTP • ODOT OHP 	<ul style="list-style-type: none"> • Reliability & Congestion
<p>Prepare for Change: Manage the system to be agile in the face of growth, disruptions, and changing technology.</p>	<ul style="list-style-type: none"> • Metro RTP • ODOT OTP 	<ul style="list-style-type: none"> • Climate & Resilience

Table B1. 2010 Regional TSMO Plan

2021 TSMO Strategy Goals	2010 Regional TSMO Plan Objective	2010 Regional TSMO Plan Goal	Objective #
Create a transportation system where all users are free from harm.	Reduce crashes at signalized intersections.	Safety & Security	1
	Reduce crashes resulting from weather, construction, and secondary crashes from incidents.	Safety & Security	2
	Reduce crashes involving vulnerable road users (pedestrians and bicycles).	Safety & Security	3
	Provide a safe environment for transit, bicycling and walking.	Safety & Security	4
Collaborate as effective stewards of the transportation system.	Integrate arterial and freeway roadway systems and operate the transportation system from the overall system perspective.	Reliability	5
	Improve communication and coordination between transportation agencies and emergency management agencies.	Safety & Security	6
	Continue a regional collaborative marketing campaign to increase awareness and use of travel options and reduce drive-alone trips.	Quality of Life	6
	Support initiatives to reduce greenhouse gas emissions from vehicles.	Quality of Life	3
	Enhance regional multi-modal trip planning tools.	Traveler Information	3
Eliminate the disparities in the transportation system experienced by black, indigenous, (and) people of color and low income individuals.	Encourage transit ridership by providing safe and secure public transportation facilities.	Safety & Security	5
	Support equitable distribution of transportation services and investment.	Quality of Life	4
Connect all people to the goods, services, and destinations they need through a variety of travel choices.	Improve connections between modes to enhance traveler mobility and reduce reliance on the automobile.	Quality of Life	2
	Market and provide travel options services to employers and commuters.	Reliability	6
	Enhance pre-trip and en-route traveler information tools.	Traveler Information	2
Provide a transportation system that is reliable for all users.	Expand traffic incident and event management capabilities to restore roadway capacity reduced by incidents, weather and construction.	Reliability	1
	Enhance regional traffic signal coordination systems and support systems that respond to current conditions.	Reliability	2
	Implement and expand systems that improve reliability for transit, pedestrians, and bicycles.	Reliability	3
	Implement systems that reduce delays through known bottlenecks.	Reliability	4
	Encourage transit ridership by improving transit travel times and services	Quality of Life	1
	Provide current information that may affect roadway users and travel choices across all modes.	Traveler Information	1
Operate the system to be resilient to growth and disruptions.	Protect physical infrastructure and transportation communication networks from harm or misuse.	Safety & Security	7
	Support systems that implement future pricing strategies (e.g., congestion, tolls, parking).	Quality of Life	5

Expand traffic surveillance and transportation system condition data collection capabilities.	Traveler Information	4
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Table B2. 2018 Metro Regional Transportation Plan

2021 TSMO Strategy Goals	2018 RTP Objective	2018 RTP Goal	Objective #
Create a transportation system where all users are free from harm.	Eliminate fatal and severe injury crashes for all modes of travel.	Safety and Security	1
	Reduce the vulnerability of the public and critical passenger and freight transportation infrastructure to crime and terrorism.	Safety and Security	2
	Improve public health by providing safe, comfortable and convenient transportation options that support active living and physical activity to meet daily needs and access services.	Healthy People	1
Collaborate as effective stewards of the transportation system.	Focus growth and transportation investment in designated 2040 growth areas (the Portland central city, regional and town centers, corridors, main streets, and employment and industrial areas).	Vibrant Communities	1
	Build an integrated system of throughways, arterial streets, freight routes and intermodal facilities, transit services and bicycle and pedestrian facilities, with efficient connections between modes that provide access to jobs, markets and community places within and beyond the region.	Shared Prosperity	1
	Plan communities and design and manage the transportation system to increase the proportion of trips made by walking, bicycling, shared rides and use of transit, and reduce vehicle miles traveled.	Transportation Choices	1
	Complete all gaps in regional bicycle and pedestrian networks.	Transportation Choices	2
	Minimize unnecessary light pollution to avoid harm to human health, farms and wildlife, increase safety and improve visibility of the night sky.	Healthy Environment	4
	Improve wildlife and habitat connectivity in transportation planning and design to avoid, minimize and mitigate barriers resulting from new and existing transportation infrastructure.	Healthy Environment	5
	Reduce transportation-related air pollutants, including criteria pollutants and air toxics emissions.	Healthy People	2
	Minimize air, water, noise, light and other transportation-related pollution health impacts.	Healthy People	3
	Reduce transportation-related consumption of energy and reliance on sources of energy derived from petroleum and gasoline.	Climate Leadership	5
	Meet adopted targets for reducing transportation-related greenhouse gas emissions.	Climate Leadership	2
	Improve coordination and cooperation among the owners and operators of the region's transportation system.	Transparency and Accountability	3

	Make transportation investment decisions using a performance-based planning approach that is aligned with the RTP goals and supported by meaningful public engagement, multimodal data and analysis.	Transparency and Accountability	2
	Increase the number of households and businesses with access to outreach, education, incentives and other tools that increase shared trips and use of travel options.	Reliability and Efficiency	5
Eliminate the disparities in the transportation system experienced by black, indigenous, (and) people of color and low income individuals.	Increase the number and variety of community places that households, especially households in historically marginalized communities, can reach within a reasonable travel time for all modes of travel.	Vibrant Communities	4
	Increase the number and diversity of regulated affordable housing units within walking distance of current and planned frequent transit service.	Vibrant Communities	3
	Reduce the share of income that households in the region spend on transportation to lower overall household spending on transportation and housing.	Shared Prosperity	4
	Protect historic and cultural resources from the negative impacts of transportation.	Healthy Environment	2
	Plan, build and maintain regional transportation assets to maximize their useful life, minimize project construction and maintenance costs and eliminate maintenance backlogs.	Fiscal Stewardship	1
	Engage more and a wider diversity people in providing input at all levels of decision-making for developing and implementing the plan, particularly people of color, English language learners, people with low income and other historically marginalized communities.	Transparency and Accountability	1
	Eliminate disparities related to access, safety, affordability and health outcomes experienced by people of color and other historically marginalized communities.	Equitable Transportation	1
	Eliminate barriers that people of color, low-income people, youth, older adults, people with disabilities and other historically marginalized communities face to meeting their travel needs.	Equitable Transportation	2
Connect all people to the goods, services, and destinations they need through a variety of travel choices.	Increase the share of households in walkable, mixed-use areas served by current and planned frequent transit service.	Vibrant Communities	2
	Attract new businesses and family-wage jobs and retain those that are already located in the region while increasing the number and variety of jobs that households can reach within a reasonable travel time.	Shared Prosperity	3
	Increase household and job access to current and planned frequent transit service.	Transportation Choices	3
	Increase household and job access to planned regional bike and walk networks.	Transportation Choices	4

	<p>Implement policies, investments and actions identified in the adopted Climate Smart Strategy, including coordinating land use and transportation; making transit convenient, frequent, accessible and affordable; making biking and walking safe and convenient; and managing parking and travel demand.</p>	<p>Climate Leadership</p>	<p>1</p>
<p>Provide a transportation system that is reliable for all users.</p>	<p>Increase access to industry and freight intermodal facilities by a reliable and seamless freight transportation system that includes air cargo, pipeline, trucking, rail, and marine services to facilitate efficient and competitive shipping choices for goods movement in, to and from the region.</p>	<p>Shared Prosperity</p>	<p>2</p>
	<p>Maintain reasonable person-trip and freight mobility and reliable travel times for all modes in the region's mobility corridors, consistent with the designated modal functions of each facility and planned transit service within the corridor.</p>	<p>Reliability and Efficiency</p>	<p>1</p>
	<p>Increase the use of real-time data and decision-making systems to actively manage transit, freight, arterial and throughway corridors.</p>	<p>Reliability and Efficiency</p>	<p>2</p>
	<p>Increase the number of travelers, households and businesses with access to real-time comprehensive, integrated, and universally accessible travel information.</p>	<p>Reliability and Efficiency</p>	<p>3</p>
	<p>Reduce incident clearance times on the region's transit, arterial and throughway networks through improved traffic incident detection and response.</p>	<p>Reliability and Efficiency</p>	<p>4</p>
	<p>Expand the use of pricing strategies to manage vehicle congestion and encourage shared trips and use of transit.</p>	<p>Reliability and Efficiency</p>	<p>6</p>
	<p>Manage the supply and price of parking in order to increase shared trips and use of travel options and to support efficient use of urban land.</p>	<p>Reliability and Efficiency</p>	<p>7</p>
<p>Operate the system to be resilient to growth and disruptions.</p>	<p>Reduce the vulnerability of regional transportation infrastructure to natural disasters, climate change and hazardous incidents.</p>	<p>Safety and Security</p>	<p>3</p>
	<p>Protect fish and wildlife habitat and water resources from the negative impacts of transportation.</p>	<p>Healthy Environment</p>	<p>1</p>
	<p>Integrate green infrastructure strategies in transportation planning and design to avoid, minimize and mitigate adverse environmental impacts.</p>	<p>Healthy Environment</p>	<p>3</p>
	<p>Promote green infrastructure that benefits both climate and other environmental objectives, including improved stormwater management and wildlife habitat.</p>	<p>Climate Leadership</p>	<p>6</p>
	<p>Reduce vehicle miles traveled per capita.</p>	<p>Climate Leadership</p>	<p>3</p>



Support state efforts to transition Oregon to cleaner, low carbon fuels and increase the adoption of more fuel-efficient vehicles and alternative fuel vehicles, including electric and hydrogen vehicles.	Climate Leadership	4
Develop new revenue sources to prepare for increased demand for travel on the transportation system as our region grows.	Fiscal Stewardship	2

Table B3. Oregon Transportation Plan

2021 TSMO Strategy Goals	OTP Policy	OTP Goal	Objective #
Create a transportation system where all users are free from harm.	Provide access to healthy lifestyle options by supporting the ability of people to reach goods and services such as groceries, recreation, parks and natural areas, health care, and social opportunities via public transportation.	Health	1
	Plan for, design, and locate transit stops and stations to support safe and user-friendly facilities, including providing safe street crossings.	Safety and Security	1
	Provide for passenger and operator security on public transportation vehicles and at stops and stations through investments in facility design, amenities, appropriate security systems and personnel, and coordination with law enforcement staff.	Safety and Security	2
	Enhance the safety of public transportation through personnel training and education programs.	Safety and Security	3
	Promote public transportation as a safe travel option through public outreach campaigns and rider education programs.	Safety and Security	4
Collaborate as effective stewards of the transportation system.	Coordinate and enhance mobility management services and strategies to better coordinate services to enable riders and potential riders to use public transportation.	Mobility	4
	Encourage employers, educational institutions, and others to provide opportunities for employees' and clients' use of public transportation, carpool, vanpool, shuttles, and other shared rides.	Accessibility and Connectivity	4
	Integrate health considerations into public transportation planning and decision making at the local, regional, and state level.	Health	2
	Integrate public transportation agencies and personnel into emergency response and recovery planning and training activities to support resilience during and after natural disasters and other emergencies.	Safety and Security	6
	Support public transportation investments as a key approach to reducing greenhouse gas (GHG) emissions, as emphasized in state policy.	Environmental Sustainability	1
	Increase the use of public transportation by fully integrating public transportation with other community plans including transportation, land use, and economic development plans.	Land Use	1
	Invest strategically in maintenance, planning, transit service, and capital improvements to preserve and enhance public transportation.	Strategic Investment	1
	Foster creative investments and partnerships among public agencies and private organizations to improve the efficiency and effectiveness of public transportation services	Strategic Investment	2
	Pursue stable and consistent funding for public transportation operations and capital investments that maintain services and address identified needs.	Strategic Investment	3
Coordinate communication and marketing to promote knowledge and understanding of available public transportation services.	Communication, Collaboration, and Coordination	1	

Table B3. Oregon Transportation Plan

2021 TSMO Strategy Goals	OTP Policy	OTP Goal	Objective #
	Collaborate and share costs for resources, supplies, and services that can be used by multiple agencies.	Communication, Collaboration, and Coordination	2
	Identify and advance opportunities to share data resources and collection methods.	Communication, Collaboration, and Coordination	3
	Collaborate with various agencies, jurisdictions, and transportation providers in support of effective public transportation that is reliable and easy to use and helps meet state, regional, and community goals.	Communication, Collaboration, and Coordination	4
Eliminate the disparities in the transportation system experienced by black, indigenous, (and) people of color and low income individuals.	Enact fare policies that reflect the needs of the community served; ensure that public transportation fares are understandable and easy to pay	Mobility	3
	Enhance access to education and employment via public transportation.	Community Livability and Economic Vitality	1
	Promote the use of public transportation to foster greater community livability	Community Livability and Economic Vitality	3
	Engage populations recognized as transportation disadvantaged in public transportation service decision making.	Equity	1
	Understand and communicate how disparities, barriers, and needs affect the ability of people to access and use public transportation, especially those who are transportation disadvantaged.	Equity	2
	Identify disparities, barriers, and needs that impact people’s ability to access and use public transportation.	Equity	3
	Address the disparities, barriers, and needs that impact people’s ability to access and use public transportation.	Equity	4
	Integrate equity criteria into funding decisions.	Equity	5
Connect all people to the goods, services, and destinations they need through a variety of travel choices.	Increase the share of households in walkable, mixed-use areas served by current and planned frequent transit service.	Mobility	2
	Attract new businesses and family-wage jobs and retain those that are already located in the region while increasing the number and variety of jobs that households can reach within a reasonable travel time.	Accessibility and Connectivity	3
	Increase household and job access to current and planned frequent transit service.	Community Livability and Economic Vitality	3
	Increase household and job access to planned regional bike and walk networks.	Community Livability and Economic Vitality	4

Table B3. Oregon Transportation Plan

2021 TSMO Strategy Goals	OTP Policy	OTP Goal	Objective #
	Implement policies, investments and actions identified in the adopted Climate Smart Strategy, including coordinating land use and transportation; making transit convenient, frequent, accessible and affordable; making biking and walking safe and convenient; and managing parking and travel demand.	Land Use	1
Provide a transportation system that is reliable for all users.	Increase access to industry and freight intermodal facilities by a reliable and seamless freight transportation system that includes air cargo, pipeline, trucking, rail, and marine services to facilitate efficient and competitive shipping choices for goods movement in, to and from the region.	Accessibility and Connectivity	2
	Maintain reasonable person-trip and freight mobility and reliable travel times for all modes in the region’s mobility corridors, consistent with the designated modal functions of each facility and planned transit service within the corridor.	Equity	1
	Increase the use of real-time data and decision-making systems to actively manage transit, freight, arterial and throughway corridors.	Equity	2
	Increase the number of travelers, households and businesses with access to real-time comprehensive, integrated, and universally accessible travel information.	Equity	3
	Reduce incident clearance times on the region’s transit, arterial and throughway networks through improved traffic incident detection and response.	Equity	4
	Expand the use of pricing strategies to manage vehicle congestion and encourage shared trips and use of transit.	Equity	6
	Manage the supply and price of parking in order to increase shared trips and use of travel options and to support efficient use of urban land.	Equity	7
Operate the system to be resilient to growth and disruptions.	Reduce the vulnerability of regional transportation infrastructure to natural disasters, climate change and hazardous incidents.	Health	3
	Protect fish and wildlife habitat and water resources from the negative impacts of transportation.	Safety and Security	1
	Integrate green infrastructure strategies in transportation planning and design to avoid, minimize and mitigate adverse environmental impacts.	Safety and Security	3
	Promote green infrastructure that benefits both climate and other environmental objectives, including improved stormwater management and wildlife habitat.	Land Use	6
	Reduce vehicle miles traveled per capita.	Land Use	3
	Support state efforts to transition Oregon to cleaner, low carbon fuels and increase the adoption of more fuel-efficient vehicles and alternative fuel vehicles, including electric and hydrogen vehicles.	Land Use	4
	Develop new revenue sources to prepare for increased demand for travel on the transportation system as our region grows.	Communication, Collaboration, and Coordination	2

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Appendix D

Performance Measures Memo

Memorandum

Date: September 22, 2021

To: Caleb Winter, Metro and Scott Turnoy, ODOT

From: Briana Calhoun, Kara Hall, and Chris Grgich, Fehr & Peers

Subject: DRAFT Performance Measures for the 2021 Transportation Systems Management and Operations Strategy

PT20-0045 ODOT Key 21411

Introduction

Metro, the Oregon Department of Transportation (ODOT), and their partner agencies are collaborating to develop the 2021 Regional Transportation Systems Management and Operations Strategy (2021 TSMO Strategy).

The 2021 TSMO Strategy will be a key tool for implementing the Regional Transportation Plan and position the region to collaboratively manage the transportation system in a rapidly changing environment while advancing the RTP priorities for safety, equity, vibrant communities, shared prosperity, congestion management, and a healthy environment.

This memorandum introduces the performance measures developed for the six goals and 24 objectives for the 2021 TSMO Strategy. These performance measures make up the path the TSMO strategy will follow to achieve its vision, goals, and objectives. Development of the performance measures will be followed by the identification of targets to reach in ten years, and then discussions of supportive actions.



2021 TSMO Strategy Performance Measures

Seven performance measures were identified that will be used to measure progress toward the six goals and 24 objectives:

- VMT per Capita
- Number of Crashes by Severity
- Buffer Index
- Agency Collaboration and Communication Events



- System Connectivity
- Targeted TSMO Investments
- Timely Traveler Information

Rather than identifying a performance measure for each objective, these seven will help Metro to measure how well the TSMO strategy is advancing its goals without becoming a burden to track and report. Several of these measures are not restricted to TSMO planning but are broader indicators for the transportation system as a whole. The TSMO actions identified in the next steps of this process are ones that will be able to move the needle on these measures and indicate progress towards meeting the Strategy's goals.

The following section provides for each measure:

- A brief definition
- Which of the six TSMO goals the measure supports
- The key performance indicators (KPIs) that would be regularly tracked and reported by Metro.
- How these KPIs can be an indicator or proxy for other measures that will not be tracked or are outside of the scope of TSMO, and how they may relate to other measures in the document. Many measures are shown to correlate in a positive direction or negative direction to another measure. We refer to these as Direct (positive or upward) or Inverse (negative or downward)
- Related measures that are recommended for Metro and other agencies to consider tracking or do not have data available at this time.
- Whether the measure is already being used in other regional planning or monitoring efforts.

Vehicle Miles Traveled (VMT) per Capita

Vehicle Miles Traveled (VMT) per capita is a measure of the average number of auto miles driven per person within a given geography.



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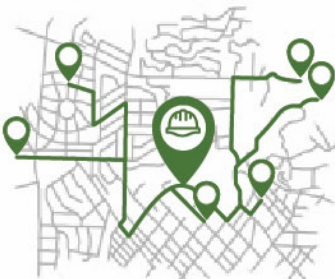
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Key Performance Indicators

Regional VMT per Capita. Regional VMT measures how much travelers are driving in the region. The measure is related to air toxins and greenhouse gas emissions, but does not account for vehicle electrification. Historically, VMT responded to economic changes (as the economy grew, so did VMT). However, as gas prices rose in 2008, VMT and the economy began to separate. VMT is still related to economics, and can represent upward economic movement, but new technology, higher seat utilization, and greater mobility choices can help reduce overall VMT, reducing recurring and non-recurring congestion. VMT can also be measured by geography determining an area's VMT generation and exposure.



VMT Exposure per Capita by Census Block Group. Exposure to VMT can result in increased air toxin exposure and higher crash risk. Historically, major routes have been constructed in BIPOC and Low-Income neighborhoods, disproportionately exposing those communities. Measuring VMT exposure tracks these impacts.



VMT Generation per Capita by Census Block Group. VMT generation can show that an area has grown economically, is attracting more employment, or that households that were transit dependent have the ability to choose an auto. VMT generation maybe much higher in locations where households own multiple vehicles, or in central business districts. Measuring generation by area will help identify what improvements are needed where.

Relationships

- Directly related to economic activity.
- Inversely related to the use of non-auto modes such as walking, biking, and transit.
- Directly related to crash risk.
- Directly related to the volume of cut through traffic.
- Inversely related to seat utilization.
- Directly related to total tailpipe air toxins and greenhouse gases.

Regional Use

This measure is used by numerous agencies, including Metro and PBOT¹, with the long-term target to reduce VMT in the region.² The Oregon Transportation Planning Rule (TPR) establishes VMT reduction targets for Transportation System Plans and Metro's Regional Transportation Plan (RTP) established a target of 10% reduction in VMT by 2040. VMT is currently not being reported by Transportation Analysis Zone³ or Census Block. Additional work is needed to determine exposure and generation by these metrics.

¹ Portland's TSP Policy 9.49.c aims to reduce the number of miles Portlanders travel by car to 11 miles per day or less, on average, by 2035.

² Greater Portland Area Daily VMT Per Capita 1990-2020: <https://www.oregonmetro.gov/transportation-system-monitoring-daily-vehicle-miles-travel>

³ A Transportation Analysis Zone (TAZ) is a unit of geography used in transportation planning and transportation models for aggregating traffic related data.

Number of Crashes by Severity

The number and rate of crashes by severity is a measure of transportation safety.



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Key Performance Indicators

Total Crashes per Million Vehicle Miles Traveled (MVMT) and per 100,000 Capita. Metro's Safety Strategy aims to eliminate serious crashes (crashes with life-changing injuries or fatalities) by 2035. Crashes on the transportation network cause non-recurring congestion, and fatal and serious injury crashes result in longer incident response times with sustained impacts. The TSMO Strategy aims to reduce harm and reduce the non-recurring congestion created by crashes by improving the safety of the system overall. Therefore, tracking total crashes should be evaluated in the following subsets:

- Crash rate by severity (crashes/MVMT/per 100,000 capita)⁴.
- Crash rate by mode (crashes/MVMT/per 100,000 capita).
- Crash frequency of fatal, pedestrian, and bicycle related crashes (number of crashes).
- Ratio of crashes that occur in equity focus areas to total regional crashes (percent) by severity.

Exploratory Metrics

Crash Demographics. Current crash demographics are not readily available.⁵ Metro's Safety Strategy identifies that "Traffic deaths are increasing and are disproportionately impacting people of color, people with low incomes and people over age 65." This metric would improve the region's understanding of the disproportional impacts of crashes, and how to correct them.

Crash Risk. Crash analysis is currently conducted using historical data and is therefore reactive. Technology and data sources are available to identify locations of increased crash risk before crashes occur but can be costly and privately owned. ODOT has recently conducted research on crash risk factors⁶ and these findings could be incorporated into future crash metrics. This metric would help the region be proactive in transportation safety improvements.

Secondary Crashes. Secondary crashes are those that occur at the scene of the original crash or in the queue, even in the opposite direction. Current crash reporting documents do distinguish between a primary and secondary crash. This metric would help Metro measure the region's ability to manage, clear, and reopen facilities following an incident.

Average Miles Biked or Walked. Pedestrian and Bicycle miles traveled are lower than the total vehicle miles traveled. Therefore, when evaluating pedestrian and bicycle crash rates per miles traveled data on the average trip length or total miles walked or biked, better correlates than the total miles traveled by vehicles in the region. A data source for this measurement needs to be researched and determined for this work. These could include traveler surveys or data from a third-party provider.

Relationships

- Inversely related to disproportional impacts of transportation on neighborhood safety.
- Directly related to the number BIPOC and people with lower incomes seriously injured or killed while using the transportation system.
- Directly related to the number of non-recurring congestion events related to crashes.
- Directly related to the amount of resources needed for incident management.

Regional Use

⁴ Consistent with the Regional Transportation Safety Strategy's annual reporting (see Chapter 6 Measuring Progress).

⁵ Demographics are not reported in ODOT crash reports. NHTSA Fatality Analysis Reporting System (FARS) include race and ethnicity, analyzed in ODOT's memo on Pedestrian Injury and Social Equity in Oregon: https://www.oregon.gov/odot/Safety/Documents/Pedestrian_Safety_and_Social_Equity.pdf

⁶ NCHRP 20-44(13) Implementation of NCHRP Research Report 893: The Oregon DOT Statewide Pedestrian and Bicycle Plan. <http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-44-13FinalReport.pdf>



Metro reports traffic fatalities and serious injuries regionally and by equity focus area in an annual safety performance report⁷ and the Metro Regional Transportation Plan and Regional Transportation Safety Strategy targets eliminating all fatalities and serious injury crashes by 2035. The City of Portland's Transportation System Plan aims to eliminate deaths and serious injuries for all who share Portland streets by 2025⁸. While demographics are not reported in the existing DMV crash reports, the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) includes race and ethnicity.

⁷ <https://www.oregonmetro.gov/sites/default/files/2021/03/04/Metro-safety-annual-performance-report-2015-2019.pdf>

⁸ TSP Policy 9.49.a https://www.portland.gov/sites/default/files/2020-05/chapter2.tsp_03.06.2020.pdf

Buffer Index

The extra time a traveler adds to their trip (buffer) to ensure on-time arrival.



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Key Performance Indicators

Buffer Index. Travel time reliability is measured by taking the ratio of the longest to shortest duration trips for trips of the same distance on the network. Buffer index measures is the variability between 90th-percentile and 10th-percentile or run time for transit, or between the 95th percentile and average travel time for vehicles⁹, as calculated by the following equation:

$$\frac{90th-Percentile - 10th-Percentile}{10th-Percentile} = Transit Buffer Index (\%)$$

$$\frac{95th-Percentile - 50th-Percentile}{50th-Percentile} = Vehicle Buffer Index (\%)$$

A higher percent value indicates a higher degree of variability during congested hours. Buffer index can measure by mode, and the TSMO strategy will report on changes to Transit Buffer Index and Vehicle Buffer Index:

- Transit Buffer Index for Frequent Bus Routes & Light Rail¹⁰
- Transit Buffer Index for BIPOC and Low-Income Service Routes
- Vehicle Buffer Index for Throughway Segments and Major Arterials¹¹
- Freight Buffer Index for Regional Intermodal Connectors¹²

Relationships

- Directly related to the reliability of transit routes and on time performance.
- Directly related to congested areas that delay transit.
- Directly related to transit run time variability
- Directly related to the reliability of routes in a corridor.
- Inversely related to elapsed total time in which responders are able to clear incidents from roadways, railroads and transit tracks.

Regional Use

ODOT reports buffer time in their traffic performance report¹³, with breakdowns by time of day and for major highway corridors designated as Throughway in the Metro Regional Transportation Plan. They also report the average and percentile travel times on key ODOT facilities as part of their TSMO performance measures¹⁴.

TriMet reports on-time performance for their vehicles¹⁵, and the Enhanced Transit Concept from PBOT includes peak delay and run time variability as key performance measures for enhanced transit. Metro reports excessive delay and travel time reliability in their regional barometer¹⁶, and the City of Portland

⁹ FHWA recommends a number of reliability metrics including the ones listed above.
https://ops.fhwa.dot.gov/publications/tt_reliability/ttr_report.htm

¹⁰ As defined by TriMet, Frequent Service bus lines and MAX Light Rail run every 15 minutes or less most of the day, every day. <https://trimet.org/schedules/frequentservice.htm>

¹¹ [Throughways](#) and Major Arterials are defined on the RTP Motor Vehicle Network Map:
<https://drcmetro.maps.arcgis.com/apps/MapSeries/index.html?appid=9057331682354a188ecec2688071239f>

¹² As defined in Chapter 3 the Metro RTP (2018) and Metro Regional Freight Strategy (2018).
<https://www.oregonmetro.gov/sites/default/files/2019/09/20/Regional-Freight-Strategy-FINAL-091919.pdf>

¹³ <https://www.oregon.gov/ODOT/Projects/Project%20Documents/2018TrafficPerformanceReport.pdf>

¹⁴ https://www.oregon.gov/odot/Maintenance/Documents/ITS%20Plans%20and%20Reports/ODOT-Operations%20Program%20Performance%20Management%20Plan-June%202021_r6.pdf

¹⁵ TriMet's FY 2021-2025 Business Plan has a target of time performance of 85% for bus, 90% for Max, 93.5% for LIFT, and 95% for WES for FY2022. They also have a target that the on-time performance on minority and low-income lines is better than or within 5 percent of non-minority and non-low income lines
<https://trimet.org/about/dashboard/index.htm>

¹⁶ <https://regionalbarometer.oregonmetro.gov/pages/transportation-reliability>

reports truck minutes of delay and the ratio of congested speed to posted speed in the Freight Master Plan.

Agency Collaboration and Communication Events

How often agency staff are collaborating and communicating progress towards TSMO Goals.



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Key Performance Indicators

Percent of Public Engagement Activities that Involved BIPOC, Low Income, and Historically Marginalized Communities. Metro and their agency partners develop transportation solutions that serve the entire community. The solutions aim to correct historically disproportional impacts to BIPOC and Low-Income neighborhoods. **This relies on creating meaningful opportunities for these communities to participate in the decision making.**

Percent of Agencies Reporting & Sharing Data Metrics Annually. Data sharing is vital to collaboration across jurisdictional boundaries. Data should easily be available and in stored a central system (like the PDX Data Portal) to public and agencies within the region.

Average number of agencies and community groups involved in completed TSMO projects. Agency involvement is defined as participation in a management team, stakeholder groups, and/or technical reviews.

Exploratory Metrics

Number of Coordination Events and Number of Agencies Involved. Coordination between agencies can take a variety of forms. Making connections across departments and agency boundaries deepens the level of knowledge and empathy for the work and challenges staff face across the region. Coordination events build relationships and communication paths that lead to information sharing that allow agencies to be more agile and responsive in a rapidly changing environment.

Relationships

- Directly related to documenting agreed upon data standards, data collection and active (i.e., time-based) data sharing
- Directly related to improved collaboration & coordination.
- Coordination events can be inter-agency, or intra-agency across department lines

Regional Use

No regional agencies use this metric at this time. Federal Highway Administration Operations offers Capability Maturity Frameworks¹⁷ and supports collaboration through regional workshops. Several agencies have public involvement plans or policies, and TransPort is a regularly well attended meeting.

¹⁷ FHWA Capability Maturity information and links: <https://ops.fhwa.dot.gov/publications/fhwahop16031/index.htm>

System Connectivity

How complete and connected the infrastructure system is for each travel mode.



Key Performance Indicators

Percent of Signals with Communications. Installing communications across signals allows for connection to a central signal system, improved data collection, and signal management and operations. These connections should be prioritized for signals on regional important routes, including:

- Frequent service bus lines
- Arterials serving equity focus areas¹⁸
- Throughway Segments and Major Arterials
- Regional Intermodal Connectors

Connectivity Index of Infrastructure. A connectivity index is the comparison of 30-minute travel shed on the existing network as compared to an ideal grid network. A high connectivity index represents redundancy in the transportation network that can reduce the impacts of unforeseen events and the non-recurring congestion those events can cause. For examples, a high connectivity index for bicycles represents an alternative route when trails are flooded, or bridges are raised. A high connectivity index for vehicles could present shorter trips through neighborhoods, or alternative routes in regions impacted by natural disasters such as forest fire or mudslides. Connectivity Index should be measured mode and geography, including:

- for active transportation modes (pedestrian, bicycle) by route level of stress;
- for vehicular modes; and
- measured by census block, breaking out equity focus areas, regional centers, and town centers.

Percent of Households and Employers within 10-minute Walk or Bike Travel Shed from Transit.

This measurement determines how easily travelers can access and interface with transit by low-stress bicycle and walking routes. The 10-minute walk or bike travel shed shows how far from transit a traveler can live but still have reasonable access to the system. The walk and bike travel shed connectivity using the existing system, assuming travelers are only able to use identified low-stress and accessible bike and walking routes. The metrics should be measured by census block, and affordability breaking out equity focus areas, regional centers, and town centers.

Relationships

- Indirectly related to sidewalk and bicycle system gaps.
- Directly related to access to transit, jobs, and services.
- Directly related to miles of infrastructure by mode in Equity Focus Areas where field devices are connected to centers.
- Directly related to systems infrastructure such as bicycle, pedestrian, and transit signal priority or stop amenities.
- Directly related to walking and biking network completeness
- Directly related to geographic transit coverage

Regional Use

¹⁸ <https://www.oregonmetro.gov/sites/default/files/2019/03/13/Transportation-Equity-Evaluation-Final-3.12.19.pdf>



The Metro RTP has specific targets for system completeness¹⁹. TriMet's Business Plan also has targets for the percent of housing and employment within walking distance of transit²⁰. ODOT's Operations Program Performance Management Plan aims to connect all ODOT signals by 2026.

¹⁹ The 2018 RTP target for system completeness is to complete 100 percent of the regional network of sidewalks, bikeways and trails by 2040.

²⁰ The FY2021-2025 target is that the percentage of housing development and employment within walking distance of MAX, Division Transit Project, and Frequent Service bus is greater than or equal to the previous year.

Targeted TSMO Investments

How investments are distributed regionally and on key corridors for modal efficiency.



Key Performance Indicators

Percent of TSMO Investments benefiting key corridors. Where TSMO investments are made is an indication of who is benefiting from the efficiencies that result from this strategy. To ensure those efficiencies are realized in an equitable way, and to match the priorities and values of the region, the distribution of the investments should be measured through the life of the strategy. This strategy will track where investment benefit the following types of corridors as defined by other regional plans.

- Regional Emergency Transportation Routes²¹
- Enhanced Transit Corridors²² & Frequent Bus Routes²³
- Equity Focus Areas
- Regional Intermodal Connectors
- Throughway Segments and Major Arterials

Relationships

- Directly related to increasing reliability, access, and safety on intermodal connectors and other freight routes
- Directly related to economic gains from greater freight access
- Directly related to truck drivers finding places to park for required rest periods²⁴
- Directly related to collaboration across jurisdictions as Mobility Corridors cross jurisdictional boundaries and connect cities and counties.
- Directly related to transportation operator's ability to integrate corridor management²⁵
- Directly related to an equitable distribution of resources and ensuring that Equity Focus Areas are receiving equal or greater investment than the regional average.
- Directly related to resiliency of key facilities such as bridges
- Directly related to preparation for short- and long-term disruptions
- Directly related to improving reliability for high frequency transit
- Directly related to transit signal priority investments

Regional Use

No regional agencies use this metric at this time, though Metro's Regional Flexible Funding Allocation evaluates projects in part based on whether they develop specific arterial freight routes or make improvements on a travel corridor.

²¹ <https://rdpo.net/emergency-transportation-routes>

²² PBOT's Enhanced Transit Corridors documentation. <https://www.portlandoregon.gov/transportation/73684>

²³ The RTP Regional Transit Network concept is section 3.6.2

²⁴ Oregon Commercial Truck Parking Study in 2020: <https://www.oregon.gov/odot/Projects/Pages/Commercial-Truck-Parking-Study.aspx>

²⁵ An example is the I-84 Multimodal ICM study: <https://www.oregonmetro.gov/multimodal-integrated-corridor-management>



Timely Traveler Information

How effectively information is being relayed to travelers to reduce delay associated with planned or unexpected events.



Eliminate Disparities



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Key Performance Indicators

Percent of transit shelters with functional real-time arrival displays. Travelers without access to smart phones or on-line data sources at bus stop locations may not be aware of transit delays or missed buses. Shelters are installed at high frequency and high ridership locations as identified by the transit operators. Ensuring these locations have on-time arrival displays can provide travelers with needed information. Ensuring that these displays are functional and continue to operate is key to ensuring the maintenance of the system moving forward. These should be reported as a total for the region and for equity focus areas.

Number of Agencies with a Traveler Information System (TIS) plan. Metro and their partner agencies regularly provide information to the public around both planned and unexpected incidents. The creation of a TIS plan will help agencies to be prepared to rapidly distribute information to travelers about detours, closures, and hazardous conditions. The plan should at a minimum include standards for communication in a variety of languages and an equitable variety of communication channels.

Exploratory Metrics

Non-recurring delay associated with incidents. It is currently difficult to quantify and report non-recurring delay that is associated with specific incidents such as a crash. Exploring new data sources that can measure this delay would enable Metro to better understand whether their travel notifications are successful rerouting drivers and what share of delay is associated with recurring versus non-recurring congestion.

Data Sharing with Connected & Automated Vehicles (CAV), Smart Phones, and Mobility Devices. CAV technology enables a new level of traveler communication through in-vehicle data sharing. That data sharing also extends to specific Smart Phone apps, and other smart mobility devices. Applications include Mobility on Demand, Mobility as a Service, on-board notifications of traffic incidents, dangerous queues, or other roadway hazards. Mobility data can also be used to identify and report hard braking and other behaviors related to unexpected delays and non-recurring congestion. These data sources should be researched, with specific attention given to impacts to equity, safety, reliability, and cost.

Number of Buildings in Town Centers and Regional Centers with Real Time Traveler Information. Several third-party vendors provide systems with real time traveler information that is often available through smart phone applications or other mobility devices. Not all travelers have access to smart phones or other personal mobility technology, therefore providing real time traveler information can help notify travelers of conditions of closures before they begin their journey.

Relationships

- Directly related to the non-recurring congestion associated with both planned and unexpected events.
- Directly related to traveler happiness and comfort using the system.

Regional Use

TriMet's Business Plan includes a key strategic action to "implement enhanced information to customers through technology advances and communications strategies", which includes expanding digital



information displays at stops and on-board transit vehicles²⁶. ODOT reports four performance measures for traveler information: number of people visiting ODOT communication outlets, ATIS notification delay, major incidents with no message (ATIS), and critical station on-time report²⁷.

²⁶ https://trimet.org/businessplan/pdf/TriMet_BusinessPlan_FY21_FINAL.pdf

²⁷ https://www.oregon.gov/odot/Maintenance/Documents/ITS%20Plans%20and%20Reports/ODOT-Operations%20Program%20Performance%20Management%20Plan-June%202021_r6.pdf

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Appendix E
Actions Memo

Memorandum

Date: September 22, 2021

To: Caleb Winter, Metro and Scott Turnoy, ODOT

From: Briana Calhoun, Kara Hall, and Chris Grgich, Fehr & Peers

Subject: DRAFT Actions for the 2021 Transportation Systems Management and Operations Strategy

PT20-0045 ODOT Key 21411

Introduction

Metro, the Oregon Department of Transportation (ODOT), and their partner agencies are collaborating to develop the 2021 Regional Transportation Systems Management and Operations Strategy (2021 TSMO Strategy).

The 2021 TSMO Strategy will be a key tool for implementing the Regional Transportation Plan and position the region to collaboratively manage the transportation system in a rapidly changing environment while advancing the RTP priorities for safety, equity, vibrant communities, shared prosperity, congestion management, and a healthy environment.

This memorandum introduces the actions developed for the 2021 TSMO Strategy. These actions are the final step in the strategy creation and lay out practical, concrete steps for Metro and the regional partners to undertake during the ten year timeframe of the plan to meet the TSMO goals.



Development of the Actions

The project team worked with the stakeholders to develop and evaluate several actions related to the identified objectives for the project. To begin, a list of actions was developed to accomplish each of the strategy's objectives. This draft list of actions was refined by working with the stakeholder group. They stake holders were also given 3 votes actions related to each goal, in order to help the group determine the priority of actions given limited resources. The group also had the option to rewrite, remove, and or add to the actions initially drafted.

The process led to nearly 100 draft actions for the strategy. The stakeholder group noted that several of these actions were related, redundant, or supported each other. Following the stakeholder workshops, the project team then resorted the draft actions that were similar or redundant, to create a single overall action that included the aspects of the smaller more pointed actions. This was accomplished by physically cutting and pasting the actions into groups, listing what objectives each sub-action was meant to accomplish. Figure 1 shows some key points of the refinement process.

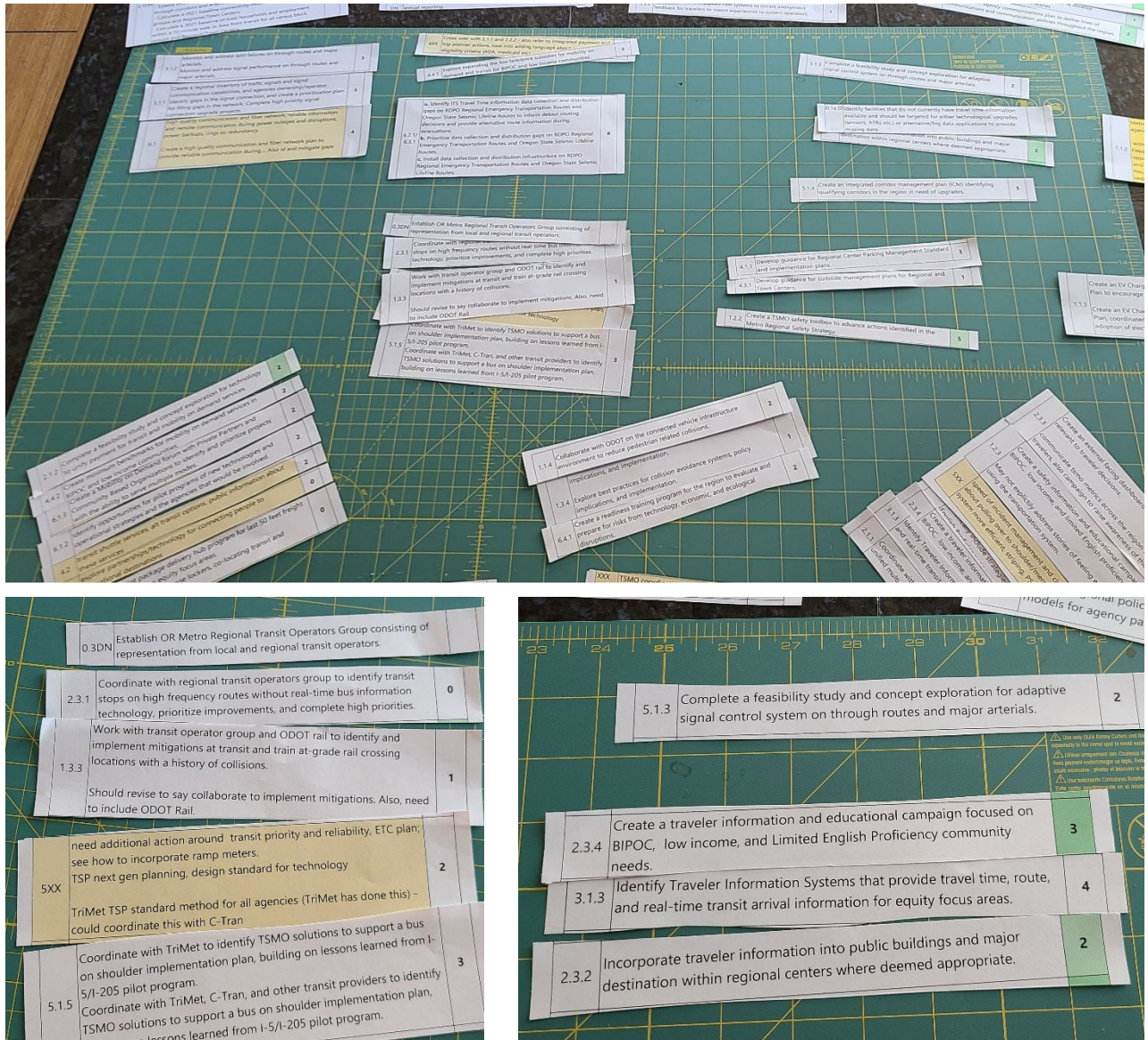


Figure 1: TSMO Action Development Process

These actions continued to be refined with input from TransPort, agency partners, and Metro staff.

2021 TSMO Strategy Actions

21 TSMO Actions were identified by the Regional TSMO Stakeholders. These actions were sorted into:

- Planning
- Concepts, Capabilities, & Infrastructure
- Listening & Accountability
- Data Needs

Each action was given a priority and completion timeline, as well as an agency that would track and report the action progress over the life of the plan.

These actions are meant to be a starting direction for the Regional TSMO Strategy. Over the course of the plan, if progress is not being measured on the strategy's objectives, the actions should be revised to better meet the region's needs.

The TSMO Strategy Actions are:

1. Establish TSMO performance measures baseline.
2. Inventory and manage regional signal and ITS communication infrastructure.
3. Develop a Mobility on Demand strategy and policy.
4. Manage transportation assets to secure the network.
5. Pilot Origin-Destination data to prioritize TSMO investments.
6. Track and prioritize TSMO Investments in BIPOC and low-income communities.
7. Continue freight technology and ITS deployment.
8. Facilitate Ground Truthing of Emerging Technologies.
9. Establish a Regional Transit Operators TSMO Group.
10. Unify and standardize fare subsidies for transit and MOD.
11. Develop an ITS travel time Information Data Collection and Distribution Plan for RDPO Regional Emergency Routes.
12. Explore new TSMO data sources.
13. Create a community listening program.
14. Create continuous improvement process for existing and new signal systems and related performance.
15. Deploy regional traveler information systems.
16. Implement Integrated Corridor Management and mainstream into corridor planning.
17. Create a TSMO Safety Toolbox.
18. Participate in regional public outreach to assist in guiding, listening, and learning through TSMO-focused conversations.
19. Improve TSMO data availability to aid in traveler decisions and behavior.
20. Plan for and use a TSMO Toolbox to connect gaps in bicycle and pedestrian infrastructure.
21. Update the Regional ITS Architecture.



1. Establish TSMO performance measures baseline.

Planning

Action Description:

Create a baseline for measuring regional TSMO performance and advancement by:

- Mapping regionally significant routes as identified in other Metro planning documents where TSMO Metrics will be reported. These should include state routes, freight routes, transit routes, emergency transportation routes, and Mobility Corridors.
- Summarize findings from TSMO project before/after studies.
- Establish a standard calculation for VMT exposure and generation by census block and calculate a baseline for census blocks within the region.
- Extend bicycle and pedestrian Level of Traffic Stress (LTS) threshold and inventory existing LTS for through corridors and arterials.
- Calculate a 2021 baseline connectivity index for all census block groups, downtowns (Regional and Town Centers) and main streets, informed by community-identified barriers to connectivity.
- Calculate a 2021 baseline of total households and employment within a 10-minute walk or bike from transit for all census block groups and Regional/Town Centers.
- Identify gaps on routes where travel time information is needed for calculating reliability (e.g., buffer index).

Priority:

Low: required but not urgent
(SAC did not vote on this item)

Timeline:

Near: 2021-2023; in coordination with RTP update

Tracked by:

Metro and ODOT

Further Objectives:

This data is needed to track the identified TSMO performance metrics.

References to other Plans and Projects:

[Subcontract: NCHRP 17-87 Enhancing Pedestrian Volume Estimation and Developing HCM Pedestrian Methodologies for Safe and Sustainable Communities](#)



2. Inventory and manage regional signal and ITS communication infrastructure.

Concepts, Capabilities, and Infrastructure

Action Description:

- Create a regional inventory of traffic signal capabilities by location and operator (e.g., connected to central signal system, utilizing Next Generation Transit Signal Priority, serving freight, sensing bike and ped movements).
- Using the inventory, plan for a high quality, reliable, and redundant signal communication network by identifying gaps and prioritizing projects.
- Upgrade traffic signals and communication networks on regionally significant corridors to meet the needs of advanced applications such as Next-Generation Transit Signal Priority (NextGen TSP) and Automated Traffic Signal Performance Measures (ATSPM) that require Advanced Transportation Controllers (ATCs) and fiber optic communication.
- Monitor and address signal performance on regionally significant corridors by identifying performance issues such as freight delay, transit delay, or high pedestrian and bicycle traffic stress.

Priority:

10 Stakeholder Advisory Committee (SAC)
High – to ensure the benefits of Next Generation Transit Signal Priority are extended region-wide

Timeline:

Ongoing
Milestone: September 2022
Division Transit Project

Tracked by:

PBOT (TransPort’s Central Signal TransPort Subcommittee) – led by Chair

Further Objectives:

5.1) Manage recurring and non-recurring congestion to improve travel time reliability for all users, including active transportation, transit, and freight.

6.2) Manage projects and resources to be responsive to changes in land use planning and growth patterns.

References to other Plans and Projects:

[Road User Understanding of Bicycle Signal Faces on Traffic Signals](#)

[Improved Safety and Efficiency of Protected/Permitted Right Turns in Oregon](#)

[Improving Walkability Through Control Strategies at Signalized Intersections](#)

[Addressing Bicycle-Vehicle Conflicts with Alternate Signal Control Strategies](#)

[Incorporating Pedestrian Considerations into Signal Timing](#)

[Operational Guidance for Bicycle-Specific Traffic Signals](#)



3. Develop a Mobility on Demand strategy and policy.

Planning

Action Description:

Create a Regional Mobility on Demand (MOD) Working Group consisting of agency staff, transportation demand management non-profits (e.g., Transportation Management Associations), private partners, university researchers, and community-based organizations to:

- Build on existing regional policy conversations in support of mobility partnerships, and technology solutions for last-mile connections.
- Participate in expanding access through micro-freight delivery (curb side delivery such as on-line purchases, food delivery apps, etc.).
- Coordinate with parking managers to improve operations particularly in downtowns and along main streets (e.g., Regional and Town Centers).
- Examine benchmarks set for shared mobility services (such as the [PBOT Scooter Policy](#)) by partner agencies and establish regional minimum level of service benchmarks for MOD service in equity focus areas connecting to opportunities, BIPOC, and low-income communities.
- Evaluate unified payment strategy and related policies, including congestion pricing, as they function to provide demand and system management through MOD, transit and connected travel options.
- Establish a strategy for connecting people to recreational destinations not well served by traditional transit during off-peak service hours.
- Identify opportunities for pilots to connect people to MOD and support them through programs with MOD service providers.
- Develop a pilot package delivery hub program for the "last 50 feet freight delivery", focusing on equity focus areas, incorporating guidance on siting package lockers, and the ability to co-locate with transit and other services.
- Develop communications with travelers to inform more travelers about these choices.
- Establish public-agency person-to-person lines of communication, formal agreements as necessary, pre-planned emergency needs, and information flows supportive of MOD operations.
- Use information flows with forecast models to optimize traveler's experience and MOD operator logistics.

Priority:

10 SAC Votes
High

Timeline:

Near: 2022-2024
Milestone: forming working group

Responsibility:

Metro convenes across planners and operators

Identify appropriate ODOT contacts for tasks to act in a supporting role.

Further Objectives:

- 2.1) Ensure historically marginalized communities and people of color benefit from safety improvements.
- 2.4) Improve inter-agency & intra-agency collaboration to ensure efficient operations by identifying and addressing barriers in communication when making decisions about network operation or expansion.
- 4.1) Connect decentralized travel options to facilitate viable destinations in Regional Centers, Town Centers, and employment areas outside downtown Portland.
- 4.2) Prioritize the completion and expansion of planned transit and active mode networks when investing discretionary revenues especially to destinations with limited travel choices.



- 4.3) Connect goods and delivery services to people and businesses by providing for and managing last mile connections for goods delivery.
- 4.4) Increase availability and accessibility of low-cost transportation options in historically marginalized communities.
- 6.1) Plan and design a flexible transportation network that can adapt to new technology and travel choices that are consistent with the region's desired land use and transportation outcomes.
- 6.2) Manage projects and resources to be responsive to changes in land use planning and growth patterns.
- 6.4) Provide public agency staff with the data, tools, models, and training needed to assess long-term disruptive transportation trends.

References to other Plans and Projects:

[Evaluation of Portland Shared E-Scooter Pilot Program Goals and Outcomes](#)

[Delivering Packages at Transit Stations: Considering Accessibility and Equity in Site Placement](#)

[New Mobility For All: Can Targeted Information and Incentives Help Underserved Communities Realize The Potential of Emerging Mobility Options?](#)

[Marginalized Populations' Access to Transit: Journeys from Home and Work to Transit](#)

[NSF Collaborative Research: RAPID: Maintain Mobility and Reduce Infection Through a Resilient Transit and Micromobility System](#)

[National Scan of Bike Share Equity Programs](#)

[Novel Approaches to Model Travel Behavior and Sustainability Impacts on E-Bike Use](#)

[The E-Bike Potential: How E-Bikes Can Improve Sustainable Transportation](#)

[How Technology Can Affect the Demand for Bicycle Transportation: The state of technology and projected applications of connected bicycles](#)

ODOT TripCheck



4. Manage transportation assets to secure the network.

Concepts, Capabilities, and Infrastructure

Action Description:

Secure the network from natural disasters and other disruptions by physically securing the infrastructure, identifying end of life equipment, and replacing it proactively.

Priority:

5 SAC Votes
High

Timeline:

Ongoing

Responsibility:

Individual Agency Responsibilities
(ITS-NMT group TransPort subcommittee), depending on assets included in this task

Further Objectives:

- 2.2) Collaborate with emergency management when prioritizing investments on key emergency response routes.
- 6.3) Minimize long term disruptions to the transportation system by creating resiliency to climate change and economic shifts.

References to other Plans and Projects:

[Smart, Shared, and Social: Enhancing All-Hazards Transportation Recovery Plans with Demand Management Strategies and Technologies](#)

[Rapid Transportation Structure Evaluation Toolkit](#)

[Integrate Socioeconomic Vulnerability for Resilient Transportation Infrastructure Planning](#)



5. Pilot Origin-Destination data to prioritize TSMO investments.

Planning

Action Description:

- Identify data sources and obtain Origin-Destination (OD) data to determine the highest use trip pairs in the region, pairs with the greatest trip lengths, pairs with a trip end in an equity focus area, and pairs without existing transit connections for use in planning and project prioritization.
- Use the data to identify TSMO upgrades that benefit multiple modes and are adaptable to emerging technologies (i.e., charging stations for e-bikes and EVs, controller upgrades that allow for varying communication systems).
- Create an active system of OD collection, monitoring, and reporting.

Priority:

7 SAC Votes
Medium

Timeline:

Mid: 2023-2025

Responsibility:

Metro considers pilot with partners
Supportive role for ODOT

Further Objectives:

- 4.2) Prioritize the completion and expansion of planned transit and active mode networks when investing discretionary revenues especially to destinations with limited travel choices.
- 5.2) Expand travel time reliability improvements for people of color and historically marginalized communities burdened with long travel distances.
- 6.1) Plan and design a flexible transportation network that can adapt to new technology and travel choices that are consistent with the region’s desired land use and transportation outcomes.
- 6.4) Provide public agency staff with the data, tools, models, and training needed to assess long-term disruptive transportation trends.

References to other Plans and Projects:

[Reducing VMT, Encouraging Walk Trips, and Facilitating Efficient Trip Chains through Polycentric Development](#)

[Revisiting TODs: How Subsequent Development Affects the Travel Behavior of Residents in Existing Transit-Oriented Developments](#)



6. Track and prioritize TSMO Investments in BIPOC and low-income communities.

Listening & Accountability

Action Description:

- Create a priority process that listens for TSMO needs, projects, and guides funding allocation to prioritize investments for and/or in BIPOC and people with lower income.
- Review and update TSMO discretionary revenue prioritization to reflect the 2021 TSMO Strategy's updated goals and objectives.
- Evaluate TSMO prior investments from the last 10 years and identify disparities for BIPOC and low-income communities.
- Identify and multimodal connectivity disparities to target future TSMO investments.
- Track TSMO investments in equity focus areas and report bi-annually.

Priority:

6 SAC Votes
High

Timeline:

Near: 2021-2023
Milestone: RTP Update

Responsibility:

Metro, ODOT, and a third-party

Further Objectives:

- 1.4) Ensure people of color and historically marginalized communities can safely access multiple low stress mode choices and routes within the transportation system by improving access to transit stops, pedestrian, and bicycle facilities.
- 3.2) Identify and correct past disparities when planning, operating, and maintaining the transportation system (e.g., transit access, air toxins exposure, allocation of funds).
- 4.2) Prioritize the completion and expansion of planned transit and active mode networks when investing discretionary revenues especially to destinations with limited travel choices.

References to other Plans and Projects:

[Addressing Changing Demographics in Environmental Justice Analysis, State of Practice](#)



7. Continue freight technology and ITS deployment.

Concepts, Capabilities, and Infrastructure

Action Description:

- Utilize existing and pilot new freight ITS technologies that identifies solutions to optimize freight operations and improve safety on critical corridors, such as optimizing progression for trucks, progress to pilot programs, freight dilemma zone detection and green extension.
- Share TSMO-generated data resources broadly with start-ups and established freight services.

Priority:

2 SAC Votes
Medium

Timeline:

Medium: 2021-2027

Responsibility:

All Agency Operators

Further Objectives:

- 4.3) Connect goods and delivery services to people and businesses by providing for and managing last mile connections for goods delivery.
- 5.3) Manage critical freight corridors to create reliable routes for freight movement between key destinations.

References to other Plans and Projects:

[Delivering Packages at Transit Stations: Considering Accessibility and Equity in Site Placement](#)

[Application of Smart Phone Truck Data for Freight Performance Measures and Transportation Planning](#)

[Real-Time Stochastic Matching Models for Freight Electronic Marketplace](#)

Metro convenes regional freight planning <https://www.oregonmetro.gov/regional-freight-plan> and City of Portland convenes a Freight Committee <https://www.portlandoregon.gov/transportation/54899>.

Safety measures for commercial vehicle drivers now include limitations that can cause issues including semi-trucks parking in undesignated areas. This was studied statewide with recommendations for the Portland region <https://www.oregon.gov/odot/Projects/Pages/Commercial-Truck-Parking-Study.aspx>



8. Facilitate Ground Truthing of Emerging Technologies.

Concepts, Capabilities, and Infrastructure

Action Description:

Respond to community-voiced needs to initiate agency partnerships to test emerging technologies. Consider efforts in context provided by the forthcoming Metro Emerging Trends Study. Consider these as examples, recognizing that more pilots are needed to keep pace with technology advancements:

- Collaborate with ODOT on the connected vehicle infrastructure environment to reduce pedestrian related collisions.
- Explore best practices for collision avoidance systems, policy implications, and implementation.
- Create a readiness training program for the region to evaluate and prepare for risks from technology, economic, and ecological disruptions.
- Identify solutions to changes in growth patterns, travel behavior, and other non-emergency travel trends.
- Partner to increase mobility with electric vehicle (EV) adoption, including e-bikes, shared vehicles, and fleets. EVs relate to connectivity index in equity focused areas, downtowns (Regional and Town Centers), main streets and employment areas.
- Collect and evaluate safety and operational performance metrics for multimodal users (including pedestrians, bicyclists, and transit) through emerging detection technologies
- Partner with regional university transportation research centers in identifying and implementing projects exploring emerging technologies and data sources.

Priority:

7 SAC Votes
Medium

Timeline:

Ongoing
Milestone: Metro Emerging Trends Study

Responsibility:

Washington County, ODOT, PBOT, and Portland State University (PSU) Transportation Research & Education Center (TREC)

Further Objectives:

- 1.1) Manage the transportation system to reduce negative health impacts so that public health risk does not adversely affect people's mode choice.
- 1.3) Provide a transportation system where human error does not result in serious injury or loss of life.
- 4.4) Increase availability and accessibility of low-cost transportation options in historically marginalized communities.
- 6.1) Plan and design a flexible transportation network that can adapt to new technology and travel choices that are consistent with the region's desired land use and transportation outcomes.
- 6.4) Provide public agency staff with the data, tools, models, and training needed to assess long-term disruptive transportation trends.



References to other Plans and Projects:

[Exploring Data Fusion Techniques to Derive Bicycle Volumes on a Network](#)

[New Mobility For All: Can Targeted Information and Incentives Help Underserved Communities Realize The Potential of Emerging Mobility Options?](#)

[Integrate Socioeconomic Vulnerability for Resilient Transportation Infrastructure Planning](#)

[Exploring the Use of Crowdsourced Data Sources for Pedestrian Count Estimations](#)

The Federal Highway Administration supports research and innovation at the national level <https://highways.dot.gov/research> and in partnership with FHWA's Oregon Division. This includes testing new devices in the context of the Manual on Uniform Traffic Control Devices (MUTCD). ODOT's Office of Innovation is also leading on connected vehicle technology, road usage charging and more. <https://www.oregon.gov/odot/Programs/Pages/OfficeOfInnovation.aspx>



9. Establish a Regional Transit Operators TSMO Group.

Concepts, Capabilities, and Infrastructure

Action Description:

Establish a Metro Regional Transit Operators TSMO Group as a subcommittee of Transport consisting of representation from local and regional transit operators. Collaborate with the group to:

- Identify transit stops on high frequency routes without real-time bus information technology, prioritize improvements, and complete high priorities.
- Identify and implement mitigations at transit and train at-grade rail crossing locations with a history of collisions.
- Review and Regional NextGen Transit Signal Priority (TSP) projects and develop a coordination standard for deploying TSP throughout the region.
- Coordinate with TriMet to identify TSMO solutions to support a bus on shoulder implementation plan, building on lessons learned from I-5/I-205 pilot program.
- Inform and review speed and reliability project need and solutions.
- Create a standard for reviewing and deploying new technology.

Priority:

6 SAC Votes
High

Timeline:

Ongoing

Responsibility:

TriMet
ODOT has supporting role focused on rail crossings, passenger rail, signal prioritization

Further Objectives:

- 1.3) Provide a transportation system where human error does not result in serious injury or loss of life
- 2.3) Collaborate with emergency management when prioritizing investments on key emergency response routes.
- 5.1) Manage recurring and non-recurring congestion to improve travel time reliability for all users, including active transportation, transit, and freight.
- 5.2) Expand travel time reliability improvements for people of color and historically marginalized communities burdened with long travel distances.
- 5.4) Communicate expected changes in reliability so that travelers can make informed travel choices.

References to other Plans and Projects:

- [Evaluation of Road User Comprehension and Compliance with Red Colored Transit Priority Lanes](#)
- [The Connection Between Investments in Bus Stops, Ridership, and ADA Accessibility](#)

10. Unify and standardize fare subsidies for transit and MOD.

Concepts, Capabilities, and Infrastructure

Action Description:

- Create a policy that includes standardized eligibility criteria with regard for ADA, Medicaid, and other assistance programs. Utilize existing efforts such as the General Transit Feed Specification for Eligibilities and Capabilities.
- Expand low fare/price subsidies to include MOD and transit for BIPOC and low-income communities.
- Evaluate feasibility of implementing City of Portland's Transportation Wallet pilot program for connecting affordable transportation options with people living in affordable housing.

Priority:

8 SAC Votes
High

Timeline:

Near

Responsibility:

TriMet

Further Objectives:

- 2.1) Collaborate to provide consistent travel experiences across jurisdictional boundaries through integrated payment and scheduling systems, integrated corridor management, and data sharing between agencies.
- 4.4) Increase availability and accessibility of low-cost transportation options in historically marginalized communities.

References to other Plans and Projects:

[New Mobility For All: Can Targeted Information and Incentives Help Underserved Communities Realize The Potential of Emerging Mobility Options?](#)

[Portland's Transportation Wallet Increases Access to New Mobility Services](#)

[Applying an Equity Lens to Automated Payment Solutions for Public Transportation](#)

[Do Travel Costs Matter?: Using Psychological and Social Equity Perspectives to Evaluate the Effects of a Low-Income Transit Fare Program on Low-Income Riders](#)

TriMet, Metro, ODOT and USDOT have supported grants for improved trip planning for demand responsive transit (DRT). In 2021, two new data specifications were introduced to handle eligibility and service provider capability. <https://github.com/full-path/gtfs-eligibilities>

BIKETOWN offers income based discounts including college students receiving financial aid. <https://www.portland.gov/transportation/news/2021/9/16/biketown-expands-e-bike-service-portland-state-university-students>



11. Develop an ITS travel time Information Data Collection and Distribution Plan for RDPO Regional Emergency Routes.

Concepts, Capabilities, and Infrastructure

Action Description:

- Coordinate with agency partners to identify bottlenecks on RDPO Regional Emergency Transportation Routes, Oregon State Seismic Lifeline Routes and routes lacking redundancy and develop TSMO solutions to address these.
- Model strategies to reduce emergency response times and evacuation scenarios through technology or other actions.
- Create an Emergency Route travel time data collection plan. The plan should:
 - Identify ITS travel time information data collection and distribution gaps on RDPO Regional Emergency Transportation Routes and Oregon State Seismic Lifeline Routes to inform detour routing decisions and provide alternative route information during evacuations.
 - Prioritize data collection and distribution gaps on RDPO Regional Emergency Transportation Routes and Oregon State Seismic Lifeline Routes.
 - Install data collection and distribution infrastructure on RDPO Regional Emergency Transportation Routes and Oregon State Seismic Lifeline Routes.

Priority:

8 SAC Votes
Medium

Timeline:

Mid: 2023-2028

Responsibility:

ODOT

Further Objectives:

- 6.2) Manage projects and resources to be responsive to changes in land use planning and growth patterns.
- 6.3) Minimize long term disruptions to the transportation system by creating resiliency to climate change and economic shifts.

References to other Plans and Projects:

[Integrate Socioeconomic Vulnerability for Resilient Transportation Infrastructure Planning](#)

[Rapid Transportation Structure Evaluation Toolkit](#)

[Smart, Shared, and Social: Enhancing All-Hazards Transportation Recovery Plans with Demand Management Strategies and Technologies](#)

Emergency Routes Planning work (Metro)PORTAL Archive <https://portal.its.pdx.edu/home>

Regional Emergency Transportation Route (RETR) Phase 1 <https://rdpo.net/emergency-transportation-routes> will be followed by Phase 2.



12. Explore new TSMO data sources.

Planning

Action Description:

- Explore new sources to measure identified exploratory TSMO performance measures. Exploratory metrics include:
 - Average miles walked and biked
 - Frequency of secondary crashes
 - Collision risk
 - Transportation cost burden for BIPOC and low-income communities
 - Non-recurring delay associated with incidents
 - Freight travel time and movement data
- Develop a NHTSA FARS data reporting policy and incorporate into annual reporting.

Priority:

SAC did not vote on this
Low

Timeline:

Ongoing

Responsibility:

PSU TREC

Further Objectives:

- 1.2) Ensure historically marginalized communities and people of color benefit from safety improvements.
- 1.3) Provide a transportation system where human error does not result in serious injury or loss of life.
- 1.4) Ensure people of color and historically marginalized communities can safely access multiple low stress mode choices and routes within the transportation system by improving access to transit stops, pedestrian, and bicycle facilities.
- 3.2) Identify and correct past disparities when planning, operating, and maintaining the transportation system (e.g., transit access, air toxins exposure, allocation of funds).
- 5.1) Manage recurring and non-recurring congestion to improve travel time reliability for all users, including active transportation, transit, and freight.
- 5.3) Manage critical freight corridors to create reliable routes for freight movement between key destinations.

References to other Plans and Projects:

[PORTAL](#)

[BikePed Portal](#)

13. Create a community listening program.

Listening & Accountability

Action Description:

Build capacity for a community listening program to reduce barriers for travelers to report experiences related to TSMO. Tactics may involve but are not limited to partnering with large-scale public outreach to facilitate a breakout group specific to TSMO, supporting equity-focused consultants and Community Based Organizations to share input, initiating a study of agency customer feedback (including social media), piloting an anonymous feedback system generated by and for BIPOC and people with lower income to report travel experiences related to operations.

As part of the listening program, create a pilot where BIPOC and low-income travelers are paid to provide feedback and share their traveler experiences/stories with agency staff.

Support efforts with service providers to add capacity. Participate to listen for TSMO-related issues and follow up on previous efforts, identifying TSMO-related solutions.

Priority:

7 SAC Votes
High

Timeline:

Near: 2021-2024

Responsibility:

ODOT, Metro and PSU TREC

Further Objectives:

- 3.1) Prioritize reaching underrepresented groups when providing traveler information and community outreach and ensure that modal access and traveler information is free from technological and financial barriers.
- 3.3) Identify and increase awareness of the unique travel experiences of people of color and historically marginalized communities.

References to other Plans and Projects:

TriMet Reimagine Transportation

ODOT Office of Social Equity

Metro Regional Travel Options Program.

[Equity outcomes and potential for a better bike share](#)

[Developing strategies to enhance mobility and accessibility for a community-dwelling older adults](#)

[New mobility for all: Can targeted information and incentives help underserved communities realize the potential of emerging mobility options?](#)

[Seamless wayfinding by individuals with functional disability in indoor and outdoor spaces: An investigation into lived experiences, data needs, and technology requirements](#)

[App-based data collection to characterize latent transportation demand within marginalized and underserved populations](#)

[How can enter disciplinary teams leverage emerging technologies to respond to transportation infrastructure needs? Mixed-methods evaluation of civil engineers urban planning and social workers' perspectives](#)

[Marginalized populations' access to transit: Journeys from home and work to transit](#)

[Do travel costs matter?: Using psychological and social equity perspective to evaluate the effects of a low income transit fare program on low income riders](#)



[Applying an equity lens to automated payment solutions for public transportation](#)

[Developing data, models, and tools to enhance transportation equity](#)

[A comprehensive examination of electronic wayfinding technology for visually impaired travelers in an urban environment](#)

[Defining and measuring equitable access to Washington Park in Portland, Oregon](#)

[Addressing changing demographics and environmental justice analysis, state of the practice](#)

[Life-space mobility and aging in place](#)

[Evaluating and enhancing public transit systems for operational efficiency, service quality and access equity](#)

[Racial bias in drivers' yielding behavior or at crosswalks: Understanding the effect](#)

[Evaluating efforts to improve the equity of bike share systems](#)

14. Create continuous improvement process for existing and new signal systems and related performance.

Concepts, Capabilities, and Infrastructure

Action Description:

Outline and begin continuous improvement process for signal systems and new concepts that serve major arterials and high-injury corridors. The continuous improvement process will utilize systems engineering from concept of operations through retirement of legacy systems.

In coordination with asset managers, inventory automatic traffic recorder stations, ATC controllers, and detection sensors (location, status, age, and operability). Identify through corridors and major arterials that do not currently have travel time information collection by mode to identify gaps in the existing system. Create a plan to mitigate identified gaps by completing high priority projects targeted for either technological upgrades (sensors, ATRs etc.) or crowd sourced data.

Priority:

2 SAC Votes
Low

Timeline:

Ongoing

Responsibility:

Agencies participating in TransPort's Central Signal System Users Group and PBOT

Further Objectives:

- 2.1) Collaborate to provide consistent travel experiences across jurisdictional boundaries through integrated payment and scheduling systems, integrated corridor management, and data sharing between agencies.
- 5.1) Manage recurring and non-recurring congestion to improve travel time reliability for all users, including active transportation, transit, and freight.
- 6.1) Plan and design a flexible transportation network that can adapt to new technology and travel choices that are consistent with the region's desired land use and transportation outcomes.
- 6.4) Provide public agency staff with the data, tools, models, and training needed to assess long-term disruptive transportation trends.

References to other Plans and Projects:

ODOT ITS Master Communication Plan

[Data-driven mobility strategies for multimodal transportation](#)

[Understanding factors affecting arterial reliability performance metrics](#)



15. Deploy regional traveler information systems.

Concepts, Capabilities, and Infrastructure

Action Description:

Create a traveler information and educational campaign with BIPOC, low- income, and limited English proficiency community needs. The campaign should also start deploying traveler information systems where community-voiced need and multiple transportation options are present, building into a methodology Traveler Information Systems (TIS) priorities that may involve transit stops, public buildings, major destinations within regional centers. and on-vehicle displays. The TIS should incorporate a broad cross section of traveler needs which may include travel time, route, real-time transit, and real-time shared-use mobility information.

Priority:

9 SAC Votes
High

Timeline:

Ongoing

Responsibility:

Metro for convening and scoping

Further Objectives:

2.3) Collaborate with and educate travelers.

3.1) Prioritize reaching underrepresented groups when providing traveler information and community outreach and ensure that modal access and traveler information is free from technological and financial barriers.

References to other Plans and Projects:

[Overcoming barriers for a wide-scale adoption of standardized real time transit information](#)

[Developing data, models, and tools to enhance transportation equity](#)

ODOT TripCheck offers a Beta TripCheckTV for internet-connected displays.

<https://www.tripcheck.com/tv/>

TriMet lists developers including some who tailor information to dedicated monitors.

<https://trimet.org/apps> [] F&P will reference Ron's learning from CA



16. Implement Integrated Corridor Management and mainstream into corridor planning.

Concepts, Capabilities, and Infrastructure:

Action Description:

Provide tools for regional partners based on [I-84 Multimodal ICM Deployment Plan](#) including:

- Establish a multimodal detour policy across agencies. Define lines of communication and pre-plan emergency needs by rehearsing scenarios for a variety of events impacting operations. Provide job-shadow and training experiences.
- Create a data sharing policy and inter-agency(s) agreement with agency partners to incorporate data into PORTAL or another identified internal sharing system. Share construction schedules across agencies. Implement a decision support system, employing forecast models as useful.

Beginning with the next RTP update, consider corridor needs that can be met through ICM based on regional efforts and FHWA guidance and local operators.

Priority:

3 SAC Votes
Low

Timeline:

2021-2023
Milestone: RTP Update

Responsibility:

Metro and ODOT

Further Objectives:

- 2.1) Collaborate to provide consistent travel experiences across jurisdictional boundaries through integrated payment and scheduling systems, integrated corridor management, and data sharing between agencies.
- 2.2) Collaborate with emergency management when prioritizing investments on key emergency response routes.
- 2.4) Improve inter-agency & intra-agency collaboration to ensure efficient operations by identifying and addressing barriers in communication when making decisions about network operation or expansion.
- 5.1) Manage recurring and non-recurring congestion to improve travel time reliability for all users, including active transportation, transit, and freight.
- 6.4) Provide public agency staff with the data, tools, models, and training needed to assess long-term disruptive transportation trends.

References to other Plans and Projects:

[Understanding factors affecting arterial reliability performance metrics](#)

[Statistical inference for multimodal travel time reliability](#)



17. Create a TSMO Safety Toolbox.

Concepts, Capabilities, and Infrastructure:

Action Description:

Create a TSMO Safety Toolbox to advance actions identified in the Metro Regional Safety Strategy. The toolbox should include guidance for the deployment of new technologies and create policy for evaluating their effectiveness.

Create a Speed Management Plan, in coordination with Statewide Policy, and collaborate with local agencies to provide guidance and implementation program for active speed management and feedback including, automated speed feedback signs, changeable speed limits, automated enforcement, and traffic calming solutions. Evaluate speed limits and identify opportunities to apply a safe systems approach to speeds in regional and town centers, high pedestrian, and bicycle corridors, and in equity focus areas. Apply Automated Traffic Signal Performance Measures (ATSPMs), including speeds,

The toolbox should respond to emerging research related to speed reduction through signal timing strategies context and point out where overlapping road functions or classifications have potential for creating risk and/or preventing implementation of TSMO safety tools.

Priority:

5 SAC Votes
High

Timeline:

Near: 2022-2024

Responsibility:

All Agencies

Further Objectives:

- 1.2) Ensure historically marginalized communities and people of color benefit from safety improvements.
- 1.3) Provide a transportation system where human error does not result in serious injury or loss of life.

References to other Plans and Projects:

[Data-driven mobility strategies for multimodal transportation](#)

[Improving walk ability through control strategies at signalized intersection](#)

[Subcontract: NCHRP 17-87 Enhancing Pedestrian Volume Estimation and Developing HCM Pedestrian Methodologies for Safe and Sustainable Communities](#)

[Pedestrian behavior study to advance pedestrian safety in smart transportation systems using innovative LiDAR sensors](#)

[Effect of residential street speed limit reduction from 25 to 20 mph on driving speeds in Portland, Oregon](#)

[Road user understanding of bicycle signal faces on traffic signals](#)

[Improving integration of transit operations and bicycle infrastructure at the stop level](#)

[Contextual guidance at intersections for protected bicycle lanes](#)

The TSMO Safety Toolbox should utilize the Safe Systems Approach. Safe Routes to School efforts work with the traffic patterns, facilities, and education to improve safety for children and families on the way to and from school. In 2021, the Oregon Legislature approved emergency speed changes for Cities/Counties.



18. Participate in regional public outreach to assist in guiding, listening, and learning through TSMO-focused conversations.

Listening & Accountability

Action Description:

TSMO-focused public outreach should include traveler safety information and be created with BIPOC, low-income, and limited English proficiency communities. Work with local agencies to create/update public outreach that specifically include equity-focused TSMO that include BIPOC, low income and limited English proficiency communities.

Priority:

8 SAC votes
Medium

Timeline:

Near

Responsibility:

Metro, ODOT and Third Party

Further Objectives:

- 1.2) Ensure historically marginalized communities and people of color benefit from safety improvements.
- 2.3) Collaborate with and educate travelers.
- 3.1) Prioritize reaching underrepresented groups when providing traveler information and community outreach and ensure that modal access and traveler information is free from technological and financial barriers.
- 5.4) Communicate expected changes in reliability so that travelers can make informed travel choices.

References to other Plans and Projects:

[Developing data, models, and tools to enhance transportation equity](#)

[New mobility for all: can targeted information and incentive help underserved communities realize the potential of emerging mobility options?](#)

[Do travel costs matter?: Using psychological and social equity perspectives to evaluate the effects of a low-income transit fare program and low-income riders](#)

[Implementing a community transportation academy](#)



19. Improve TSMO data availability to aid in traveler decisions and behavior.

Listening & Accountability

Action Description:

- Unify multimodal trip planning by coordinating among transit service providers' and riders' needs, creating opportunities for TriMet and other Open Trip Planner partners.
- Create an external facing dashboard for TSMO metrics accountability connecting each metrics' relevance to travelers.
- Communicate TSMO to raise awareness in the need for travelers to participate to improve transportation system outcomes and metrics. For example, signage about moving over for emergency vehicles, merging, or moving property-damage-only crashes out of the travel lane will help with overall system management and clearance metrics.
- Increase communication about how the system could operate safer and more efficiently using signage and coordinating agency Public Service Announcements (PSAs.)

Priority:

7 SAC Votes
Medium

Timeline:

Mid

Responsibility:

Metro, TriMet and ODOT

Further Objectives:

- 2.1) Collaborate to provide consistent travel experiences across jurisdictional boundaries through integrated payment and scheduling systems, integrated corridor management, and data sharing between agencies.
- 2.3) Collaborate with and educate travelers.
- 5.4) Communicate expected changes in reliability so that travelers can make informed travel choices.

References to other Plans and Projects:

[Overcoming barriers for the wide-scale adoption of standardized real-time transit information](#)
[Social transportation analytics toolbox \(STAT\) for transit networks](#)



20. Build and use a TSMO Toolbox to connect gaps in bicycle and pedestrian infrastructure.

Concepts, Capabilities, and Infrastructure:

Action Description:

Create a connected bicycle and pedestrian infrastructure with TSMO tools. Start with a Connectivity Index of existing pedestrian and bicycle infrastructure that includes community-voiced barriers, inventories of low stress facilities, and other identified gaps in the system. The toolbox should consider how pedestrian and bicycle modes interact with signals, illumination, and transit connections, while also the disparities experienced by BIPOC and people with lower income-. Investments made using the toolbox should afford complete treatment to address these disparities.

Priority:

23 SAC Votes
High

Timeline:

Ongoing
Milestone: ODOT Pedestrian and Bicycle Priority Routes

Responsibility:

All Agencies and PSU TREC

Further Objectives:

1.4) Ensure people of color and historically marginalized communities can safely access multiple low stress mode choices and routes within the transportation system by improving access to transit stops, pedestrian, and bicycle facilities.

4.1) Connect decentralized travel options to facilitate viable destinations in Regional Centers, Town Centers, and employment areas outside downtown Portland.

4.2) Prioritize the completion and expansion of planned transit and active mode networks when investing discretionary revenues especially to destinations with limited travel choices.

References to other Plans and Projects:

[Equity in bike share research](#)

[Understanding economic and business impacts of street improvements for bicycle and pedestrian mobility - A multi-city multi-approach exploration \[phase 2\]](#)

[Reducing VMT, encouraging walk trips, and facilitating efficient trip chains through polycentric development](#)

[Bikeway design research](#)

[Improving integration of transit operations and bicycle infrastructure at the stop level](#)

ODOT Active Transportation Needs Inventory (ATNI)

21. Update the Regional ITS Architecture.

Planning

Action Description:

Collaborate on updates to the Regional ITS Architecture by reviewing changes on a quarterly basis and adjusting every two years to include innovations in the national and statewide architecture.

Priority:

4 SAC Votes
Low

Timeline:

Near: 2022-2024

Responsibility:

Metro
(ITS Architecture Group should be integral to this action)

Further Objectives:

- 2.4) Improve inter-agency & intra-agency collaboration to ensure efficient operations by identifying and addressing barriers in communication when making decisions about network operation or expansion.
- 6.1) Plan and design a flexible transportation network that can adapt to new technology and travel choices that are consistent with the region's desired land use and transportation outcomes.

References to other Plans and Projects:

[Applying data driven multi model speed management strategies for safe, efficient transportation](#)

[Deploying electric buses to improve air quality in low-income areas](#)

[Can incentivizing E bikes support GHG goals? Launching the new EV incentive cost and impact tool](#)

[Connected vehicle system design for signalized arterials](#)

[Modeling and analyzing the impact of advanced technologies on livability and multimodal transportation performance measures in arterial corridors](#)

The regional ITS Architecture was updated in 2016 and posted here on Metro's site

<https://www.oregonmetro.gov/public-projects/regional-tsmo-strategy/2010-2020-tsmo>