

MOBILITY AS A SERVICE (MAAS) IN OREGON

Implications for the Oregon Department of Transportation



Prepared for ODOT by Trillium Solutions

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Introduction.....	2
1. Mobility as a Service: Defining the concept.....	3
<i>Section Overview.....</i>	<i>3</i>
<i>Context: Why MaaS? Why now?.....</i>	<i>3</i>
<i>Defining Mobility as a Service.....</i>	<i>4</i>
<i>Summary of Findings.....</i>	<i>5</i>
<i>Interviewees.....</i>	<i>8</i>
<i>Related Resources.....</i>	<i>8</i>
2. Summary of Current and Planned Practices Related to MaaS.....	10
<i>Section Overview.....</i>	<i>10</i>
<i>Matrix Primer.....</i>	<i>10</i>
<i>Table 2.1: Matrix of Current and Planned MaaS Practice.....</i>	<i>12</i>
3. Assessing ODOT’s Readiness for MaaS.....	19
<i>Section Overview.....</i>	<i>19</i>
<i>Organizational Capacity.....</i>	<i>19</i>
<i>Technical Capacity.....</i>	<i>22</i>
<i>Conclusions.....</i>	<i>25</i>
4. Role Recommendations and Implications for Policy & Planning.....	27
<i>Section Overview.....</i>	<i>27</i>
1. <i>ODOT as Partner and Convener.....</i>	<i>27</i>
2. <i>ODOT as Policymaker.....</i>	<i>30</i>
3. <i>ODOT as Investor.....</i>	<i>34</i>
4. <i>ODOT as Technical Resource and Data Steward.....</i>	<i>37</i>
<i>Policy and Planning Implications.....</i>	<i>40</i>

Introduction

Innovations in transportation technology are reshaping the way Oregonians travel, particularly by expanding options beyond driving alone. Recognizing this, the Oregon Department of Transportation (ODOT) has identified the emerging concept of Mobility as a Service, or MaaS, as an area of opportunity for the agency to play a significant role.

ODOT hired Trillium Solutions to explore the agency's potential approach to MaaS, given Trillium's experience in the transportation technology field. Trillium conducted extensive research to this end, including stakeholder engagement within and outside of ODOT. This document is the final product of that work.

The document is organized into four sections:

1. **Mobility as a Service: Defining the concept**, which provides an operational definition of MaaS for ODOT. Interviewees for this portion of the project primarily came from experts at agencies within Oregon, while research included a broader set of informational resources.
2. **Summary of current and planned practices related to MaaS**, which summarizes a review of several public, private, and non-profit sector programs, projects, and products in the MaaS realm. The focus is on practices most relevant to the Oregon context.
3. **Assessing ODOT's readiness for MaaS**, which examines the agency's organizational and technical capacity to play a role in MaaS implementation in the state. This review included engaging ODOT's Transportation Technology Advisory Group and interviews with several other ODOT staff.
4. **Role recommendations and implications for policy in planning**, which is the culmination of the prior three sections. It includes actionable next steps for ODOT to consider taking, including creation of a MaaS-focused advisory group and a MaaS policy evaluation framework.

A major purpose of this work is to inform two forthcoming efforts: updates to the Oregon Transportation Plan (OTP) and Oregon Highway Plan (OHP). Note that this document does not serve as the agency's comprehensive MaaS policy document; rather, it provides a foundation from which ODOT can determine how MaaS will impact the future of the transportation system in Oregon, and how the agency may shape those impacts.

1. Mobility as a Service: Defining the concept

Section Overview

In order to identify the appropriate roles that the agency should play with respect to MaaS, ODOT must first establish an operational definition of the concept. This section provides this definition, formulated from a review of the latest practices and understandings of stakeholders from the public and private sectors.

Context: Why MaaS? Why now?

In March 2019, ODOT released an Emerging Technologies Impact Assessment (ETIA) report that frames policy implications for the agency to consider for an uncertain future due to advancements in computing power and miniaturization, communications and networking, and the increased volume of and access to data. This changing landscape calls for transportation planning that acknowledges how different Oregon's transportation system is likely to look over the next few decades compared to the present. Specifically, updates to the Oregon Highway Plan (OHP) and Oregon Transportation Plan (OTP) must aim to align the state's transportation vision and policies with both current and projected future circumstances.

ODOT recognizes that MaaS will be a key component of this future. Various MaaS initiatives are being implemented around the world, with implications for private and public transportation providers, policymakers, regulatory agencies, and – most importantly – transportation system users. At the same time, the concept is arguably still in its nascent stages, especially in the U.S. This presents an opportunity for ODOT to define its role within the MaaS ecosystem in a way that supports agency goals. The first step towards this is to develop a shared understanding of what we mean when we talk about MaaS.

Defining Mobility as a Service

Based on a review of public agency, non-profit, and private business stakeholders in the MaaS realm (further described in the Summary of Findings later in this section), we provide this working definition of MaaS:

In its visionary form, MaaS is an open marketplace that maximizes personal mobility in a way that reduces one's need to rely on a privately-owned vehicle. Successful MaaS implementation integrates the suite of available transportation options into a single platform that enables on-demand trip planning, real-time information, and payment for seamless end-to-end journeys.

Within this definition are terms that call for further description:

Open marketplace

A marketplace is a venue for the sale and purchase of goods and services. The MaaS marketplace must be accessible (“open”) for providers and users to sell and buy transportation services, enabled by open data architecture, which is discussed in more detail in Section 4 of this document. Not only will this help foster a more robust menu of current services, but it leaves room to add services in the future that do not exist currently. “Open marketplace” should *not* be interpreted as one that operates free of any policy or regulatory structures. On the contrary, public policy interventions will likely be necessary to create the most open, accessible, and competitive arena for MaaS.

Suite of available transportation options

The transportation options that users have to make trips differ from place to place and from person to person. In this sense, the “suite” we are referring to is highly contextual. For example, micro-mobility services such as bikeshare or e-scooters exist in relatively few communities; even where available, not everyone has the ability to use them. Additionally, some transportation providers may not wish to participate in MaaS, rendering those services unavailable, and therefore not part of the suite in the context of MaaS.

One platform

While some definitions of MaaS include a specific type of platform for implementation (e.g. mobile application), this definition avoids prescribing to that degree. A MaaS platform is

meant to be a “one stop shop,” so to speak, and this definition embraces the “one stop” concept without asserting what the “shops” should look like. It also allows for the likelihood that multiple MaaS providers will compete to offer their one platform to meet customers’ transportation needs.

Seamless end-to-end journeys

Piecing together multimodal journeys from multiple information sources and paying for services separately causes friction for travelers. MaaS must reduce or eliminate this friction by enabling complete trips as conveniently as possible, in order to compete with the experience of getting from door to door by driving a personal vehicle.

The intent here is not to create a set of categorical standards for MaaS. Rather, MaaS can be considered on a spectrum, where the farther along that spectrum a particular application of MaaS lies, the closer it gets to maximizing personal mobility without the need to own a car. It should also be noted that implicit in this definition is that the quality of service options on the ground – especially public transit – can support the type of trip-making facilitated by a MaaS platform. Without adequate infrastructure and service provision, MaaS will not be useful to travelers, appealing to private investors, or worthy of public sector resources.

Summary of Findings

This working definition was informed by a review of the thinking and practice of major local, national, and international MaaS stakeholders. Through research and interviews, several themes emerged that informed this definition.

Theme 1: Integration

“A single mobility service provided through an app is not MaaS.” --project interviewee

At its most basic level, MaaS is about integrating transportation options that have varying operators, payment systems, and information access points. Without this integration (e.g. in the case of operator-specific applications), trip planning begins by selecting a mode like ride-hailing or bike share or public transit, and then proceeding to navigation and payment. This model puts the onus on the traveler to determine their best option with incomplete information, which in turn reinforces habits that may not most effectively meet traveler needs in terms of travel time or cost. The result is a significant barrier to the multimodal mobility that policymakers aim to encourage. Having all of one’s choices presented in a single

location, with itineraries to complete entire journeys using the traveler's best modal options to do so, is essential to MaaS.

Theme 2: User-centric, seamless experience

"The goal of MaaS is seamless, frictionless city movement." --project interviewee

MaaS is about personal mobility. Successful implementation requires an experience that end users find useful, convenient, affordable, and perhaps even enjoyable. Consumers must be able to fulfill their transportation needs primarily using public transit and shared mobility options. Reliable real-time information is key, as it allows users to plan journeys on the fly and make adjustments as plans or conditions on the ground change.

Without these characteristics, MaaS will not be an effective alternative to the use of private vehicles.

Theme 3: Reduce reliance on private vehicle use and ownership

"MaaS creates an environment where people don't have to own their means of transportation." --project interviewee

Stakeholders tend to assert that MaaS is meant to be a viable option to meet *all* of one's transportation needs. In many areas this would not be possible if driving were eliminated; services like Whim include rental car options in their packages, so users can drive, if needed, without needing to own a vehicle. Still, reducing negative externalities stemming from driving – traffic congestion, greenhouse gas emissions, pollution, injuries and fatalities, land use impacts – is very much behind the push for MaaS.

Theme 4: Data challenges and opportunities

"In our business we run into issues with data ownership, since each entity needs to approve of its use." --project interviewee

Behind any MaaS implementation is a wealth of data. As a result, discussions about data occurred in most interviews:

- User privacy and the protection of personal data is a top priority.
- Travel and payment data generated could be very useful for transportation planning purposes.

- Determining data ownership & standardization requirements will impact the degree to which the MaaS marketplace is an open one.

Given oftentimes competing objectives between the private, public, and non-profit sectors, data integration and policy may be the greatest challenge for MaaS. The Finnish Government's Act on Transport Services¹, which established open data requirements for all transportation providers, is one example of a data policy intervention that could provide useful lessons, albeit in a different governmental and societal context.

Theme 5: Geographic context

"MaaS is not going to be one size fits all." --project interviewee

To this point, MaaS has generally been conceptualized as applicable to large cities and regions with a plethora of transportation options. Still, MaaS solutions have the potential to benefit smaller communities as well, so long as solutions are designed with those communities in mind. The focus in such areas may be geared more towards options such as carshare services, public transit, or mobility management to address the needs of transportation disadvantaged populations. These approaches imply a significant role for the public sector to support innovative MaaS or MaaS-like strategies.

Theme 6: Interoperable payment systems

"Solving fare payment integration may be the most difficult part of MaaS." --project interviewee

An important foundation for MaaS is integration of payment for services, and the task of integrating is complicated. Service providers understand the value of open standardized fare payment, but concerns exist about fair distribution of revenues. In the public transit realm, regional (and even national) smartcard-based fare systems have made riding transit on different operators simpler for users. Behind the front-end simplicity are backend fare reciprocity agreements and complex technical implementations. Accepting payment via bank-issued payment cards, especially contactless, delivers convenience for some travelers, but this approach involves agreements with the banking sector and may create disparities for unbanked and underbanked populations. Some mobility apps integrate trip planning and fare payment through private commercial partnerships. Questions about how pricing can be used as a tool to encourage certain transportation choices add to this complexity.

¹ <https://www.lvm.fi/en/-/act-on-transport-services-955864>

Additionally, quality auditable data is needed for jurisdictions or public agencies that are receiving funds as part of MaaS facilitation.

Interviewees

To allow for candid responses during the interviews, interviewees were assured that their specific comments would not be attributed to them or their organizations. We are providing a list of interviewees here to highlight the range of experience of those who contributed to this portion of the project.

Kevin Chambers, Founder and Principal, Full Path LLC

Jeremy Dalton, Method City Planning and Technical Project Manager for the California Integrated Travel Project (Cal-ITP)

Clinton Fulcher, Director, Business Rental Sales, Commute with Enterprise

Linda Gehrke, Region 10 Administrator, Federal Transit Administration

Robert Johnson, Transit Fleet & Safety Manager, Kayak Public Transit

Susan Johnson, Public Transit Manager, Kayak Public Transit

Melissa Lowry, Associate Planner, Rogue Valley Transportation District

Dwight Mengel, Chief Transportation Planner, Tompkins County, New York Department of Social Services

Roger Millar, Secretary of Transportation, Washington Department of Transportation

Miller Nuttle, Bike & Pedestrian Policy, Lyft

Chris Pangilinan, Head of Global Policy for Public Transportation, Uber

Lilly Shoup, Senior Director, Policy & Partnerships, Lyft

Related Resources

Eno Center for Transportation: <https://www.enotrans.org/article/mobility-service-coming-city-near-soon/>, February 2018

Goulding and Kamargianni / TRA2018, *The Mobility as a Service Maturity Index: Preparing Cities for the Mobility as a Service Era*, Vienna, Austria, April 16-19, 2018

Kamargianni, M., and M. Matyas 2017. The Business Ecosystem of Mobility as a Service. 96th Transportation Research Board (TRB) Annual Meeting, Washington DC, 8-12 January 2017.

Kelly, Nerissa, Geotab, *What is Mobility as a Service?*, November 2018

MaaS Alliance: <https://maas-alliance.eu/>

MaaS Global/Whim: <https://whimapp.com/about-us/>

MaaS Scotland: <https://maas-scotland.com/what-is-maas/>

National Center for Mobility Management, *Mobility as a Service: Concept and Practice*, March 2018

Schweiger, Carol, *Mobility as a Service White Paper*, National Aging and Disability Transportation Center, January 2017

Goodall et al., *The rise of mobility as a service: Reshaping how urbanites get around*, Deloitte Review Issue 20, 2017

Washington State Department of Transportation, *Government's Role in Mobility on Demand*, February 2019

2. Summary of Current and Planned Practices Related to MaaS

Section Overview

This section provides a sampling of public, private, and non-profit sector practices that connect to MaaS. These practices take several forms including projects, programs, and products, both current and planned. While this is not meant to be an exhaustive resource of all things MaaS, it is a curated list meant to inform ODOT as it determines its role with respect to MaaS. It therefore focuses on practices most relevant to the Oregon context.

Matrix Primer

The Oregon Department of Transportation's (ODOT's) working definition of MaaS is as follows:

In its visionary form, MaaS is an open marketplace that maximizes personal mobility in a way that reduces one's need to rely on a privately-owned vehicle. Successful MaaS implementation integrates the suite of available transportation options into a single platform that enables on-demand trip planning, real-time information, and payment for seamless end-to-end journeys.

The information in the matrix below is organized into three sub-categories that support movement towards this vision:

1. **Open data and trip-planning technology development.** Several efforts are underway to develop and implement data specifications and tools to aid transportation system users, particularly to more easily use modes besides driving alone.
2. **Supply-side multimodal connectivity projects.** These initiatives are focused on services, infrastructure, and modal integration in order to improve transportation options.

3. **Demand-side programs to reduce single occupancy vehicle trips.** By incorporating information resources and incentives, these programs aim to shape traveler behavior, encouraging use of public transit and other non-single-occupancy vehicle modes.

The summary of each practice includes: a brief description, the leading agency or organization, the timeline/status and applicable geography for implementation, and the transportation context (i.e. the types of trips it intends to enable or support)

Table 2.1: Matrix of Current and Planned MaaS Practice

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
Open data & trip planning technology development				
<p>GTFS-Flex² Project to build GTFS (General Transit Feed Specification)-flex datasets for all public transit agencies in Oregon, describing dial-a-ride, deviations, and flag stopping, in combination with fixed route data. Surveys for this data have also collected information about service capabilities and eligibility.</p>	ODOT	Active	State of Oregon	Small urban, rural
<p>GTFS-capabilities & GTFS-eligibilities ODOT has invested in the development of the early drafts of GTFS-capabilities and GTFS-eligibilities - these extensions of the GTFS allow for better representation of a traveler’s full range of transit options.</p> <p>GTFS-capabilities will allow transit operators to share vehicle capabilities related to passengers, mobility devices, and more. GTFS-eligibilities will allow transit operators to share what factors determine eligibility for service - for example age, income, or veteran status.</p> <p>ODOT submitted an Integrated Mobility Innovation (IMI) grant proposal as well as a Mobility for All proposal to continue the development of these data specifications and to create these data sets for transit operators in Oregon.</p>	ODOT	2020 (pending grant approval)	State of Oregon (complete datasets); International (data specifications)	Small urban, rural, urban, intercity

² <https://content.govdelivery.com/accounts/ORDOT/bulletins/248330d>

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
<p>Open Trip Planner improvements³ Open Trip Planner (OTP), used for the back end of trip planners such as TriMet’s trip planner and ODOT’s Get There trip planner, needs to be updated to support flexible transit services. ODOT, soon to have a complete GTFS-flex dataset for transit options throughout the state, has proposed updated OTP development in the FTA Innovative Mobility Integration (IMI) grant.</p>	ODOT	2020 (pending grant approval)	State of Oregon (representing flexible services); International (potential use once data is created)	Small urban, rural, urban, intercity
<p>Open Street Map improvements⁴ ODOT’s proposed IMI project includes improvements to Open Street Map (OSM). Get There’s OTP instance uses OSM for routing options.</p>	ODOT	2020 (pending grant approval)	State of Oregon	Small urban, rural, urban
<p>TriMet Next Generation Trip Planner⁵ Navigation tool that includes transit, bicycling, bike share, e-scooters, park and ride, and Uber. User selects between transit only or transit + the option of their choice to plan trips.</p>	TriMet	Beta version 2019	Portland Metro	Large urban, medium urban, intercity
<p>Get There⁶ Trip planning tool to help connect travelers to transportation options including carpool, vanpool, transit, and bike share.</p>	ODOT	Active	State of Oregon	Large urban, medium urban, small urban, rural, intercity

³ <https://www.opentripplanner.org/>

⁴ <https://www.openstreetmap.org/>

⁵ <https://trimet.org/newplanner/index.htm>

⁶ <https://getthereoregon.org/>

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
<p>Biketown⁷ - General Bikeshare Feed Specification (GBFS) GBFS is the open data standard for bikeshare. Biketown in Portland publishes GBFS, allowing third-party apps to make Biketown bikes discoverable to travelers. TriMet includes Biketown availability in its new trip planner. Biketown is the only Oregon bikeshare system with a publicly available GBFS dataset, according to the GBFS GitHub repository⁸.</p>	Portland Bureau of Transportation/ TriMet	Active	Portland, OR	Large urban
<p>Portland eScooter pilot⁹ - Mobility Data Specification (MDS)¹⁰ MDS is a set of Application Programming Interfaces (APIs) focused on dockless e-scooters, bicycles, and carshare. Currently, shared scooter operators in Portland and Milwaukee create MDS data. Portland manages the data for both Portland Milwaukee. MDS data is directly shared with third-party software vendors, but the City only stores aggregated data on City cloud servers.</p>	Portland Bureau of Transportation/ Bureau of Planning and Sustainability (Smart City PDX)	Active	Portland, OR; Milwaukee, OR	Large urban, medium urban
Supply-side multimodal connectivity projects				
<p>LTD Mobility on Demand Pilot¹¹ 13-month Statewide Transportation Improvement Fund (STIF)-funded project to better serve outlying areas of the LTD service district. Includes a pilot in Cottage Grove (the Connector) and downtown Eugene (EmGo), which uses 5-passenger electric vehicles. Includes the development of mobility management plan focused on emerging technologies and innovative service models.</p>	Lane Transit District	January 2019 – August 2020	Eugene/ Springfield, OR metro area	Small urban, rural

⁷ <https://www.portlandoregon.gov/transportation/57983>

⁸ <https://github.com/NABSA/gbfs>

⁹ <https://www.portlandoregon.gov/transportation/77294>

¹⁰ <https://github.com/openmobilityfoundation/mobility-data-specification>

¹¹ https://www.ltd.org/system-map/route_MOD/

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
<p>Clean Rural Shared Electric Mobility Project (CRuSE)¹² Electric vehicle car share pilot in Hood River. To include tiered pricing and alternative payment methods on a digital platform.</p>	Forth	2019 - 2022	Hood River, OR	Small urban, rural, intercity
<p>Oregon State University Cascades Mobility Lab¹³ Stated purpose is to educate the community, inform policy, and test transportation technologies to encourage implementation of those that can safely and efficiently move people and goods. Collaborative effort led by OSU-Cascades, with support from the City of Bend, the Bend Metropolitan Planning Organization, Bend 2030's Move Bend Coalition, and St. Charles Health System.</p> <p>Programs include Ride Bend micro-transit pilot, Zagster Bike Share, potential e-scooter pilot, as well as data analysis and community outreach.</p>	OSU-Cascades + partners	Active	Central Oregon	Medium urban
<p>Rogue Bike Share¹⁴ Partnership between Rogue Valley Council of Governments (RVCOG), Rogue Valley Transportation District (RVTD), ODOT, City of Ashland, and Southern Oregon University, with stations throughout Ashland, including one at RVTD's Front Street Station.</p>	RVCOG/RVTD	Active	Jackson County, OR	Small urban

¹² <https://forthmobility.org/news/forth-to-receive-doe-funding-for-clean-rural-shared-electric-mobility-cruse-project>

¹³ <https://osucascades.edu/mobility-lab>

¹⁴ <http://bike.zagster.com/jacksoncounty/>

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
<p>Ashland Connector¹⁵ Funded by STIF, Rogue Valley Transportation District (RVTD) launched this 18-month micro-transit pilot in December 2019. RVTD purchased two hybrid vans; riders can use an app to call on demand for rides from home to one of 24 stops in the city.</p>	RVTD	2019-2021	Ashland, OR	Small urban
<p>First and Last Mile Project¹⁶ Project to recommend first and last mile strategies, including: Infrastructure investments to provide safer, faster, and more comfortable access to transit; and Opportunities to support and integrate innovative mobility options that are coordinated, flexible, and responsive to the land use and transportation context.</p>	Washington County Long Range Planning section	2019-2020	Washington County, OR	Medium urban, small urban, rural
<p>Gresham Emerging Transportation Technologies Project¹⁷ Project looking to explore near-term impacts and opportunities in Gresham related to transportation technology. In November 2019, City launched an online survey to gather community input on micromobility.</p>	City of Gresham	2019	Gresham, OR	Medium urban

¹⁵ <https://www.ashlandconnector.org/>

¹⁶ <https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/PlanningPrograms/TransportationPlanning/first-and-last-mile.cfm>

¹⁷ <https://greshamoregon.gov/Planning-Projects/>

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
Demand-side programs to reduce single-occupancy-vehicle trips				
<p>Commuter Benefits/Transportation Demand Management software services Akin to MaaS, but geared specifically towards reducing driving alone to work, these platforms integrate mobility options and use incentives (e.g., earned rewards) to influence commuter behavior. Examples include RideAmigos, Luum, Metropia, and Velocia.</p>	Multiple private companies	N/A	Multiple	Large urban, intercity
<p>Portland Transportation Wallet¹⁸ Program available to residents in targeted areas that offers a package of transportation options. Currently costs \$99 and includes \$150 in stored value loaded onto a TriMet Hop card, an annual Portland Streetcar pass, and an annual Biketown membership.</p> <p>The City has issued an RFP for the development of a digital platform to administer this program.</p>	PBOT	Active Work on digital platform expected to begin July 2020.	City of Portland	Large urban
<p>LTD Point2Point Program¹⁹ Partnership between LTD and multiple jurisdictions/agencies providing information about transportation options in order to reduce driving and encourage use of transit, biking, walking, carshare, carpooling, and telecommuting.</p>	Lane Transit District	Active	Eugene/ Springfield, OR	Medium urban, small urban, rural

¹⁸ <https://www.portlandoregon.gov/transportation/78470>

¹⁹ <https://www.ltd.org/point2point/>

Program/Project	Agency/ Organization	Timeline/ Status	Geographies	Supported Trips
<p>Humboldt County Mobility on Demand Strategic Plan²⁰ Purpose is to assist the HCAOG in determining the best courses of action to increase multimodal mobility and accessibility in Humboldt County, especially for public transportation, bicycling, walking, rideshare, and other modes separate from single-occupancy automobile.</p>	Humboldt County Association of Governments (HCAOG)	Draft complete Oct 2019; Final expected June 2020	Humboldt County, CA	Suburban, rural

²⁰ <http://www.hcaog.net/documents/mobility-demand-strategic-development-plan>

3. Assessing ODOT's Readiness for MaaS

Section Overview

The extent to which ODOT can play a role in the implementation of Mobility as a Service (MaaS) depends on the agency's capacity to do so. This section provides an assessment of ODOT's current organizational and technical capacity to support MaaS in Oregon as a prelude to recommending what that role should entail (discussed in the next section).

Organizational Capacity

To assess ODOT's organizational capacity to play a role in MaaS, we aimed to answer three key questions:

1. What MaaS-related work is currently underway at ODOT?
2. What MaaS-supportive structures are already in place?
3. Where are the major gaps or barriers (organizationally) that need to be addressed in order for ODOT to play a role in MaaS?

The project team led a roundtable discussion with ODOT's Transportation Technology Advisory Group (TTAG) and interviewed internal stakeholders to inform answers to these questions.

1. What MaaS-related work is currently underway at ODOT?

The Public Transportation Division (PTD) has discretionary funds that are allocated through two programs – the Statewide Transportation Improvement Fund (STIF) and the Statewide Transit Network Program (STN) – in part to support “technological innovations that improve efficiencies and support a seamless, easy-to-use Statewide Transit Network.” Distributed via grants to public transportation providers in Oregon, this funding presents an opportunity to enable projects that move communities and the transit agencies that serve them further along the MaaS spectrum.

ODOT is also engaged in the realm of data standards and specifications. This includes a statewide General Transit Feed Specification (GTFS) program to build and maintain transit

providers’ GTFS data feeds, as well as work to expand upon GTFS with extensions such as GTFS-flex (describes dial-a-ride, deviations, and flag stopping); GTFS-ride (describes ridership information); GTFS-capabilities²¹ (describes vehicle capabilities related to passengers, mobility devices, and more); and GTFS-eligibilities (describes what factors determine eligibility for service - for example age, income, or veteran status). These efforts lay the groundwork for integration of a variety of transit services into a MaaS platform.

Another ODOT initiative relevant to MaaS is OReGO, the state’s road usage charge program. Launched in 2015, the program relies on personal accounts through which participants pay for their miles driven. It is statutorily required that OReGO adopt standards for open system technology and have an open architecture that integrates “information systems currently in use or planned for future use.”²² This could establish a foundation for the integration and payment of many transportation services (see Figure 3.1).

Leveraging the private sector

- Provide latest technology solutions
- Administer accounts
- Provide interoperability
- Deliver an integrated user experience



Figure 3.1: ODOT Office of Innovation’s schema of potential use cases for personal transportation accounts.

²¹ Other options for the name of this specification are being considered as of this writing.

²² Enrolled Senate Bill 810 (SB 810-B), Oregon State Legislature. (2013) <https://olis.leg.state.or.us/liz/2013R1/Measures/Overview/SB0810>

2. What MaaS-supportive structures are already in place?

MaaS has the potential to touch many business areas within ODOT. PTD is likely to play a major role, and many staff members who participated in the TTAG roundtable indicated interest and capacity to support MaaS. PTD's role may include: helping shape policy, funding MaaS-relevant projects through STIF and STN, coordinating and convening transit providers around the state, MaaS marketing, and providing analytic support/customer service. ODOT's policy and planning efforts establish a foundation from which to support MaaS implementation. The Oregon Transportation Plan (OTP), Oregon Public Transportation Plan (OPTP), and Oregon Highway Plan (OHP) all present opportunities to connect MaaS to long term goals.

In the shorter term, initiatives like implementation of the Statewide Transportation Strategy (STS) and the Oregon Innovative Partnerships Program (OIPP) also have logical connections to MaaS. The purpose of the OIPP, for example, is to develop public-private partnerships and streamline a variety of projects. It helps ODOT overcome some of the barriers discussed in the next section, in that it enables private companies to work with ODOT in earlier stages of projects; in some cases, direct negotiations between private firms and ODOT are possible.

One exemplary project under the OIPP umbrella is the Road Usage Charge program (OReGO), which is based on an open data architecture, demonstrating how a user transportation account could function. The system lends itself to expansion, which could include things like tolling, congestion pricing, and other transportation services.

The Public Transportation Advisory Committee (PTAC) is another body that could play a role in supporting MaaS. PTAC's stated role is to "...[provide] a forward thinking, strategic view of public transportation for the state of Oregon. PTAC focuses on the dual roles of addressing the realities of the current state transportation paradigm as well as providing direction on the future of public transportation." Specifically, the committee advises PTD and the Oregon Transportation Commission on matters of policy and funding, and its 2019-2021 work plan includes convening a first mile/last mile summit. This summit presents an opportunity to further explore ODOT's role with respect to MaaS.

3. Where are the major gaps or barriers (organizationally) that need to be addressed in order for ODOT to play a role in MaaS?

As with any large organization, inter-divisional coordination does not always occur naturally at ODOT. The relevance of MaaS to multiple ODOT business units means that communicative partnerships are crucial; interviewees identified this as a potential challenge to ODOT's ability to support MaaS.

Similarly, slow internal processes (such as procurement) limit the nimbleness of ODOT. Because transportation technology is changing at a rapid pace, having an impact requires swift adaptation; ODOT's ability in this area is deficient, according to several staff interviewed. The Office of Innovation was established in part to address this and is therefore likely to be an important MaaS partner.

Technical Capacity

To assess ODOT's technical capacity to play a role in MaaS, we aimed to answer three key questions:

1. What knowledge and skills exist at ODOT to foster MaaS implementation?
2. What technologies and tools does ODOT have at its disposal to support MaaS?
3. Where are the major technical gaps or barriers that need to be addressed in order for ODOT to play a role in MaaS?

Answers to these questions were also informed by the TTAG roundtable and interviews with internal stakeholders.

1. What knowledge and skills exist at ODOT to foster MaaS implementation?

A major reason for ODOT's interest in MaaS is the policy implications: how will MaaS impact the transportation system and its users? How can MaaS play a role in furthering established goals? TTAG participants pointed to policy development as a strength of the agency, with experienced staff and ample precedent from which to draw.

ODOT often plays the role of convener and leader of strategic partnerships. Relationships established throughout the state are an asset to the agency and will be necessary for successful MaaS deployment in Oregon. Regional Transit Coordinators (RTCs) are likely to be instrumental in this sense, as they engage a variety of transit stakeholders across the state.

The agency also has experience deploying technology to support Oregon transportation providers and users. These technologies are discussed next.

2. What technologies and tools does ODOT have at its disposal to support MaaS?

ODOT has made a concerted effort to develop and utilize technology for transportation planning, analysis, and system user information²³. Table 3.1 provides a summary of MaaS-related technological tools, projects, and resources available to ODOT.

Table 3.1: Summary of ODOT’s MaaS-related technology resources

Tool/Project/Resource	Description	Connection to MaaS
Statewide General Transit Feed Specification (GTFS) data	<p>Since 2011, ODOT’s Public Transportation Division has supported and maintained GTFS datasets for public transit providers in the state.</p> <p>GTFS-flex – an extension of the specification that describes dial-a-ride, deviations, and flag stopping, in combination with fixed route data – datasets are currently being built for Oregon transit providers.</p>	<p>GTFS is an open data specification that is used by third-party software applications for a variety of transit-related purposes. MaaS applications will rely on GTFS for fixed route transit information and GTFS-flex for the various services it describes.</p>
Transit Network Explorer Tool (TNEXT)	<p>Open source tool developed by OSU and ODOT that tracks a variety of transit performance measures (for example, agency connectivity and access to employment via transit) for the statewide transit network.</p>	<p>ODOT intends to evaluate how MaaS impacts travel in the state, and MaaS is likely to enable analysis that builds upon what TNEXT currently offers.</p>

²³ Note that ODOT has extensive interest in technologies such as Intelligent Transportation Systems (ITS) and Vehicle to Infrastructure (V2I), which this paper does not address as they are outside its scope.

Tool/Project/ Resource	Description	Connection to MaaS
TransData Portal	Online portal that links to a variety of data resources, including maps and GIS, safety/crash data, traffic counts, and others.	The TransData Portal establishes a centralized location for tools that can aid in MaaS-related analysis.
Get There	Online tool supported by ODOT that helps travelers connect to transportation options including carpool match, joining or starting a vanpool, finding transit options, locating bike share stations, and more.	Get There is a MaaS-like application that aggregates several different modes besides driving alone in one place.
Open Trip Planner	Tool that provides itineraries combining transit, pedestrian, bicycle, and car segments through networks built from widely available, open standard OpenStreetMap (OSM) and GTFS data. An OTP instance is part of Get There. It currently uses a proprietary mapping system rather than OSM.	Open Trip Planner is one tool likely to be used by MaaS applications.
Transit Technical Resource Center	Site designed to help Oregon’s transportation agencies find resources for training, transportation planning, and information technology tools.	<p>The Resource Center’s purposes include:</p> <ul style="list-style-type: none"> • Provide educational opportunities to transit agencies on existing and emerging transit technology. • Identify and pursue opportunities for shared solutions among transit agencies.

Tool/Project/ Resource	Description	Connection to MaaS
Remix	Software tool to aid in transportation planning and analysis. ODOT subscribes to Remix, providing access to transit providers across the state.	Remix has the capacity to track shared mobility metrics that ODOT could use in analyzing the impacts of MaaS on the state's transportation system.
TripCheck	ODOT's real-time road traveler tool to help drivers access traffic congestion, road conditions, and weather information.	The information provided through TripCheck is relevant to trip-planning components of a MaaS platform.

3. Where are the major technical gaps or barriers that need to be addressed in order for ODOT to play a role in MaaS?

Lack of a shared understanding of MaaS itself across relevant sections of ODOT is a fundamental barrier to MaaS-supportive initiatives at the agency. This project aims to address this barrier, but its importance should be reiterated.

Seamless payment for transportation services is a feature envisioned for advanced MaaS platforms. A common theme that arose through this project was ODOT's limited experience with payment systems, indicating that the agency does not have the technical capacity to shape such systems in a significant way. However, through OReGO, ODOT has formed public-private partnerships wherein third-party service providers handle account management and banking transactions for the agency.

Conclusions

ODOT has some valuable structures, resources, and experience to lend to MaaS in the state. This may entail leveraging existing programs to include an explicit MaaS focus, expanding the roles of PTD staff whose roles intersect with MaaS, utilizing the various technological tools at the agency's disposal, and expanding upon these tools as new software developments occur.

While there are several potential organizational and technical limitations that preclude ODOT from being the sole implementer of MaaS, the agency has a history of partnering with

stakeholders to accomplish statewide goals. Additionally, programs like OReGO demonstrate capacity to innovate in order to address organizational barriers and respond to emerging technological challenges and opportunities.

4. Role Recommendations and Implications for Policy & Planning

Section Overview

In this section, we first present options for roles along with potential pros and cons, followed by recommendations to put roles into action. ODOT should consider the interrelatedness of these roles in order to identify which ones to assume, given the context of the agency's recent leadership changes, reorganization, and to-be-developed updates to long range plans.

Roles and recommendations are categorized under four umbrella roles that ODOT plays currently:

1. ODOT as partner and convener,
2. ODOT as policymaker,
3. ODOT as investor, and
4. ODOT as technical resource and data steward.

These categories are meant both to organize the information and to help inform which ODOT divisions and staff are most appropriate to assume related tasks. Following role recommendations, we discuss policy and planning implications for ODOT to consider as part of MaaS implementation.

Note that these recommendations are based solely upon the consultant team's perspective given the scope of this document. Unless specific citations to existing ODOT policy and/or programs are given, the recommendations have not been approved or endorsed in any way by ODOT.

1. ODOT as Partner and Convener

ODOT has a large and diverse array of stakeholders. Forming partnerships - with public, private, and nonprofit entities - is essential to the management of the state's transportation system. Even in areas where ODOT does not serve as a direct provider of transportation

service (e.g., nearly all public transportation in Oregon), the agency has a vested interest in working with partners to achieve transportation outcomes vis-à-vis the goals established in the Oregon Transportation Plan and its eight modal plans.

It is therefore not surprising that many internal and external stakeholders engaged for this project suggested the agency play a convening role in MaaS implementation. ODOT has extensive experience bringing partners to the table and working towards mutually beneficial solutions. **The agency should develop a new MaaS-oriented task force that will engage with existing advisory committees, such as the Area Commissions on Transportation (ACTs) and Public Transportation Advisory Committee (PTAC).**

Public-private partnerships (PPPs) in particular will be important for ODOT to influence Oregon’s MaaS ecosystem, and PPPs are called out in the Oregon Transportation Plan (OTP) as a strategy under Goal 6 - Funding the Transportation System as well as the Oregon Public Transportation Plan under multiple goal areas. OReGO, the state’s road usage charge pilot program, provides valuable lessons and a model for ODOT’s MaaS efforts. OReGO demonstrated ODOT’s ability to implement an innovative program that relies on user accounts and open data architecture. ODOT served as program administrator while contracting with private companies to handle account management, data collection, and payment processing. Previous experience developing the business and technical requirements for the program, as well as the specifications for the various functions, provides ODOT with a framework that could be applied to implementation of MaaS-related projects.

Key to this program was state-level legislation, which amended ORS 367.804²⁴ to establish the Oregon Innovative Partnerships Program (OIPP), enabling ODOT to expedite project delivery and overcome statutory limitations, especially with regard to standard procurement processes. Through OIPP, ODOT is able to work more directly with private companies, select projects based on overall value rather than lowest bid, and “...consider any financing mechanisms, including but not limited to the imposition and collection of franchise fees or user fees and the development or use of other revenue sources.”

Support from leaders within ODOT will be essential to supporting MaaS. **At an early stage, internal champions who will liaise with existing advisory bodies and represent ODOT with respect to MaaS should be identified.** These champions should be adequately charged to ensure that adopted policies related to MaaS services (e.g. in the updated Oregon

²⁴ <https://www.oregonlaws.org/ors/367.804>

Transportation Plan, Oregon Public Transportation Plan, and Oregon Highway Plan) translate to practice. Champions could include representatives from the Policy, Data and Analysis Division, Public Transportation Division (PTD), Office of Innovation, the Office of Urban Mobility and Mega Project Delivery, and the newly-established Climate Office.

Pros to assuming this role in the MaaS ecosystem

- ODOT is familiar with the role of partner and convener. The agency often coordinates multi-stakeholder programs and initiatives. As a proactive convener, ODOT will assume a guiding role in MaaS implementation and may be able to avoid or mitigate solutions that do not meet ODOT's goals.
- Working together with partners plays to the strengths that each party brings to the table and leverages existing resources. This reduces the risk of ODOT (or others) taking on roles that they have little-to-no expertise in carrying out.

Cons to assuming this role in the MaaS ecosystem

- Likely overlap between individual stakeholders on existing advisory bodies, and demand for their participation on a potential new MaaS-specific advisory group, could constrain some people's capacity to participate.
- Successful partnership necessarily depends on the level of investment of participating entities. If crucial MaaS stakeholders do not join and fully engage, ODOT may not have sufficient leverage to compel participation. This may result in less robust MaaS solutions and strategies.

Recommended Next Steps

Putting the above partnership/convener-related recommendations into action may include the following elements:

Establish a MaaS-oriented task force

- Identify needed skills and department representation for the group.
- Survey existing advisory groups to see to what degree they already meet the purpose and needs identified.
- Form a new group if currently existing groups do not meet these needs.

Develop public-private partnerships

- Develop the business case to present to the Oregon Transportation Commission, so this effort is enrolled as a transportation project.

- Conduct further analysis of lessons learned from OReGO and how they apply to MaaS implementation.
- Identify potential roles of private sector entities and candidates to engage based on these roles.
- Work with existing mobility on demand providers to expand services and incorporate MaaS concepts.

Cultivate internal MaaS champions

- Identify potential champions, based on relevant business areas within ODOT, and including those with decision-making authority (i.e. director level) and staff tasked with core implementation roles.
- Develop educational materials that help build the technical capacity of these champions.
- Determine ODOT staff capacity and potential future needs in regard to identifying and addressing local MaaS implementations and coordinating with the new advisory group.

2. ODOT as Policymaker

In February 2019, Washington State DOT (WSDOT) released a memorandum summarizing interviews exploring government’s role in Mobility on Demand (MoD), a concept closely related to MaaS²⁵. Interviewees included: staff from WSDOT, transit agencies in Washington, Federal Highway Administration (FHWA), transportation researchers, representatives of shared mobility providers (e.g. Lime, Lyft, Reach Now), consultants, and others. The memo’s recommendations included the establishment of a set of values with respect to MoD that WSDOT should consider. Table 4.1 evaluates the alignment of these values with the goals and supportive policies established in the OTP.

²⁵ According to the US Department of Transportation, Mobility on Demand is “an innovative, user-focused approach which leverages emerging mobility services, integrated transit networks and operations, real-time data, connected travelers, and cooperative Intelligent Transportation Systems (ITS) to allow for a more traveler-centric, transportation system-of-systems approach, providing improved mobility options to all travelers and users of the system in an efficient and safe manner.” MaaS can be thought of as an implementation of Mobility on Demand.

Table 4.1: Alignment of WSDOT’s values for Mobility on Demand with the Oregon Transportation Plan goals

Washington DOT Mobility on Demand Values	Relevant Oregon Transportation Plan Goal	Relevant Policies
Accessibility	OTP Goal 1 - Mobility and Accessibility	Policy 1.2 - Equity, Efficiency and Travel Choices
Safety	OTP Goal 5 - Safety and Security	Policy 5.1 - Safety
Equity	OTP Goal 1 - Mobility and Accessibility	Policy 1.2 - Equity, Efficiency and Travel Choices
Affordability	OTP Goal 1 - Mobility and Accessibility	Policy 1.2 - Equity, Efficiency and Travel Choices
Reduced congestion	OTP Goal 2 - Management of the System	Policy 2.1 - Capacity and Operational Efficiency
	OTP Goal 3 - Economic Vitality	Policy 3.2 – Moving People to Support Economic Vitality
Decreased trip time	OTP Goal 1 - Mobility and Accessibility	Policy 1.2 – Equity, Efficiency and Travel Choices (note: focus on intercity transit)
Carbon reductions	OTP Goal 4 - Sustainability	Policy 4.2 - Environmentally Responsible Transportation System
Reduced vehicle ownership	OTP Goal 4 - Sustainability	Policy 1.2 - Equity, Efficiency and Travel Choices Policy 4.2 – Environmentally Responsible Transportation System

The WSDOT values largely align with the OTP goals and supportive policies. While “reduced vehicle ownership” is not currently an *explicitly* stated ODOT goal, the agency is initiating research efforts to understand how reduced vehicle ownership could stimulate increased demand for longer distance travel via public transportation, particularly for trips where air travel is less of a viable option. Additionally, several of these values (e.g. reduced congestion,

decreased trip time, carbon reductions, and reduced vehicle ownership) are consistent with the vision and strategies outlined in the ODOT Statewide Transportation Strategy.

Implicit in many of these values, and explicit in ODOT’s working definition of MaaS, is the value of an open, competitive marketplace. However, this will not occur without supportive regulation. Private companies whose business models call for maximizing market share (e.g. acting as a sole gateway for mobility options) have little-to-no incentive to offer access to all available transportation services or to support open data environments. While these companies may support the types of transportation goals ODOT adopts, their primary motive is profitability, which may conflict with some of ODOT’s adopted goals.

Finally, ODOT has a policy role to play regarding MaaS cybersecurity and data privacy. Integrating multiple systems and payment platforms presents inherent risks that call for the implementation of security standards. But these standards alone will not be enough to ensure user privacy. Geolocation data is increasingly being identified as personally-identifiable information (PII), indicating the sensitivity of the matter. ODOT has direct experience with this through OReGO and the Open Architecture for Transportation Services, as the American Civil Liberties Union pushed for stronger PII protections than had been included in the initial draft of the foundational legislation.²⁶ With implementation of Hop Fastpass, the state legislature passed HB4086, granting a public records exemption in order to protect individuals’ personal and travel behavior information associated with electronic fare accounts. While acknowledging the current backlog of public records exemption reviews that the Oregon Sunshine Commission has – and a desire by some members to halt passage of exemptions for the time being²⁷ – **ODOT should consider if further state legislation is needed in anticipation of cybersecurity and privacy²⁸ concerns, for both users and service providers.**

²⁶ https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf, pg. 25

²⁷ <https://www.statesmanjournal.com/story/news/2019/10/01/public-records-exemptions-expanded-oregon-legislature-panel-seeks-limit/2419751001/>

²⁸ ODOT’s policy ADM 08-01 guides the agency’s collection and use of passive electronic data in a way that is transparent and ensures protection of the privacy and sensitive information of the public, including collected personal information (PI). This policy can inform potential legislation that expands protections beyond the data collected by ODOT.

Pros to assuming this role in the MaaS ecosystem

- Staff whose roles connect to MaaS (e.g. members of the Transit Technology Advisory Group and the Office of Innovation) have experience in the policy arena.
- ODOT can shape regulations such that they best support statewide goals and values.
- Equity considerations are necessary to build and protect affordability and access for low-income Oregonians and communities of color. Stakeholders commonly identify potential negative impacts of MaaS on these communities. ODOT also has an important role to play in addressing the impacts that the growth of TNCs - growth that MaaS has potential to further - may have on vehicle accessibility for people with disabilities.
- State-level legislation and guidance, and private sector partnerships, can take some onus off individual jurisdictions to navigate data-related issues.
- Leadership on MaaS policy better enables ODOT to connect MaaS to other issues such as shaping roadway capacity utilization, determining modal equity targets, and improving system operations.

Cons to assuming this role in the MaaS ecosystem

- If policies are developed that put too high a regulatory and/or financial burden on mobility providers, they may refuse to participate. This could increase the risk of diminishing service, which would most significantly affect communities with limited alternative transportation options.
- Local jurisdictions may prefer to maintain the ability to set different standards with MaaS operators and vendors.

Recommended Next Steps

Putting the above policy-related recommendations into action may include the following elements:

Establish values and goals for MaaS

- As part of statewide policy development, establish policy language with respect to MaaS implementation that should act as a lens in evaluating MaaS-supportive policies and investments. A recommended approach for such a lens is described in the Policy and Planning Implications section of this document.
- Provide a statewide view and vision for mobility and mobility related services, defining and prioritizing strategic corridors, hubs, gaps, and connection opportunities for MaaS implementation.

- Utilize informational resources of the MaaS Alliance, which ODOT recently joined. The MaaS Alliance is a public-private partnership creating the foundations for a common approach to MaaS, unlocking the economies of scale needed for successful implementation and take-up of MaaS.

Support an open, competitive marketplace

- Provide technical assistance to regional and local jurisdictions in Oregon that are looking to regulate private mobility providers.
- Support emerging open data standards and their adoption within cities, which could include a pilot in partnership with a jurisdiction to build MaaS-related datasets (e.g. using SharedStreets' CurbLR data standard²⁹ for curb data). This pilot should include assistance with crafting policies consistent with MaaS objectives and the jurisdiction's long-range Regional Transportation Plan or Transportation System Plan.
- Create a MaaS and related shared mobility/mobility on-demand toolkit with guidance for jurisdictions on working with and regulating private mobility providers. The toolkit should include recommended strategies to assess potential equity impacts on low-income households, communities of color, and people with disabilities, with a menu of interventions to work towards equitable outcomes.
- Advise the Oregon Transportation Commission (OTC) and the Oregon State Legislature on the importance of standardized, open data and its value as a tool to support statewide policy objectives.

Provide guidance on cybersecurity and data privacy

- Research cybersecurity and data privacy best practices, including related legislation passed at city, regional, and/or state levels.
- Advise the OTC and the Oregon State Legislature on implementable strategies.

3. ODOT as Investor

MaaS implementation in Oregon calls for strategic investment. A clear role that ODOT already plays, and should continue in support of MaaS, is funding public transit services and transportation system planning efforts. A MaaS platform will have little use if it does not connect users to quality transportation options.

²⁹ As a demonstration project, SharedStreets created a CurbLR feed and interactive map for a small area of downtown Portland: <https://medium.com/sharedstreets/interactive-curb-map-curb-lr-feed-for-portland-or-c638dbdf1b45>

In addition to investments in public transit service, ODOT funds many transportation projects and programs across the state. **The agency should tie funding opportunities to data comprehensiveness and quality, perhaps by including grant application questions and tailoring scoring criteria to that end.** For example, currently the STIF Discretionary Evaluation Criteria Framework includes the following criterion, established by OAR 732-044-0030(1)(c)(B): “Implements technological innovations that improve efficiencies and supports a seamless, easy-to-use Statewide Transit Network.” If MaaS-related data work would meet this criterion, then this should be emphasized to applicants. If not, ODOT should consider updating the OAR so that it would.

Similarly, several objectives of the Transportation Growth Management Program (TGM)³⁰ align with MaaS, i.e. providing transportation choices, accommodating future transportation needs within the existing or improved system, and promoting environmental stewardship. **ODOT should update guidance for eligible uses under Category 1 (Transportation System Planning) to include MaaS-related planning initiatives.**

Existing funding should not be the only focus area, however. **ODOT should dedicate funds specifically to support data creation, collection, storage, integration, and analysis³¹.** This would not only help lay the groundwork for MaaS but would signal the priority ODOT is placing on transportation data and technology. The statewide GTFS program managed by PTD – including current work to create GTFS-flex datasets for providers and the development of GTFS-ride – are examples of this and should be replicated where doing so will support interoperability of data in the state.

Finally, even if not providing direct funding, ODOT should aim to influence investments around the state to support MaaS. The agency should work with the Department of Administrative Services to develop **statewide shared procurement tools and price agreements for MaaS-related investments**, including: low and zero-emission vehicle infrastructure, transit vehicles, operations technology, and software. This may dovetail with an action in the OTP Implementation Work Program to provide procurement, service, marketing, and other tools for public transportation providers to leverage resources and create consistent solutions.

³⁰ <https://www.oregon.gov/lcd/TGM/Documents/TGM-Application-Packet.pdf>

³¹ Note that advancing data-sharing opportunities, tools, and standards is an action in the OTP Implementation Work Program and Goal 10: Communication Collaboration and Coordination.

Pros to assuming this role in the MaaS ecosystem

- Service available to users is the most important, foundational component of MaaS.
- Many of the resources and structures are already in place.
- Fosters partner buy-in of MaaS implementation by incentivizing participation.
- Budgeting for MaaS demonstrates ODOT's leadership in the arena.

Cons to assuming this role in the MaaS ecosystem

- For the STIF criteria example, updating OARs is a time-consuming and political process.
- The relevance of MaaS (and therefore any associated funding opportunities) will likely vary by constituent. Some may see this as an inequitable distribution of state resources.

Recommended Next Steps

Putting the above investment-related recommendations into action may include the following elements:

Analyze Oregon's existing transit network³²

- Identify connectivity gaps (both in terms of coverage and service levels) in the statewide transit network.
- Determine needs to address gaps identified, working towards coordinated and seamless transit connections throughout the state.

Tie funding opportunities to data comprehensiveness and quality

- Research and publish the benefits of a seamless user experience for MaaS services – for example related to cost, operations, and customer experience – provided by complete and accurate data to encourage partners across the state to seek funding for MaaS-related planning, thereby helping to build a foundation for MaaS implementation.
- Update PTD funding (including STIF) and TGM guidance documents³³ and criteria to encourage applicants to make MaaS-related investments.

³² The forthcoming Transit Network Report, Key Transit Hubs report, and planned follow-up activities should address the steps noted here.

³³ For example: <https://www.oregon.gov/ODOT/RPTD/RPTD%20Committee%20Meeting%20Documents/STIF-Substantially-Compliant-Considerations.pdf> and <https://www.oregon.gov/ODOT/RPTD/RPTD%20Committee%20Meeting%20Documents/Updated-Formula-Fund-Guidance-Application-Instructions-Dec2019.pdf>

- Continue to identify other potential funding streams (beyond STIF and TGM) that could include data creation, collection, storage, integration, and analysis as eligible uses.

4. ODOT as Technical Resource and Data Steward

From conversations with stakeholders (especially in smaller urban or more rural areas), it is clear that there is limited understanding of MaaS concepts. For example, some transit providers are unsure how it applies to their core mission of delivering traditional fixed route and/or demand response transit service, and capacity is limited to expand the scope of services provided. **ODOT should educate partners throughout the state about MaaS concepts, while determining where extra resources are needed.**

Along these same lines, **ODOT should work to understand and plan for the risks associated with MaaS implementation**, especially considering potential impacts on small and rural transit providers. For example, some transit agencies throughout the U.S. are forming partnerships with TNCs to provide paratransit and non-emergency medical transportation. These partnerships may initially reduce capital and operating costs while improving service levels for customers. To date, TNCs are generally unprofitable and have relied on venture capital to subsidize operations; their migration to publicly-traded companies makes profitability the primary objective. As a result, communities where operations do not turn a profit could see TNCs leave altogether, with significant impacts on those who have relied on them to meet their transportation needs.

The data standards that PTD is working to develop for the state's transportation providers should prioritize data quality, interoperability, and the use of open data architecture. The agency will need to demonstrate to providers the value of data interoperability, not only to the statewide transportation network and MaaS implementation, but for their own operations and user experience. ODOT manages troves of transportation data that MaaS platforms, including the back ends to TripCheck and Get There, will need to consume. Ensuring the ongoing accuracy and quality of ODOT's own data is crucial.

Part of the seamless user experience envisioned with MaaS entails integrated fare payment. ODOT itself has an opportunity to expand fare integration through the POINT, Columbia Gorge, and Cascades services that the agency manages directly. Beyond that, **ODOT should**

build upon work³⁴ examining the expansion of electronic fares, providing transit agencies throughout the state with the information and assistance they need to implement e-fare systems that other agencies in Oregon have adopted (i.e. Hop Fastpass Touch Pass). This not only includes the technological and financial components of fare systems, but guidance on policies such as revenue sharing and fare reciprocity; a common concern for providers regarding payment integration is that it will result in an unfair distribution of revenue.

A promising opportunity with MaaS is the potential to help ODOT and Oregon’s transit operators access a wealth of travel behavior data. While sensitive in nature due to aforementioned data privacy concerns, MaaS is likely to enable more in-depth analyses than currently possible, informing planning and operational decision-making. Again, the ability and capacity to perform such analyses will vary by provider or jurisdiction, calling for ODOT to assist some more than others.

Pros to assuming this role in the MaaS ecosystem

- Educating stakeholders throughout the state with consistent information about MaaS enables a more cohesive statewide strategy.
- Many resources and structures are already in place.
- Technical assistance (as opposed to regulation) allows jurisdictions and providers more autonomy, which acknowledges that solutions are not one-size-fits-all.
- Analyses performed could be used to help influence traveler behavior in ways that support agency goals (e.g. by informing incentive-based programs deployed within a MaaS platform).

Cons to assuming this role in the MaaS ecosystem

- Constituents’ use of ODOT as a technical resource will depend on the relative importance placed on MaaS. Utilization may be inconsistent across the state.

Recommended Next Steps

Putting the above recommendations into action may include the following elements:

³⁴Included in this work is a completed eFare Expansion Gap Analysis (<https://www.oregon.gov/ODOT/RPTD/RPTD%20Document%20Library/eFare-Expansion-Gap-Analysis.pdf>) and a forthcoming eFare white paper being completed as part of the OTP implementation process.

Educate partners about MaaS

- Identify opportunities to educate staff, jurisdictions, transit providers, and other stakeholders on MaaS concepts. This may include iLearn curriculum, webinars, and sessions at the annual Oregon Public Transportation Conference.

Identify and mitigate MaaS risks

- Conduct a statewide MaaS risk assessment that evaluates the potential impacts on communities' transportation systems and users, given reliance on MaaS and subsequent losses or reductions of service.

Support quality, open data

- Create a framework for the development or adoption of statewide data standards that sets the foundation for use of open data. This framework may include a set of guiding principles, identification of the universe of potential use cases (i.e. desired outcomes with respect to interoperability), and key stakeholders to include in the process.
- Assess current Standard Operating Procedures (SOPs) with respect to ongoing maintenance of the data that ODOT manages.
- Update SOPs to address gaps that may lead to data quality issues.
- Invest in software tools to manage, analyze, leverage, and share data.

Explore fare integration³⁵

- Build upon the eFare White Paper (forthcoming as part of OTP implementation) by conducting a feasibility study for statewide (and beyond) electronic fare integration.
- Explore smaller scale opportunities (e.g. pilot programs) to test payment integration between transit providers and other mobility services, perhaps using existing platforms.

Plan for new travel behavior data

- Survey jurisdictions' existing use of travel behavior data to inform transportation planning and operations, and capacity for future analysis. Include questions to gather feedback on desired analyses that MaaS may support.

³⁵ Work is underway at ODOT in this topic area, as well as smaller regional projects being implemented using STIF funding.

Policy and Planning Implications

ODOT should consider the recommendations provided within the context of ODOT’s past, current, and future planning efforts. While several plans and policies reference potential impacts of technological innovation on the transportation system generally, these plans were developed prior to the emergence of MaaS. This section discusses where MaaS has relevance to existing plans, and where ODOT has opportunities to codify its roles with respect to MaaS into future plans.

Existing Plans

The Oregon Transportation Plan and three modal/topic plans in particular – the Oregon Public Transportation Plan, Oregon Highway Plan, and Oregon Transportation Options Plan – should guide ODOT’s efforts supporting MaaS implementation. MaaS presents many opportunities to work towards the goals established in these plans as currently written. These opportunities are outlined in this section in order to demonstrate the policy basis for MaaS and its connection to long-range planning.

The Emerging Technologies Impact Assessment (ETIA) – which discusses the importance of MaaS for Oregon’s transportation future and the need to define ODOT’s role in MaaS implementation – identified eight foundational goals and desired outcomes for Oregon’s transportation system outlined in the OTP and recent modal and topic plans:

- Safety
- Efficient freight movement
- Equity
- Mobility
- Transportation options
- Fuel efficiency and reducing carbon dioxide (CO2) emissions
- Transportation funding sufficiency
- Land use management

Table 4.2 builds upon this framework to home in on connections to MaaS under each goal area.

Table 4.2: OTP and modal plan goals identified in the ETIA and their connections to MaaS

Goal Area	Connection to MaaS
Safety & Security	Ensuring cybersecurity and data privacy are inherent and crucial challenges for MaaS. At the core of these issues are concerns about personal safety.

Goal Area	Connection to MaaS
	<p>Travel behavior data generated by MaaS could be used to analyze the impacts of MaaS in relation to safety performance targets.</p> <p>Public and private transportation service providers vary in terms of driver training, background check requirements, and insurance, implying the need to consider how MaaS-related mode shifts may impact user safety.</p>
Efficient freight movement	MaaS data foundations could increase open curb space for loading and unloading, use pricing to incentivize travel on certain routes and at certain times of day by non-freight modes, and improve information about road closures and roadwork (e.g. the Work Zone Data Exchange (WZDx) specification ³⁶).
Equity	<p>MaaS has potential to improve mobility and accessibility for transportation disadvantaged persons. This is less likely to occur, however, without targeted policy interventions that address issues like cost barriers, impacts on paratransit services, and geographic areas served.</p> <p>Certain communities, e.g. immigrant and refugee populations, may be particularly concerned about privacy issues due to distrust of governmental institutions. This should be considered in the context of creating data privacy policies.</p>
Mobility	Enabling seamless end-to-end journeys is a defining objective for MaaS.
Transportation options	MaaS promises to improve information about and access to available transportation options. It will not, however, increase transportation options on its own.
Fuel efficiency and reducing CO2 emissions	<p>A MaaS ecosystem that makes non-SOV and non-TNC³⁷ options attractive and competitive – with public transit as its backbone – should result in reduced CO2 emissions from driving.</p> <p>The relationship between fuel efficiency and MaaS is unclear.</p>

³⁶ <https://www.transportation.gov/av/data/wzdx>

³⁷ Note recent findings of increased emissions related to ride-hailing as currently utilized in the U.S.: <https://www.ucsusa.org/resources/ride-hailing-problem-climate>

Goal Area	Connection to MaaS
Transportation funding sufficiency	MaaS solutions may reduce costs of providing certain transportation services, especially through public-private partnerships, potentially enabling reallocation of those resources. However, TNCs in particular may create a temporary illusion of reduced costs, given high subsidization by investors.
	Pricing incentives can be used to encourage modal shifts, impacting utilization of certain transportation facilities and, therefore, maintenance costs and expansion needs.
	The provision of MaaS services could present the potential of a new revenue stream and positively impact the Highway Fund.
Land use management	MaaS could support communities' land use strategies, for example if tied to TGM strategies.

Future Planning Efforts

If ODOT is to play a leading role in MaaS, its plan updates and program implementations should reflect this. We have provided recommended strategies to incorporate and encourage MaaS within current programs (i.e. PTD funds and TGM funds), and now we turn to a discussion of higher level, longer range planning opportunities.

The timing of this work is meant to help determine how to include MaaS in two plan updates underway: the OTP and OHP. While many considerations covering a variety of topics will inform these processes, MaaS will likely have significant direct and indirect impacts on how to achieve the adopted goals and policy objectives. In this sense, ODOT should not consider MaaS implementation as its own goal; rather, the agency should focus on how MaaS (as a tool) can support – and/or hinder – desired outcomes.

One strategy ODOT may employ is the creation of a **MaaS-focused policy evaluation tool**. Applying such a lens to goal-setting and policy making would make ODOT better prepared for goal/policy implementation in an era of emerging transportation technologies. Questions the tool may include are:

- How might MaaS implementation support achievement of the stated goal/policy, and vice-versa?
- Are there inherent conflicts between MaaS implementation and this goal/policy?

- Who within the MaaS ecosystem might be affected (positively, negatively, or otherwise) as ODOT implements this goal/policy?
- What are the equity implications of this goal/policy, and what interventions might address potential inequitable outcomes?
- What partnerships would ODOT need to rely on (and/or form) in order to effectively connect this goal/policy to MaaS?
- What are the costs associated with each option, and how are these costs addressed?

ODOT will have the opportunity to develop analysis methods that utilize data generated through MaaS platforms (presuming the agency has access to this data, reinforcing the need for open data policies and standards). **As the transportation landscape continues to evolve, transportation modeling needs to adapt.** A recent project conducted by the National Institute for Transportation and Communities (NITC)³⁸ provided a new approach to modeling that accounts for reductions in private vehicle ownership, non-motorized mode choice, and intrazonal travel – all of which are likely to be impacted by MaaS adoption, and which MaaS data could support. While ODOT has a sophisticated model (last updated in 2017), its next iteration could benefit from MaaS, potentially by reducing costs of data gathering and better predicting travel behavior.

Another area that MaaS should inform is the **development of agency performance measures**. Current mobility key performance measures³⁹ are separated by mode (e.g. number of rail service passengers). However, MaaS platforms will ideally integrate modes in a way that prioritizes seamless and efficient travel. While defining performance measures by mode is an effective way to understand how various ODOT business areas and modal operations are functioning, the approach does not take a holistic view towards the transportation system’s impact on individuals’ mobility.

Crucial to all of these strategies is **continued engagement of MaaS stakeholders** – especially Oregon’s transportation providers and the community members they serve. Because much about the future of transportation and related technologies is unpredictable, so are the potential impacts on these stakeholders. In the same vein, ongoing engagement will help ODOT stay abreast of innovation in this sector, which it will need to do in order to plan and implement related strategies. We have seen TNCs organize to influence legislation at the state level, and they will continue to do so as they strive for profitability. This is not to say that the

³⁸ https://ppms.trec.pdx.edu/media/project_files/NITC-RR-1086_Key_Enhancements_to_the_WFRCMAG_Four-Step_Travel_Demand_Model_ir92NOW.pdf

³⁹ <https://www.oregon.gov/ODOT/PerformMang/Pages/index.aspx>

actions and goals of private MaaS entities will necessarily conflict with those of ODOT; rather that ODOT should be aware of these efforts and identify where interests align.