

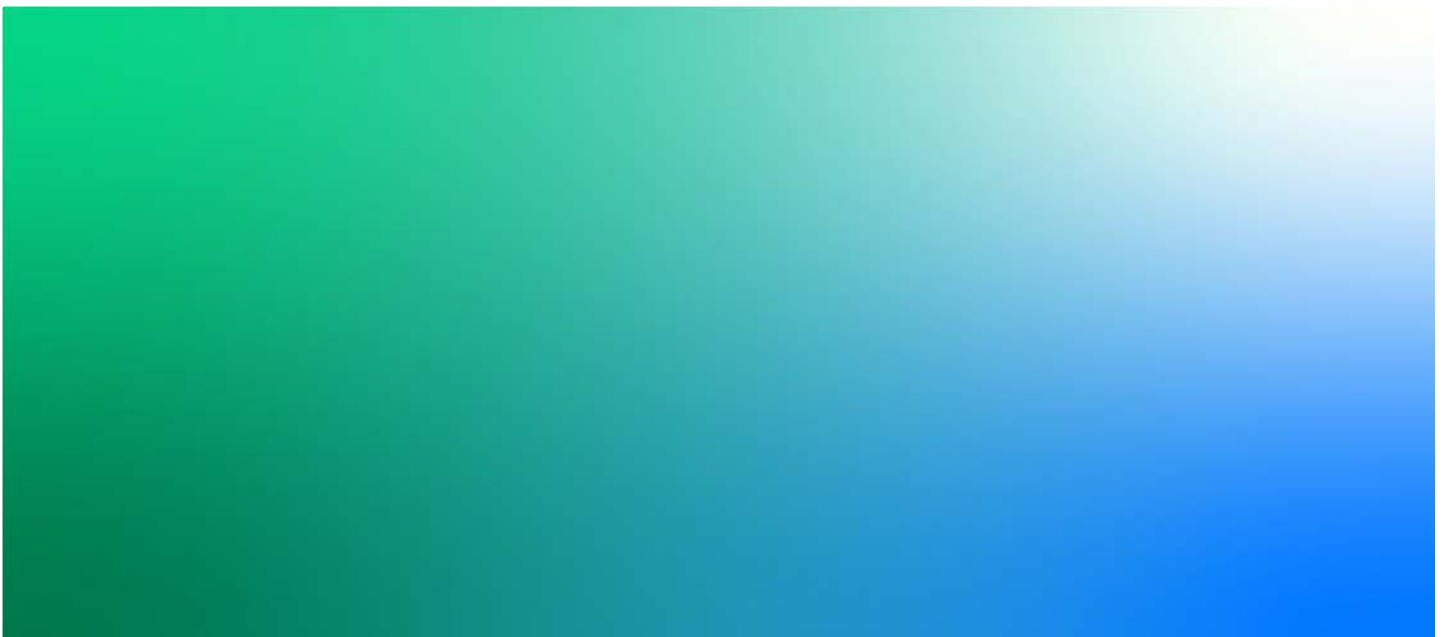


**Oregon Futures
Emerging Technologies Impact Assessment Project**

Results Report

February 24, 2020

Oregon Department of Transportation



Contents

1.	Project Background	1
2.	Scenario Planning in Context	2
3.	ETIA Phase 1 Overview and Outcomes	3
4.	ETIA Phase 2 Overview	5
4.1	Oregon Futures State Agency Peer Exchange	5
4.2	ODOT Scenario Development Workshop	6
4.3	Assessment Tools Workshop.....	6
5.	Phase 2 Outcomes to Guide Scenario Planning	7
5.1	Exploratory Scenario Planning	7
5.2	Assumptions and Trends.....	7
5.3	Assessment Tools	8
5.4	Scenario Planning Matrix.....	9
6.	Next Steps and Recommendations	11
7.	References	12

Figures

1	Goal areas and their icons	9
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Appendices

Appendix A. Peer Exchange Summary

Appendix B. Oregon Futures Scenario Workshop Summary

Appendix C. Tools Assessment Workshop Summary

Acronyms and Abbreviations

AV	automated vehicle
CAVST	Connected and Automated Vehicle Steering Team
CO ₂	carbon dioxide
CV	connected vehicle
ETIA	Emerging Technology Impact Assessment
EV	electric vehicle
FTA	Federal Transit Administration
HOV	high-occupancy vehicle
Jacobs	Jacobs Engineering Group Inc.
MaaS	Mobility-as-a-Service
MnDOT	Minnesota Department of Transportation
MPO	metropolitan Planning Organization
ODOT	Oregon Department of Transportation
OHP	Oregon Highway Plan
OTC	Oregon Transportation Commission
OTP	Oregon Transportation Plan
Peer Exchange	Oregon Futures State Agency Peer Exchange
RUC	road-usage charge
SOV	single-occupancy vehicle
SWIM	Statewide Integrated Model
TNC	transportation network company
TPAU	Transportation Planning Analysis Unit
V2I	vehicle-to-infrastructure
V2V	vehicle-to-vehicle
V2X	vehicle-to-everything
VMT	vehicle miles traveled

1. Project Background

Emerging technologies such as connected, electric vehicles and infrastructure, on-demand mobility options, and the collection and analysis of large amounts of data have led to rapid changes in Oregon's transportation system and mobility choices. To better prepare for an increasingly uncertain future, the Oregon Department of Transportation (ODOT) initiated the Emerging Technology Impact Assessment (ETIA) Project through a contract with CH2M HILL, Inc. (now Jacobs Engineering Group Inc. [Jacobs]) to identify and consider implications, including benefits and impacts, from emerging transportation technologies for Oregon's transportation system.

In 2015, ODOT established the Connected and Automated Vehicle Steering Team (CAVST), an internal group charged with leading the agency in implementing ODOT's transportation vision—as it relates to connected and autonomous vehicles—and coordinating across ODOT's various functions to manage resource investment. The CAVST first identified the need for the ETIA project when developing its work plan for 2018. The CAVST determined that the results of the assessment would inform next steps the agency takes on connected and automated vehicle policy and conferred responsibility for the scoping and completion of this task to ODOT's Transportation Development Division (now renamed as Policy, Data, and Analysis Division). They expanded the scope of this task to explore a range of additional emerging transportation technologies, such as micro-mobility (e-bikes and e-scooters) and e-commerce, in order to consider broader multimodal policy implications in preparation of updates to the Oregon Transportation Plan (OTP) and the Oregon Highway Plan (OHP).

The ODOT/Jacobs project team conducted the ETIA project in two phases. Phase 1 outlined the key trends in emerging transportation technologies, assessed potential policy implications and effects upon Oregon's transportation system, and identified a suite of potential interventions for ODOT to consider. ETIA Phase 2 built on the assumptions developed in Phase 1 to identify and prioritize analysis tools and methods to be used in the development of scenarios to inform ODOT's long-range strategic planning.

2. Scenario Planning in Context

Scenario planning for transportation occurs at multiple levels of government in accordance with federal planning principles. According to the Federal Transit Administration (FTA), scenario planning is a process that evaluates the effects of alternative policies, plans, and/or programs on the future of a community or region (FTA 2019). Scenario planning is a long-term approach used to explore and debate alternatives and trade-offs by looking at a range of future possibilities.

Designating specific outcomes before a scenario planning effort is referred to as a **normative** scenario planning approach. An **exploratory** approach examines a broad range of variables that go beyond land use and transportation. This approach broadens the scope of traditional scenario planning to generate more integrated planning and policy efforts that include more factors such as housing affordability, water conservation, fiscal sustainability, and public health (FTA 2019). Results under exploratory planning are not specific outcomes or prescriptive paths, but rather roadmaps to test and explore different influencers, drivers, and options that might be developed. The exploratory approach makes scenario planning suitable for both small and large applications.

Advantages of Scenario Planning (FTA 2019):

- Accommodates uncertainty and ambiguity.
- Helps communities prepare for a range of plausible futures rather than a single forecast.
- Results in decisions that are more robust in a variety of futures.
- Provides a forum for engaging a diverse set of stakeholders to identify critical factors.
- Facilitates testing out possible decisions and their effects on multiple future scenarios.

Scenario planning is common at a regional level through local metropolitan planning organization (MPOs) or regional governments. MPOs and regional governments are well suited to implement scenario planning because they operate within a smaller geographical area when compared to a statewide agency, they have easy access to necessary data, and are able to more quickly conduct stakeholder outreach to understand underlying issues and trends. Though the ETIA project focused on statewide scenario planning applications, the project team identified and evaluated various assessment tools that could be used to measure, track, and influence regional objectives as well.

3. ETIA Phase 1 Overview and Outcomes

The project team designed the first phase of the ETIA project to identify and describe the emerging technology trends that affect transportation in Oregon. During Phase 1, the project team evaluated how these trends and drivers of change might affect how ODOT manages their transportation programs and systems and how they deliver transportation services in the state. This process also identified policy implications and suggested interventions to maximize positive outcomes and minimize negative outcomes.

The State of Oregon plays an integral role in identifying, developing, and implementing policies to address a future with emerging transportation technologies. To identify and understand potential impacts, the team used goals from the OTP and relevant modal plans that are elements of the OTP as a guide. ODOT then determined whether these impacts were positive or negative towards meeting project goals and indicated the level of certainty of each predicted impact. For example, how might the increased use of ride-hailing over personal vehicle ownership impact roadway usage? How might the transition to more connected, electric vehicles impact roadway safety and transportation infrastructure needs? Are these changes more likely to have positive or negative impacts on our goals and what policy interventions are possible to influence those outcomes?

The work in ETIA Phase 1 culminated in the development of potential policy interventions that could influence how emerging technologies could affect Oregon's transportation system. Some policy interventions cross-cut multiple goal areas, while others are linked to a single goal area. The project team then organized potential policy interventions according to each of ODOT's eight foundational goal areas and identified those most likely to influence outcomes. The following policy interventions (listed by ODOT foundational goal area) exemplify potential actions to incorporate in the development of future scenarios, trends, and considerations for the OTP and OHP Updates:

Safety

- Deploy vehicle-to-infrastructure and vehicle-to-vehicle technology
- Regulate level 3 and higher automated vehicles (automated driving functions)
- Update roadway design standards
- Update All Roads Transportation Safety program requirements

Efficient Freight Movement

- Deploy vehicle-to-infrastructure and vehicle-to-vehicle technology for freight
- Initiate automated, platooning, or other connected freight pilot projects
- Digitize freight route planning

Equity

- Ensure investments benefit transportation-disadvantaged and underserved groups
- Update equity criteria
- Update Statewide Transportation Improvement Fund program requirements

Mobility

- Deploy vehicle-to-vehicle and vehicle-to-infrastructure technology
- Update roadway standards
- Explore pricing strategies and priority for high-occupancy vehicles
- Update development review tools

Transportation Options

- Support investments in statewide Mobility-as-a-Service (MaaS) applications and payment systems, including integrated fare payment
- Support investments in mobility hubs
- Update funding program requirements to support public transit and active transportation

Fuel Efficiency/Reducing Carbon Dioxide (CO₂) Emissions

- Develop or adjust taxes and fees
- Participate in multistate initiatives
- Plan for alternative fuels infrastructure

Transportation Funding Sufficiency

- Implement statewide road usage charge
- Consider pricing of roadway infrastructure
- Develop Driver and Motor Vehicle Services fees and policies

Land Use Management

- Develop system planning and overlay standards and guidance
- Update mobility targets on state facilities
- Update development review requirements

4. ETIA Phase 2 Overview

Phase 2 builds on the work of Phase 1, informing how Oregon can prepare for and address emerging technologies in ODOT’s strategic long-range planning approach through exploratory scenario planning. The project team evaluated the tools, metrics, and inputs for a range of alternative future scenarios. Each scenario could incorporate different combinations of technological change and adoption, demographics, economics, and other variables. Assessing key outcomes under each of these futures was a critical aspect of Phase 2 and laid the groundwork for updating key ODOT policy documents: the OTP and the OHP.

To develop and understand potential scenarios, the ETIA project team convened stakeholder consultation sessions and meetings that consisted of a state agency peer exchange, an ODOT scenarios development workshop, and an ODOT tools assessment workshop. These efforts strengthened the project team’s understanding of state priorities and issues to consider in defining a potential range of alternative future scenarios.

Statewide scenario planning efforts are becoming more common, but the size is challenging because of the number of state agencies and stakeholders within a state government. The State Agency Peer Exchange worked to remove barriers to cross-agency planning efforts and identify shared priorities for future planning.

4.1 Oregon Futures State Agency Peer Exchange

The Oregon Futures State Agency Peer Exchange (Peer Exchange), held in July 2019, was a single, half-day, in-person workshop in Salem, with 16 statewide and local/regional partner agencies and Portland State University in attendance. Its purpose was to inform partners of ODOT’s work to plan for the transportation system’s future, learn from peer agencies on how they are planning for the future, and establish a network for information sharing. It was convened as a response to the Oregon Transportation Commission’s (OTC) assessment of Phase 1. OTC members reviewed Phase 1 findings and directed ODOT to learn of other agency’s approach to emerging technology. The Peer Exchange helped ODOT develop future scenario questions around 11 key themes:

- Equity
- Climate change
- Planning horizons
- Workforce preparedness
- Resiliency
- Urban–rural disparities
- Housing costs and supply
- Demographic and cohort changes
- Nexus of housing access and educational success
- Homelessness
- Health impacts

Examples of Statewide Scenario Planning

In winter 2018/2019, the *Minnesota Department of Transportation* (MnDOT) used scenario planning as part of an innovative approach to determine how plans and programs will address connected and automated vehicle technologies in their *CAV Scenario Planning Report*. The effort also helped educate local partners and stakeholders while giving MnDOT staff new perspectives on the promises and potential problems with different scenarios.

MnDOT developed four scenarios that each describe a possible future Minnesota in the year 2040. Each scenario assumed varied levels of automation, connectivity, electrification, and sharing. The scenarios ranged from describing a future with incremental change from today’s technology to a future with a fleet of fully automated vehicles operating as part of a robust multimodal system. The implications of each scenario were distinct to allow for unique group discussion at the workshops based on scenario-specific challenges and opportunities.

The Peer Exchange also identified long-term trends, impacts, approaches to planning, priority trends, and opportunities to collaborate (sharing info, communication channels, and other collaborative efforts). Full notes from the Peer Exchange can be found in **Appendix A**.

4.2 ODOT Scenario Development Workshop

The Scenario Development Workshop was the second key stakeholder engagement effort. It included 30 participants who represent different ODOT programs and divisions. The workshop's purpose was to share Phase 1 outcomes, review and discuss emerging trends and drivers of change that could affect Oregon in the future, and brainstorm potential future outcomes and implications. Before the workshop, ODOT sent an online survey to participants to help identify key goal areas to emphasize. Survey respondents indicated that safety, mobility, and reducing CO₂ emissions were their highest priorities. Key emerging trends and drivers of change were identified and discussed during the workshop under the themes of environmental, demographics, economic/financial, emerging technologies, and freight logistics and local delivery applications.

This workshop encouraged participants to brainstorm positive and negative impacts in relation to ODOT's eight foundational goals applied to the ETIA project. The brainstorming activity provided direction for the project team to prioritize inputs, assessment tools, and metrics for scenario development. Key takeaways and notes from the workshop can be found in **Appendix B**.

4.3 Assessment Tools Workshop

The Assessment Tools Workshop included representatives of ODOT's Transportation Planning Analysis Unit division, who provided insight into various in-house modeling and long-range planning tools that could be used to test potential future scenarios. Tools are generally categorized into three buckets under the Strategic Tactical Operational STORM Analysis framework—ODOT'S process for determining the right tool for a particular scenario planning effort—to better determine how they can be used.

Key Tools reviewed included the following:

- **VisionEval** – a strategic modeling tool designed to evaluate several alternative futures when there are many unknowns.
- **The Statewide Integrated Model (SWIM)** – a model created to test policies statewide by adjusting inputs depending on a variety of changes that can be economized.
- **Place Types** – a geospatial, data-driven application to define and visualize the many aspects of land use–transportation interactions embodied in land use plans. It is context sensitive, so it compares existing built environment characteristics with what is expected to occur in the future.

Scenario Planning at the Regional Level

Some scenario planning tools have been effectively used at the regional level to plan for and evaluate alternative transportation futures.

In September 2009, the Memphis Urban Area MPO began the *Imagine 2040 Midsouth Transportation & Land Use Plan*, a regional visioning and scenario planning process. Scenario planning was used as a tool throughout the process to identify regional goals and values and explore alternatives for growth, development, and transportation investment. Scenario planning helped the public and stakeholders visualize the interaction of new development, economic vitality, and the surrounding transportation system.

In 2017, Metrolinx (Toronto and Hamilton road and public transport agency) used a scenario planning approach for its *Regional Transportation Plan* that presented alternative futures covering wide-ranging trends in order to understand what might change in the future.

Metrolinx created a total of six alternative future scenarios that were built off previously established key questions and then shaped by a variety of driving forces stemming from different categories, including demographics, the economy, technology, and the environment.

5. Phase 2 Outcomes to Guide Scenario Planning

5.1 Exploratory Scenario Planning

ODOT will use an exploratory approach for future scenario planning in association with its long-range plan updates. This approach will allow the state to take a holistic and objective perspective in exploring, testing, and planning for different scenarios. ETIA Phases 1 and 2 prepared ODOT for this approach by developing potential policy interventions to address emerging trends and drivers of change, as well as understanding some applicable tools to be used to analyze and measure different scenarios.

5.2 Assumptions and Trends

A key outcome in Phase 2 was identifying underlying assumptions and trends for scenario development, which were informed through stakeholder engagement discussions. The following assumptions and trends were critical in establishing ETIA's scenario development framework:

- The State of Oregon acknowledges the international scientific consensus on climate change and associated implications.
- Resiliency (including seismic readiness and natural disaster preparedness) underlies all ODOT goal areas.
- Statewide sustainability policy initiatives to protect environmental resources and habitats, and to mitigate and reverse the effects of fossil fuel usage will continue to be in effect.
- Transportation revenue will continue to change because of declining fuel tax revenues and other factors.
- Statewide land use planning framework and Transportation Planning Rule will remain consistent to enable balanced land use development in coordination with transportation planning.
- Emerging vehicle and infrastructure technologies create workforce and supply chain impacts across many goal areas, with new workforce needed to plan, maintain, engineer, and construct a changing transportation system.

The listed assumptions and trends were summarized into three broad categories (the drivers of change around emerging technologies) that were used to inform a framework for exploring scenarios that will include an expanded list of assumptions and trends as ODOT begins the OTP and OHP Updates. The three categories helped organize future trends and outcomes developed by ODOT.



Mobility Options, including active transportation options, shared mobility services, and ride-hailing services that operate within the concept of the integration of transportation services into a single trip-planning and payment platform is known as Mobility-as-a-Service (MaaS).



Vehicle Technologies, including connected vehicles (CVs), automated vehicles (AVs), and electric vehicles (EVs).



Freight Logistics, including freight vehicle platooning, efficiencies in distribution networks, and on-demand delivery services.

5.3 Assessment Tools

Following the Assessment Tools Workshop and after receiving feedback from ODOT staff, the project team identified a variety of assessment tools for future scenario development for both the state and regional level. Modeling tools include SWIM, VisionEval, Travel Demand Models, and the Highway Economic Requirements System – State Version.

SWIM is intended to be used in response to large, statewide or regional project and policy questions but not for local issues around land use changes or small road segment realignments. Unlike travel demand models where land use is the major factor, SWIM uses the economy first and then models land use and transportation impact.

VisionEval is a strategic modeling tool designed to evaluate several alternative futures when there are numerous unknowns. It considers how a wide range of emerging modes and trends and policies on land use and transportation may affect future goals, such as sustainability, health, and mobility at state, regional, and local levels.

Travel Demand Models are intended to represent travel decisions that are consistent with actual travel trends and patterns. They can test the impacts of “what if” questions and can be used to predict future travel patterns and demands based on changes in transportation, land use, and demographics.

HERS-ST model identifies roadway deficiencies over a period of time and can provide a report of performance measures like speed, delay, and travel time. It can forecast future conditions and calculate cost-benefit ratios to evaluate a potential improvement to determine the best solution to a problem.

RSPM is a performance-based planning tool that models household travel, fuel and power consumption, and greenhouse gas emissions calculations. It is intended to be used when testing ideas where there are many unknown policy implementation details. The RSPM model can be used at both the statewide and regional level.

Mosaic is a tool that enables the benefits and costs of transportation options and investments to be weighed on a common scale. Mosaic compares groups of transportation investments (bundles) with one another but does not work at a fine enough resolution to evaluate individual projects.

5.4 Scenario Planning Matrix

In coordination with ODOT, Jacobs developed a draft scenarios development framework matrix that organizes the outcomes of ETIA Phase 2 and provides a reference document that ODOT can carry into its strategic planning efforts.

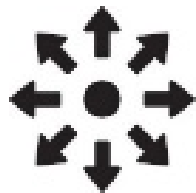
The matrix in **Appendix C** is organized by the drivers of change. Under each driver of change category is a set of trends that were developed through outreach to various state agencies and coordination between ODOT and Jacobs. The trends identified through research in Phase 1 and stakeholder engagement in Phase 2 inform the outcomes and are potential results of these futures, both positive and negative. The matrix also includes applicable goal areas to better understand how trends and outcomes relate to ODOT foundational goal areas.



Equity



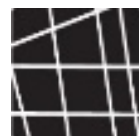
Transportation
Options



Mobility



Fuel Efficiency
Reducing CO₂



Land Use



Safety



Efficient Freight
Movement



Transportation
Funding

Figure 1. Goal Areas and Their Icons

5.5 Guiding Questions for Next Phase of Planning

The ETIA project management team, consisting of ODOT and Jacobs staff, developed a draft set of focal questions early in the ETIA Phase 2 to initiate the scenario planning process for the OTP and OHP Updates. While ODOT did not incorporate these questions into the ETIA process, the agency could consider their application moving forward in their long-range transportation planning. The focal questions to consider include:

- What are the key drivers of change that we need to understand and that affect how we manage the transportation system?
- What are the transportation-related goals that ODOT wants to influence for the state, and what policy levers does ODOT have or could have to impact those goals?
- How do goals and objectives that are known and foreseeable, such as the Statewide Transportation Strategy, inform the state's perspective and impact decision making?
- What are the measures ODOT can use to determine how well the agency is achieving the set goals?
- What uncertainties can we imagine that might impact our goals outside of our control?
- Of the key drivers of change, uncertainties, and anticipated impacts to Oregon's transportation system, which ones should ODOT prioritize?
- What is most critical for Oregonians and the state to prioritize to account for changes to, and use of, the systems that are associated with the deployment of emerging technologies?
- How can ODOT manage change to effectively mitigate negative impacts and leverage positive opportunities to the transportation system?
- What are reasonable funding levels to assume for the future and do they meet needs for maintaining the statewide transportation system?

6. Next Steps and Recommendations

Moving forward, ODOT can lead or influence implementing opportunities identified in this report to reach shared goals and achieve success in future planning efforts.

The following are recommendations for future planning:

- Use focal questions developed for internal discussion to guide the future planning process within the agency. These questions are included in Section 5.5.
- Market ETIA findings broadly across ODOT's multiple divisions.
- Create outreach and communications materials to inform the public of drivers of change and trends that are an instrumental component of messaging for the OTP and OHP Updates.
- Build on peer exchange for cross-collaboration with other agencies and consortiums (for example, share findings and host a discussion of Emerging Technologies with RUC West).
- Collaborate with MPOs on their efforts in this area (for example, Metro Emerging Technologies project) and present findings at regional events and roundtables because some outcomes are best modeled and influenced at an urban/urbanizing regional scale.
- Use the policy experts on the ETIA project team to inform legislative discussions so that foundational goal areas are being influenced in the right direction (for example, regulating AVs, requiring equitable distribution of new technologies in low-income areas by private companies.)
- Use the information about drivers of change to recruit needed staff expertise and develop training programs.
- Create pilot initiatives that analyze or study possible future scenarios. Use the findings to further inform assumptions on possible future impacts, planning process, and policy.
- Continue to update the Oregon Intelligent Transportation Systems Architecture with content from the most current service packages using the latest USDOT National ITS Reference Architecture. The new architecture addresses future considerations like connected and automated vehicles. ODOT could also expand the current planning horizon for the statewide architecture from 2011–2021 to 2021–2031.
- Conduct a follow-up session with internal ODOT team on assessment tools to make final decisions on scenario modeling.

To effectively prepare for and support emerging technologies in transportation that align with State of Oregon policies, communication, and coordination about priorities, goals, and future planning efforts will be essential. ODOT cannot effectively accomplish this alone and will rely on strong partnerships with other jurisdictions and agencies across the state. Even though realities of how emerging technologies are disrupting existing transportation systems are rapidly changing and largely uncertain, the drivers of change and policy influencers considered through this project provide valuable elements for ODOT and other stakeholders to create a plan for addressing these impacts and advancing shared goals.

7. References

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Appendix A. Peer Exchange Summary

Oregon Futures State Agency Peer Exchange

Peer Exchange Summary

July 16, 2019; 8:00 am – 12:00 pm

Attendees

Peer Exchange Participants	
Name	Agency
Linda Beuckens	Department of Motor Vehicle
Cara Biddlecom	Oregon Health Authority
Maureen Bock	ODOT
Jerri Bohard	ODOT
Megan Bolton	Oregon Housing and Community Services
Alan DeLaTorre	Portland State University
Kirstin Greene	Department of Land Conservation and Development
Cole Grisham	ODOT
Kim Herb	Business Oregon
Terra Hernandez	Oregon Department Education
Gail Krumenauer	Oregon Employment Department
Josh Lehner	Oregon Department of Administrative Services
Brian Reeder	Oregon Department of Education
Jessica Reichers	Oregon Department of Energy
Michael Rock	ODOT
Cory-Ann Wind	Oregon Department of Environmental Quality
Heather Peck	Oregon Department of Aviation
Amanda Pietz	ODOT

Project Team	
Name	Agency
Scott Richman	Jacobs
Brooke Jordan	Jacobs

Welcome and Meeting Overview

Jerri Bohard, ODOT Transportation Development Division (TDD) Administrator opened the Peer Exchange and welcomed the attendees to the meeting. Jerri provided an overview of the workshop objectives and purpose and facilitated self-introductions.

Overview of Oregon Trends

Josh Lehner, Oregon Office of Economic Analysis Senior Economist, provided an overview of current trends in Oregon based on population growth, migrant patterns, and labor force and industry outlook. Below is a list of key points that Josh made.

- Oregon's strength is its ability to attract and retain working age households. This strength is not just associated with cities in the Willamette Valley, but across the entire state.
- Attracting workers drives the State's long-term population forecast, which impacts and underpins all other economic measures and forecasts – economy, housing affordability, etc.
- Overall, deaths outpace births in the state and overall population would drop absent in-migration from other states. The large proportion of baby boomers in the state's total population contributes to a low growth rate forecast over the next 15 years. Moreover, Oregon has one of the lowest birthrates in the country and it continues to decrease.
- When it comes to Oregon's labor force, Josh highlighted that the Willamette Valley is the only area of the state that will see increases in workers – everywhere else will likely experience decreases.
- Oregon's industrial structure is diverse and has a good mix of industries, but it's still somewhat lower than the national average. Economic diversity helps protect the state from changes and recessions in individual industries. Industries in Oregon that have been strong historically will not continue to be leading industries in the next 10 years. Timber and hardware jobs will continue to decline, while collar jobs will continue to grow.
- Between 2020-2030, Oregon expects over 8% growth in urban areas and up to 8% nearby.

Discussion

- **Question:** Is population growth always good?
 - **Answer:** Managing growth declines is more challenging than managing growth. Shrinking communities, demolishing infrastructure, etc., quickly becomes problematic. Maintaining the status quo is difficult and there is no good model to do that. If Oregon isn't accommodating growth, communities will experience increased displacement.
- **Question:** What states does Oregon attract residents from?
 - **Answer:** About 30-40% of Oregon's in migration comes from California, with consistent out migration from Oregon to Washington. Flow of migration typically flows northward from California to Oregon to Washington.

Oregon Transportation Plan Update

Adam Argo, ODOT Senior Transportation Planner, updated the group about the upcoming major updates to the Oregon Transportation Plan (OTP) and the Oregon Highway Plan (OHP). Along with plan updates, Adam provided an overview of emerging transportation technologies and trends, work to-date on the Emerging Technology Impact Assessment (ETIA) Project, and the next steps for the ETIA Project.

Current Timeline

In preparation for the OTP and OHP updates ODOT will complete the following tasks:

- Emerging Technologies Impact Assessment: July 2018 – October/November 2019
- Stakeholder Interviews: August – November 2019
- Whitepapers/Background Research: Late Summer/Fall 2019

- Scope New Contract: RFP Fall 2019, kickoff by early 2020

ETIA Overview

ETIA is comprised of two phases of work:

- **Phase 1:** Identify key trends in emerging transportation technologies and analyze impacts of trends on Oregon's transportation system
- **Phase 2:** Develop planning scenarios on a broader range of considerations to inform the OTP/OHP updates

[Overview of Technologies and Trends](#)

Technologies

Report groups emerging technologies into three categories:

- Vehicle technology (automated, connected, and electric vehicles)
- Mobility options (bike and e-scooter share, ride-hailing services)
- Freight logistics (and local delivery applications)

Trends

Report organizes technological trends into three categories:

- Improvements in computing power
- Communications and networking
- Increase of available data (“big data”)

[OTC Emerging Technologies Workshop Concerns](#)

An Oregon Transportation Commission (OTC) Workshop was held on October 18, 2018 to share information about emerging transportation technologies and outline potential impacts to Oregon’s transportation system. OTC commissioners identified the following issues to inform the ETIA process.

- Understanding funding impacts
- Understanding resettlement patterns
- Aligning ODOT's efforts with other state/local agencies
- Developing new needed skills and experiences within ODOT's workforce to address impacts from emerging trends

[Future Work and Next Steps](#)

Next steps for the rest of 2019 and into 2020 will be to complete ETIA Phase 2 and prepare to evaluate scenarios and updates to the OTP and OHP. The following list provides a high-level work plan to conduct this work.

- Oregon Futures Peer Exchange: July 16, 2019
- Oregon Futures Scenario Planning Workshop: July 31, 2019
- Conduct Stakeholder Interviews: August – November 2019
 - Seek advice of transportation experts on topics and areas of focus for OTP and OHP updates
- Kick off OTP process: Early 2020
 - Initiate Public Involvement process

- Form advisory groups
- Evaluation of scenarios and research: Early 2020

Roundtable Discussion

Scott Richman and Brooke Jordan, Jacobs, facilitated a round table discussion with the group. Meeting participants were asked to share the long-term trends that their agency has identified, as well as key anticipated impacts, and their approach to planning (their planning horizons and their agency's structure for planning). The long-term trends were often identified in question format. These topics then led to a discussion among agencies in which they prioritized trends to highlight which issues are most important to their work.

Long-Term Trends

- **ODA:** Drones, pilot shortage, disaster preparedness
- **Business Oregon:** Aging infrastructure, climate change (impacts planning for the future – water and sewer), and financing
- **OED:** How do automated vehicles(AVs) effect jobs/workforce? Some occupations may come from Emerging Technology. How will that affect existing workers?
- **DLCD:** Where do people desire to live?
 - How does income affect location choices?
 - How does this impact housing access and affordability?
 - What geographic disparities exist in broadband access? E.g., limited access in most rural areas of OR.
 - Employment: Declining population in many counties means lower tax revenue and associated impacts on public investment capability
- **ODE:** 2/3 of Oregon schools are losing enrollment
 - Impacts school location decisions
- **DEQ:** Growth, congestion, and climate change is outpacing DEQ planning
 - Concerned with more than just greenhouse gas--also particulate matter
 - Portland has met air quality standards, but trends have flattened or are starting to increase due to wildfire
- **OHA:** Climate change, diversification of population, and lack of federal support on key issues
- **PSU:** Age 85+ population share is growing and with it comes an increase in adults with disabilities.
 - Mobility is core issue for aging adults and access to transit and door-to-door service is limited, even with some aging adults continuing to drive
 - Focused on how to maintain and build community connection within elderly communities
- **OHCS:** Loss of naturally occurring affordable housing (not subsidized necessarily, but perhaps small and cost-effective housing)
 - Increase in homelessness
 - Service provision for housing stability
 - Coordination with other agencies to meet service needs
- **ODE:** Getting kids to school and appointments

- Mitigating push-out (instead of “drop-out”) factors
 - Schools need social services on-site; off-site services lead to attendance conflicts
 - Highest rate of truancy is among homeless students
 - Lack of childcare after school and related transportation limits attendance in extracurricular activities too
 - ‘Most kids say they can finish high-school in 2-years... why then make them stay for 4 years?’

Impacts

- **DLCD:** Helping jurisdictions decide where to invest based on climate change
- **OHA:** Stresses resources
 - Greater frequency of emergencies and water crises
 - Can lead to positive changes with how OHA conducts work, including
 - Engagement
 - Outreach
 - Program management and access
- **OHCS:** More funding for housing due to increased visibility of housing challenges
 - Helps with housing siting
 - Working with DLCD on local housing strategies
 - High rate of child homelessness; leads to coordination with DHS
- **ODE:**
 - Focus on childcare provision
 - Transportation for elderly and young - those not participating in the workforce tend to be those caring for family members including young children and aging adults
 - Consider workforce training options for new occupations
- **PSU:** Eligibility for paratransit
 - More people are eligible, but costs are increasing
 - Recognition that elderly can still work and contribute to society
 - Vision Zero continues to be important especially for aging adults
- **DEQ:** Tend to do well as an agency at regulating air quality, but struggles with transportation emissions in particular
- **ODE:** The longer people spend working/commuting, the less time they spend with their kids, which leads to decreased education success
 - Some experiments gave money to parents to allow them to be home
 - Outcomes include increased school attendance and academic achievement
- **ODE:** “Wrap-around services” for communities contribute to educational success
- **ODE:** Greater focus on mental illness and trauma
 - Education is starting to recognize disadvantages in more population groups and how to provide targeted services to those communities. For example, there is a higher risk of suicide in black and LGTBQ communities. How does ODE provide services here?
- **Business Oregon:** Increased costs to businesses from climate change

- Impacts overall competitiveness. ‘How does Business Oregon support emerging companies in light of climate change?’
- Concerned with businesses ability to pay/retain workers due to climate change impacts
- **ODOE:** Concerned with transportation energy burden on households
 - Cost of transportation energy is 20% in urban areas, and close to 50% in rural areas. See: [10-Year Plan: Reducing Energy Burden](#) report.
 - Primary reliance on SOVs in rural areas - ‘ride sharing started in rural areas’
 - Climate change impacts: energy burden increasing in summer, because typically, Oregon is a winter peak energy state, but that is shifting to a double peak due to air conditioning use in summer

Approach to Planning (Horizon and Structure)

- **ODE:** ODE primarily supports local school districts. It was formerly a compliance agency, but now more of an assistance agency. Long range planning is not a current focus, as they are more focused on current research and improving support. ODE looks at population and enrollment forecasts and how that may inform investments (which is more of a local decision, with agency assistance). ODE’s planning horizon is not a year in the future necessarily, but is more by class cohorts. Long range planning is more the domain of local school districts. Resources and investment decisions are made over the course of a student’s 13-year school horizon.
 - ‘\$2 Billion Student Success funding passed, which will lead to new priorities and efforts.’
- **OHA:** 5-year [State Health Assessments](#) followed by [State Health Improvement Plan](#). 5 framework priorities identified:¹
 1. Social Determinants of Health
 2. Environmental Health
 3. Prevention and Health Promotion
 4. Access to Clinical Preventive Services
 5. Communicable Disease Control
- **ODOE:** ODOE does not have long range plans as an agency. The planning and Innovation division does, but it is called a [framework rather than a plan](#). ODOE does look out to the far future (50-100 years) but actually only uses a 5-year strategic plan, but has recently procured contractor for long range strategic planning.
- **OHCS:** OHCS just completed a [5-year plan](#) that resulted in lots of data and outreach efforts. This was the first time for this type of plan.
 - Also recommends all state agency staff look at [“Government Alliance for Racial Equity” \(GARE\)](#) training for government professionals.
- **ODA:** ODA is in the middle of their strategic planning process. This process also includes the [Aviation modal plan](#) (7-10 year updates, plus ~5-year studies). Oregon has 97 public airports, 28 of which are

¹ The list item were heard in the Peer Exchange by the note taker but not written. The five priorities listed were added when editing the notes a few days later based on the SHIP document mentioned, and may not be what was exactly said in the meeting.

owned/operated by Aviation, with only 15 FTE employees. Current strategic planning responds to ODA’s Board priorities in coordination with partner state and local agencies. No horizon for modal plan—updated continuously/periodically.

- **Business Oregon: 5-Year Strategic Plan.** Their 5-year strategic plan is used to develop implementation and work plans, which they are beginning to use to inform investment decisions.
- **OED:** OED is in the [middle of a strategic planning process](#).² There is no known planning horizon, but the current process is looking at 5-6 years out. OED’s work is counter-cyclical—a good economy equals less department work and staff while a bad economy equals more work and staff. Tracking key indicators and how they change to position the agency for a changing economy is an important aspect of their planning process. OED was assigned paid FMLA in last legislative session, which is new for the agency, as FMLA work allows Employment to go from a federally funded to partially federal, partially state funded agency.
- **DAS:** DAS operates on a [10-year forecast](#) updated quarterly and annually³
 - Mission: Articulate risk associated with forecasts and changes
 - Tries to keep 8-10 year numbers stable, since near-term fluctuation does not often lead to dramatic long-term change
- **PSU:** Planning approach for PSU is different because it is not a state agency, but a plan on aging will be developed in response to Governor’s age friendly initiative.
- **DEQ:** DEQ is in the middle of their planning process. The average planning horizon is 10 years - [10-year plans for DEQ](#), plus coordination with Metropolitan Planning Organization (MPO) Regional Transportation Plans (RTPs). Three-year blocks of data are used for MPO coordination.
- **DLCD:** DLCD typically operates on a 20-year horizon, but this is changing over time due to climate and other challenges (see Tsunami Preparedness Guide).
- **Question**
 - **Michael Rock: Anything these agencies should think about from DAS Economic Analysis?**
 - Two horizons appear: Short-term business cycle and Long-term drivers
 - Learn to separate short-term, fluctuating business planning from more stable long-term trends.
 - Consider trends you can and cannot change. For example, demographics cannot be changed, since they occur generationally.

Priority Trends

- **PSU:** Aging in community (accessible homes, weatherization, and services) instead of just aging in place (past focus)
- **OHA:** Climate change and equity leading to new opportunities
- **DLCD:** Housing, climate change, resiliency, and rural development

² Employment Department’s most recent completed Strategic Plan can be found here:

https://www.oregon.gov/EMPLOY/Agency/Documents/OED_Strategic_Plan_2014-2019.pdf

³ Most recent DAS Economic Analysis Report can be found here:

<https://www.oregon.gov/das/OEA/Documents/forecast0519.pdf>

- **DEQ:** GHG reduction (either directly or co-benefit)
- **ODE:** Income and wealth inequality and impacts on student success. Non-attendance gap analysis (currently in south coast, due to highest absenteeism concentration), including Memorandum of Understanding with OHA and prospective MOU with ODOT.
- **OED:** Labor force engagement (All who want to join the workforce can). Everyone who wants to be employed is adequately prepared (education and training).
 - Ensuring we have infrastructure and managing/encouraging innovation and new companies
 - Focus on job creation in rural areas and engaging under represented communities
 - Support business to be competitive in face of climate change
- **Business Oregon:** Supporting infrastructure and managing innovation pipeline (mostly small and mid-sized business). Special focus on small and rural communities and wealth generation. Climate change impacts on business competitiveness (cap and trade, emissions cap).
 - Opportunity for Oregon businesses to be at the fore of climate change
 - How to ensure that communities across Oregon are not disproportionately affected by changing energy sector in relation to climate change
 - What will energy source changes mean for rural Oregon and those struggling to meet energy needs? Equitable access to new energy infrastructure (i.e. – electric vehicles)
 - South coast area and lack of access to jobs and schools – conducting a gap analysis and developing advocates to connect people to resources.
- **OHCS:** [Oregon's Statewide Housing Plan \(5-Year\)](#), released February 2019.
 - Priorities:
 - Equity and racial justice
 - Homelessness
 - Permanent Supportive Housing
 - Homeownership
 - Affordable Rental Housing
 - Rural Communities
 - **DLCD:** 'Look at Housing's data work on population'
- **ODOE:** Offsetting impacts of shifting energy consumption on rural and low-income communities
 - Possibly shifting from internal state energy market to broad, western states market
 - Preparing for changing personal (such as home charging stations) and systemic infrastructure for new energy
- **DAS:** Always focused on skills, employment, and other indicators leading to money in the pocket of Oregonians
- **ODA:** Emerging technology, rural economic stability, disaster preparedness for all airports

Synthesis and Cross-Agency Connections

Scott Richman and Brooke Jordan, Jacobs, synthesized the key themes that were identified by the group. The opportunities for collaboration were identified through a discussion of areas of overlap and

opportunities for agency collaboration and coordination. Eleven common themes emerged from the discussion:

1. Equity
2. Climate Change
3. Planning horizons (diverging perspectives). All are doing it, but few do longer than 5-year business cycle planning.
4. Workforce preparedness
5. Resiliency
6. Urban-rural disparities
7. Housing costs and supply
8. Demographic and cohort changes
9. Nexus of housing access and education success
10. Homelessness
11. Health impacts

Opportunities for Collaboration

- Many state agencies are participating in similar meetings with common themes: equity, climate change, and resiliency and a driving force of wanting the State to thrive are priorities that cross-cut across all state agencies
- Participants at this peer exchange meeting expressed interest in continuing to meeting or otherwise coordinating share information, either monthly or quarterly, but would need to secure executive level support for committing staff time for coordination purposes
 - Use an email or list serve to check in with/others informally
- Sharing data and outcomes from public engagement is very important to improve storytelling broadly. Developing a standardized process for cross agency work and data sharing is important, either through a common MOU or other process
- **ODE:** There are often numerous coordination meetings that occur, but how do we increase information sharing with boots-on-the ground staff? It is interesting to see the common goals and language across agencies.
- **ODOE:** Working with OHA on climate issues and sharing information with DEQ are opportunities for collaboration that ODOE identified.
- **DAS:** A regular communication channel between agencies would be nice. DAS Economic Analysis uses a list-serve with other states to discuss topics, and a similar list-serve may be useful for this group.
- **Business Oregon:** Lots of strategic work happening, and Business Oregon would love to see overlap and divergence. Working on Innovation Plan and would like to see more collaboration.
- **OHA:** Lots of venues to address identified topics, except equity. OHA would like to see data sharing and leveraging research between agencies, while also comparing strategic planning work for mutual benefit and service alignment.

- **ODOE:** ODOE highlighted that data used between agencies often differs, and there is a need to explain to the public why they differ, when that's the right answer, and when to leverage each other's work when appropriate.
- **ODE:** This Peer Exchange is missing Agriculture's perspective – Agriculture provides key partnership and data for Education
- **DEQ:** Agriculture has important fuel and emission information that DEQ needs
- **OHCS:** Interested in greater coordination with ODOT and DLCD on housing siting and tax incentives
- **Question from group:**
 - We want to use one another's data, and work on process together, but how do we defer to one another's interpretation and conclusions?

Appendix B. Oregon Futures Scenario Workshop Summary

Oregon Futures Scenario Workshop

Summary

July 31, 2019; 8:30 am – 12:30 pm

Oregon Department of Transportation (ODOT) Workshop Participants

ODOT Workshop Participants		
Name	Agency	Position
Tara Weidner	Transportation Planning & Analysis Unit	Professional Engineer
Hal Gard	Rail & Public Transit Division	Administrator
Becky Knudson	Transportation Planning & Analysis Unit	Principal Economist
Brian Hurley	Transportation Planning Unit	Senior Transportation Planner
Brian Dunn	Transportation Planning & Analysis Unit	Manager
Teresa Penninger	ODOT Region 5	Planning Manager
Denise Whitney Dahlke	Transportation Development Division	Strategic Data Program Manager
Gary Farnsworth	ODOT Region 4	Manager
Nikki Nowack	Asset Management	Program Manager
Michael Bufalino	Research Section	Manager
Joel McCarroll	ODOT Region 4	Traffic Manager
Galen McGill	System Operations & Intelligent Transportation Systems	Manager
Troy Costales	Transportation Safety Division	Administrator
Darlene Weaver	Environmental Engineering & Policy Unit	Environmental Policy and Program Advisor
Rod Thompson	Environmental Engineering & Policy Unit	Manager
Jerri Bohard	Transportation Development Division	Administrator
Amanda Pietz	Program Implementation & Analysis Unit	Manager
Sonny Chickering	ODOT Region 2	Manager
Glen Bolen	ODOT Region 1	Principal
Tom McClennan	Division of Motor Vehicles	Administrator

Project Team Attendees		
Name	Agency	Position
Cole Grisham	ODOT	Transportation Development Division
Michael Rock	ODOT	Transportation Development Division
Adam Argo	ODOT	Transportation Development Division
Scott Richman	Jacobs	Consultant
Tara O'Brien	Jacobs	Consultant
Brian Burkhard	Jacobs	Consultant
Brooke Jordan	Jacobs	Consultant

Welcome and Meeting Overview

Michael Rock and Scott Richman opened the Scenario Planning workshop and welcomed the attendees to the meeting. Michael provided an overview of the workshop objectives and purpose and facilitated self-introductions.

ETIA Project Background; Scenario Workshop purpose and objectives

Adam Argo reviewed the project purpose and objectives and discussed the goals of the workshop. Below is a list of key points that Adam made.

Adam reviewed work to-date on the Emerging Technology Impact Assessment (ETIA) Project.

ETIA is comprised of two phases of work:

- **Phase 1:** Identify key trends in emerging transportation technologies and analyze impacts of trends on Oregon's transportation system
- **Phase 2:** Develop planning scenarios on a broader range of considerations to inform the Oregon Transportation Plan (OTP) and Oregon Highway Plan (OHP) updates
 - Focusing on how to frame uncertainties within ODOT goal areas
 - Look to a vision for the transportation system in 2050
 - Share outcomes for Phase 1

ETIA Themes from OTC Workshop

In an OTC Emerging Technologies ½ day workshop last fall – some common themes and top concerns emerged to help frame the project:

- What does sustainable funding of the system look like moving forward?
- Understanding resettlement patterns: where people will want to go/goods and services delivery based on changing technologies
- Aligning ODOT's work with other state and local agencies
- Developing the skills and experience within ODOT to address emerging technologies impacts.

ETIA Project Schedule, Future Work and Next Steps

Next steps for the rest of 2019 and into 2020 will be to complete ETIA Phase 2 and prepare to evaluate scenarios and updates to the OTP and OHP. The following list provides a high-level work plan to conduct this work.

- Oregon Futures Peer Exchange: July 16 2019
- Oregon Futures Scenario Planning Workshop: July 31, 2019
- Assessment Tools Workshop – September 2019
- White Papers and additional background research
- Conduct Stakeholder Interviews: August – November 2019
 - Seek advice of transportation experts on topics and areas of focus for OTP and OHP updates
- Kick off OTP process: Early 2020
 - Initiate Public Involvement process

- Form advisory groups
- Evaluation of scenarios and research: Early 2020

Scenario Workshop purpose and objectives

Adam Argo reviewed the objectives of the workshop:

- To share the ETIA Phase 1 outcomes and develop a shared understanding of the approach
- To review emerging disruptors and drivers of change that could impact Oregon in the future
- To brainstorm potential outcomes and impacts to Oregon related to these emerging trends – which will build the framework for the scenarios analysis

Emerging Disruptors and Drivers of Change

Cole Grisham and Brian Burkhard provided an overview of technologies, trends and emerging disruptors.

Overview of Technologies and Trends

- Emerging disruptors and drivers of change (Cole Grisham)
 - Demographics: Birth rates fuel projections
 - Potential labor force change – new people and new types of jobs: growth in the Willamette Valley, Portland Metro and Central Oregon over the next 10 years but declines in eastern Oregon
 - Environmental disruptors:
 - Various plans and studies within ODOT help identify how projected environmental changes will impact our systems.
- Emerging technologies (Brian Burkhard).
 - Miniaturization of technologies
 - Wireless communications – talking to your electronic devices, 5G wireless capabilities
 - Even with fiber optic capabilities, still have to go through data farms
 - Massive amounts of data impacting our systems
 - Relationship with technology is changing and being adopted more quickly in all generations – influencing behaviors and ability to access more travel modes more easily
 - Mobility services changing quickly
 - TNCs (Transportation Network Companies) are seen as a stepping stone toward Autonomous Vehicles (AVs). The share of Americans who have used TNCs has more than doubled since 2015.
 - 37% increase in TNCs in Oregon – now surpassing bus usage
 - Microtransit and AV transit growing in communities around the country (including a 3D printed vehicle)
 - Car share companies are continuing to grow in usage – some jurisdictions have mandated their usage data to be shared
 - Bike and scooter share: also growing quickly. Usage data is usually shared with municipalities or in partnership, making it easier to track trips than with TNCs.

- GTFS (General Transit Feed Specification) and MaaS (Mobility as a Service) to promote multimodal trip planning. Still in development phase but many agencies and companies interested in how this tool will transform commuting.
 - Example: new ODOT ride matching tool: Get there - to make connections integrating transit, carpooling, biking, walking options.
- Connected vehicles:
 - Vehicle to vehicle and vehicle to phone communication with a focus on improved safe driving behavior and protecting vulnerable road users
 - New generations of phones have peer to peer communications, being used for vehicle to vehicle communications
 - Pilots in Wyoming, Florida, New York
- AV
 - Conditional Automation (Level 3 AV) is in most new vehicles already
 - Progression from High Automation (level 4) to Full Automation (level 5) is most anticipated type of AV technology development
 - CVs and AVs deployed together and all being designed as electric vehicles – so this deployment is highly dependent on a successful expansion of EV infrastructure
- Freight:
 - App-based demand and responsive delivery is changing the freight delivery paradigm quickly.
 - Connected and electric vehicles, platooning trucks – technologies being developed quickly and Daimler is a major player here in Oregon.
- Data lakes: new data science that is emerging to more quickly analyze large segments of data.
- Takeaway: Adoption timelines faster for these emerging technologies than any other technological change in modern history

Framing Potential Outcomes

Scott Richman and Brooke Jordan, Jacobs, set the stage for a round table brainstorm the group.

- A pre-workshop survey was distributed prior to the workshop to evaluate which ODOT goal areas attendees anticipated would be most impacted by emerging technologies.
 - Top 3 goal areas from survey: safety, mobility, reducing CO2 emissions
 - Surprising to the group that there was less focus on resiliency
 - Shared economy – could see future growth in shared vehicle based on who is investing in CAVs – less likely to see private ownership of AVs as at high of a rate as existing vehicle ownership.
 - Brainstorm on ODOT’s foundational goal areas in small groups, identifying possible positive and negative impacts to the transportation system as a result of the emerging technologies discussed today.

- Safety
- Efficient freight movement
- Equity
- Mobility
- Transportation options
- Fuel efficiency and reducing CO₂ emissions
- Transportation funding sufficiency
- Land use management
- In each of these goal areas, participants will consider:
 - Impacts of emerging technology on active transportation modes
 - Uncertainty regarding the integration of new technologies
 - Shifting roles of agencies and private industry
 - Concerns around housing affordability and access
 - Climate change impacts to transportation infrastructure
 - Changing demographics and workforce needs
 - Economic impacts to housing costs, jobs
 - Overall operations of the transportation system in the face of change

Review of Brainstorming Exercise on outcomes for ODOT goal areas

Scott Richman and Brooke Jordan, Jacobs, synthesized the key themes that were identified by the group.

- Discussion of how workshop participants anticipated that emerging technologies are likely to affect the transportation system organized according to the 8 foundational goals

Notes on positive and negative outcomes that could occur for each goal area:

- Safety
 - Positive –
 - In the long term, there should be improvements in safety for vulnerable road users with improved technology when potential for human error is removed.
 - Mix of speeds in new micro-mobility options (scooters, slower bikes, faster e-bikes) can be a safety concern in urban environments
 - More people biking and walking brings safety and numbers
 - More cameras and sensors could increase safety (but decrease privacy and cause data protection issues)

- Removes bad drivers (or distracted or impaired drivers) from the road
- Negative
 - Poor pavement conditions – creates safety issues for all modes: e-scooter and bikes and vehicles must shift from their “lanes” to avoid poor road conditions
 - Ability of AVs to recognize pedestrians is a challenge in the short term.
 - Concerns about privacy/security of data, hacking risk, tracking of transportation movements by companies and the government
 - Drivers and passengers absolve themselves of responsibility of vulnerable road users
 - Safety features of AVs are slower to get rolled out – so it won’t necessarily improve as quickly as we’d think.
 - Complexity: there are many factors that impact potential safety of the improved technologies of vehicles – weather, unanticipated crossings etc.
- Efficient freight movement – possibly change title of this goal area to “movement of goods and services”
 - Positive
 - Opportunity for ODOT to lead in driving the standards for freight mobility (and other categories) needs for the state
 - With more efficient freight mobility, cost of consumer goods could not rise as quickly.
 - Drone delivery of small items could reduce congestion in urban areas
 - Neutral
 - Change in long haul vs. rail vs. short haul vs. drones for efficient freight mobility.
 - 3D printing could reduce need for delivery of items across long distances = less congestion, more local delivery focus
 - Negative
 - Electrification of trucking will drive a need for changing the locations and nature of truck charging depots.
 - Public policy is slow to adapt to regulate changing freight mobility trends such as platooning and connected and autonomous trucks
 - Oregon could be bypassed by major freight providers
- Equity
 - Positive:

- Improved accessibility of multiple transportation modes as well as with trip planning could help give people who are car or transit dependent more options
- New fees can help invest in low income communities: we can price by Census Tract if needed.
- Neutral:
 - Lack of supply of operators (transit drivers, truckers) already, though it is one of the most common job in most states
 - Insurance coverage will have to change for shared vehicle economy
- Negative:
 - Ensuring needs of all users met in light of increased TNC and private companies
 - Affordability and accessibility: with private sector driving the trends of adoption of new technologies, less of a focus on providing improved transportation options for those who can't afford it. Need to prevent excluding of low-income populations from benefitting from new technologies.
 - Automation replaces jobs and could widen the wealth gap
 - AI – there is a known bias of these technologies not recognizing people of color
- Mobility
 - Positive:
 - Rural areas don't have a transit network now but increased use of shared vehicles and micro-mobility could make it more viable in areas where developing a transit system was not feasible in the past.
 - Increased capacity on roadways with increased shared vehicles
 - Possible streamlining for signage/stripping/signals standards nationally for AV integration
 - Increased mobility for seniors or those who can't drive
 - Improved efficiency of commute and ability to work in AVs
 - Neutral:
 - Changing role for ODOT: need to consider how to manage congestion of low-level air space
 - Capacity on roadways could be higher or lower
 - Opportunity for re-evaluation of peak hour congestion to shift demand to other times of day for choice trips
 - Negative

- Possible increased congestion due to platooning or increased size of fleet of AVs (and potential for more zero occupancy vehicles)
- Need for improving multimodal system around state – speed differential for a mix of more modes of travel using the same roadways.
- Longer high congestion times if people can work in vehicles
- Transportation options
 - Positive
 - Opportunities for improved connectivity and accessibility
 - More AV buses could provide service to more people
 - Negative
 - A challenge to maintain transit ridership with increased TNC and AV availability
 - Increased VMT with increased prevalence of shared vehicles and TNCs
 - Inter community transit remains a rural challenge
- Fuel efficiency and reducing CO₂ emissions
 - Positive
 - Shift to electric vehicles will improve GHG impacts, but will impact where our energy comes from to power electric, which needs to be better coordinated.
 - Powering electric grid and charging infrastructure is a separate challenge
- Transportation funding sufficiency
 - Positive:
 - Rethinking public ROW: leverage for funding opportunities
 - Opportunities to capture revenue from trip fees to manage congestion, support low-income users
 - OreGo sets us up to capture new revenue as we move to electrification of the fleet
 - Neutral
 - Do funding programs line up with future needs? New funding mechanisms needed for smart vehicle infrastructure
 - Negative:
 - Possible reduced revenue from vehicle registration and title fees with more shared vehicles
 - Staff reductions with changing nature of transportation needs

- Land use management
 - Positive:
 - Much less demand for parking
 - ODOT owns lots of real estate that could be used for charging facilities or vehicle storage
 - Neutral:
 - Need to maintain our strong land use framework in Oregon to preserve UGBs.
 - Negative:
 - People with higher incomes have more options of where to move with being able to use commutes more productively.
 - AVs could lead people to move farther out – will need to accommodate different commute schedules since people will be able to work during their commute, if they need to commute at all.
- Other impacts discussed
 - Health impacts with longer vehicle commutes – if people are living further away and commuting longer in AVs, how does that impact health?
 - Opportunity for changing ODOT's own fleet for more CAVs – cost savings and safety benefits
 - Resiliency should be an overarching framework for all these changes: Preparing for resiliency in light of earthquake and other natural disasters
 - Increasing role of private sector in providing transportation services is a risk and liability – concerns over big data implications
 - Need for ODOT to become more agile to respond to these technology trends – and both lead AND fill the gaps the private sector will not.
 - Need for ODOT to adapt in hiring, training and position descriptions to better reflect changes in urban and rural transportation needs
 - Need for ODOT to become more intersectional between health, equity and transportation goals
 - Need for ODOT maintenance and construction to adapt to changes in road maintenance needs with changes in vehicle technology (EVs, AVs, different sized vehicles) and changes in construction equipment
 - Changing role of government in regulating these changes: ensure that ODOT is prepared for this transition.
 - Environmental Stewardship
 - Strong expectation for ODOT to protect environment – need to be proactive as an agency in preparing for these technological changes and how they could impact environmental resources

- Wildlife passage
- Stormwater mitigation
- Improve resiliency of assets to prepare for climate change, earthquake, wildfire risk
- Roadside development: improve planting for noise concerns, visual aesthetics and pollinator habitat protection

Next steps

Adam Argo reported back to the group on next steps before closing the workshop.

- Assessment Tools workshop in September to determine quantitative and qualitative tools for assessing scenarios
- Scenario framework memo this fall to discuss scenario concepts and approach to evaluating them
- Report to OTC on scenarios and next steps for the OTP and OHP Updates.

Appendix C. Tools Assessment Workshop Summary

The Scenario Planning Matrix was developed to present potential policy interventions (not recommendations) for future scenario planning efforts, tying to the Phase 1 Final Report. The table was developed using key trends within ETIA's organizational structure and through engagement outside of the ETIA structure. Discussions from the Peer Exchange and Scenario Planning Workshop identified trends, themes, and outcomes that will need to be addressed in the OTP and OHP Updates.



Mobility Options

Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
<p>Transition towards purchasing trips (from transportation network companies [TNCs] and other modes) over purchasing personal vehicles</p>	<p>Increased use of shared-use vehicles and multimodal trips over personal single-occupancy vehicle (SOV) trips should reduce emissions and congestion. Moderate – Oregon Department of Transportation (ODOT) could prioritize high-occupancy vehicles (HOVs) on ODOT facilities to mitigate congestion and increased vehicle miles traveled (VMT) per capita.</p>	
	<p>Replace short motorized vehicle trips with shared bike and scooters (approximately 3 miles or less) High – ODOT could regulate TNCs, bikeshare, or scooter-share service or fees.</p>	
	<p>Could negatively affect future transportation funding with fewer vehicle registrations Moderate – ODOT could levy fees or taxes on personal vehicles, parking, or other areas.</p>	
	<p>Could lead to increased VMT and congestion with increased growth of TNCs instead of transit Low – Optimize service (frequency and reliability) and improve/promote inter-agency transfers, which could include a single-fare payment system.</p>	

Positive Outcome
 Negative Outcome
 Unclear Outcome



Mobility Options

Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
<p>Increasing number of mobility choices (bikeshare, scooters, micro-mobility, shared vehicles) become available to more segments of population</p>	<p>Modal shift – could lead to reduced VMT, reduced need for parking, change in curb management or use, reduced car ownership, increased transit ridership and opportunities for smaller scale freight distribution High – ODOT could work with communities to support the development of mobility hubs.</p>	
	<p>Replacing SOV trips will affect congestion and transit ridership Moderate – ODOT could consider policies that provide adequate transit in urban and rural areas.</p>	
	<p>Increased number of mobility options could lead to increased conflict on roadways with increased demand for roadway and curb space High – ODOT could prioritize HOVs on ODOT facilities to mitigate congestion and increased VMT per capita related to increased mobility options.</p>	
<p>Electrification of micro-mobility options</p>	<p>The electrification of public and privately available bike, scooter, and other micro-mobility options expands the availability of these transportation choices to more people and (likely) creates more environmentally friendly options to SOV trips Moderate – ODOT could support active transportation options such as bikeshare and scooter-share.</p>	
	<p>Increased pressure on electric grid may cause load challenges Low – ODOT could work with energy providers (PG&E and Pacific Power, for example) to plan for future power needs.</p>	
















Positive Outcome
 Negative Outcome
 Unclear Outcome








Mobility Options

Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
Increasing availability of mobility data.	<p>More articulated information on the use of transportation systems can be used for more informed decision making, targeting marketing towards mobility needs and service planning</p> <p>High – ODOT will continue to be an authoritative source of data about closures, chain and tire requirements, and construction activities. ODOT also has an important role in ensuring that transportation disadvantaged and underserved have access to options, programs, and information. ODOT's ability to influence could grow larger if future legislative action requires ODOT to regulate mobility data as well.</p>	
	<p>Challenges to ODOT's trip planning guidance</p> <p>Moderate – ODOT could use data about travel patterns and behavior to better understand the travel needs of underserved groups and inform investment decisions.</p>	
	<p>Increased need for cyber-security brings vulnerability of system to hacking</p> <p>Moderate – ODOT has a role in developing operational plans, policies, and guidelines for the deployment of vehicle-to-infrastructure (V2I) technology that could protect ODOT facilities from potential cybersecurity attacks.</p>	

Positive Outcome
 Negative Outcome
 Unclear Outcome

 <h2>Vehicle Technologies</h2>		
Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
Vehicle fleet electrification	The prevailing usage of EVs could eliminate congestion as a factor in emissions High – ODOT is a leader in operating a road-usage charge (RUC) system based on miles driven, and the implementation of an expanded statewide, mandatory RUC could supplement or replace decreasing revenues from the gas tax.	 
	Revenue impacts of fewer vehicles paying into fuels tax without transition to RUC. Lower household costs could increase VMT per capita Moderate – ODOT could use data about travel patterns and behavior to plan.	 
	Demand for charging infrastructure may exceed capacity to deliver it High – ODOT can develop infrastructure along ODOT facilities.	
Expansion of electric vehicle charging infrastructure statewide (enabler of change)	Improvements in air quality, opportunities for co-location of charging infrastructure with other services High - ODOT could convene stakeholders (multistate) to determine fueling infrastructure needs, identify gaps in coverage, and develop investment plans.	    
	Transition to, and deployment of, electric vehicles will require significant investment in new public and private charging infrastructure statewide High – ODOT's continued participation in the Zero Emission Vehicle Interagency Working Group could support planning for charging infrastructure and electric vehicle (EV) adoption in Oregon.	   

Positive Outcome
 Negative Outcome
 Unclear Outcome

 <h2>Vehicle Technologies</h2>		
Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
Prevalence of vehicle-to-vehicle (V2V) and vehicle-to-everything (V2X) technology in more vehicles	More connected vehicles and communication will lead to improved safety, environment, and mobility High – Development of ODOT operational strategies to deploy V2X infrastructure could increase access to real-time traveler information and support the integration of transportation information, mobility hubs, and Mobility-as-a-Service (MaaS).	
	As the transportation system becomes increasingly connected, its exposure to cybersecurity threats increases, which could pose serious risks to safety and privacy Moderate – ODOT has a role in developing operational plans, policies, and guidelines for the deployment of V2I technology that could protect ODOT facilities from potential cybersecurity attacks.	
Prevalence and availability of autonomous vehicle technology	Safety improvements in vehicles will reduce user error from primary cause of crashes High – ODOT could evaluate the Highway Design Manual and consider updates to roadway design standards that improve operations of automated vehicles (AVs), as well as ensure emerging tech investments benefit transportation-disadvantaged groups.	
	Increase VMT or congestion if more zero-occupancy vehicles appear on roadways if unregulated High – ODOT could prioritize HOVs on ODOT facilities, which could mitigate congestion and increased VMT related to the deployment of AVs.	








Positive Outcome










Negative Outcome








Unclear Outcome

 <h2>Vehicle Technologies</h2>		
Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
	<p>Longer willingness to commute could affect land use patterns Moderate – ODOT could update guidance to support consideration of AVs, CVs, and emerging active transportation modes on trip generation in development review process.</p>	
	<p>Increased reliance on technology for crash prevention could lead to more distracted driving Moderate – ODOT could develop operational policies that encourage the deployment of AV applications to improve safety.</p>	
<p>Growth and prevalence of 5G technology statewide (enabler of change)</p>	<p>Expanded network brings benefits of V2I technology to more places Moderate – ODOT could support efforts of V2I to enable positive acceptance of this new communication type.</p>	
	<p>Challenges around widespread adoption Low – ODOT could consider policies that reduce barriers to public-private partnerships and leverage to inform investment and operational decision making.</p>	

Positive Outcome
 Negative Outcome
 Unclear Outcome

 <h2>Freight Technologies</h2>		
Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
Increased expectation of on-demand delivery of goods and services	Increased economic activity with availability of on-demand delivery (Positive Outcome)	
	Possibilities for increased and decreased efficiencies with changing retail patterns Low – Local delivery hubs, rather than door-to-door service. (Unclear Outcome)	
	Increased VMT per capita and congestion Moderate – ODOT could coordinate with jurisdictions on time-of-day and type-of-vehicle regulations to reduce impacts to peak-hour congestion. (Negative Outcome)	
Increased use of V2V, V2I, and AV technologies in long-haul trucking	Likely to improve delivery efficiency, reduce VMT per capita, and improve air quality Moderate – Development of ODOT operational strategies to deploy V2X infrastructure. (Positive Outcome)	
	Likely economic impacts to truck stop infrastructure based on changing schedules and ability to platoon vehicles without required rest stops Moderate – ODOT could develop pilot projects involving automated or connected freight projects on select facilities and digitize freight route planning to support real-time freight route planning. (Negative Outcome)	
	Likely fewer truck operating job opportunities in an industry of need Moderate – ODOT could leverage new data to develop policies, plans, and programs for decision making. (Unclear Outcome)	

Positive Outcome
 Negative Outcome
 Unclear Outcome

 <h2>Freight Technologies</h2>		
Trend	Outcome (ODOT's ability to influence outcome – high, moderate, low)	Goals
Increased use of drones or robotic technologies for delivery	Could reduce congestion or move smaller items more efficiently – fewer unnecessary vehicles on roadways	
	Concerns about regulation and safety of these technologies	
	Impacts to employment, likely to eliminate some jobs while creating new jobs – net impacts are unclear	
Growth of 3D printing	Could reduce need to transport goods across long distances and increase availability of goods in more places	

Positive Outcome
 Negative Outcome
 Unclear Outcome

Assessment Tools Workshop

Summary

September 4, 2019; 10:30 am – 12:00 pm

Oregon Department of Transportation (ODOT) Workshop Participants

ODOT Workshop Participants		
Name	Agency	Position
Tara Weidner	Transportation Planning & Analysis Unit	Professional Engineer
Hal Gard	Rail & Public Transit Division	Administrator
Becky Knudson	Transportation Planning & Analysis Unit	Principal Economist
Brian Hurley	Transportation Planning Unit	Senior Transportation Planner
Brian Dunn	Transportation Planning & Analysis Unit	Manager

Project Team Attendees		
Name	Agency	Position
Cole Grisham	ODOT	Transportation Development Division
Michael Rock	ODOT	Transportation Development Division
Adam Argo	ODOT	Transportation Development Division
Scott Richman	Jacobs	Consultant
Stuart Campbell	Jacobs	Consultant

Welcome and Meeting Overview

Adam Argo opened the Assessment Tools workshop and welcomed the attendees to the meeting. Adam provided an overview of the workshop objectives and purpose and facilitated self-introductions.

ETIA Project Background; Scenario Workshop purpose and objectives

Adam Argo reviewed the project purpose and objectives and discussed the goals of the workshop. Below is a list of key points that Adam made.

Workshop Purpose and Objectives:

- Engage small group of ODOT technical staff to determine how key outcomes of each of the scenarios should be assessed
- Ensure that available assessment tools reflect measurable outcomes and potential policy interventions
- Identify and document assessment tools to align with potential alternative future scenarios related to emerging trends

Adam reviewed work to-date on the Emerging Technology Impact Assessment (ETIA) Project. ETIA is comprised of two phases of work:

- **Phase 1:** Identify key trends in emerging transportation technologies and analyze impacts of trends on Oregon's transportation system
- **Phase 2:** Develop planning scenarios on a broader range of considerations to inform the Oregon Transportation Plan (OTP) and Oregon Highway Plan (OHP) updates
 - Focusing on how to frame uncertainties within ODOT goal areas
 - Look to a vision for the transportation system in 2050
 - Share outcomes for Phase 1

Drivers of Change and Scenario Framework

Scott Richman introduced the Drivers of Change and Assumptions, which included a handout. The handouts provided a table that provided a framework for how trends within the Drivers of Change might impact future outcomes. Trends are identified under the Drivers of Change, which are assessed for their future impact/influence on outcomes.

The Drivers of Change are categorized into 3 categories:

- **Mobility Options:** including active transportation options, shared mobility services, and ride-hailing services made available to users using various models that operate within the concept of the integration of transportation services into a single trip-planning and payment platform is known as Mobility-as-a-Service (MaaS).
- **Vehicle Technologies:** including connected vehicles (CVs), automated vehicles (AVs), and electric vehicles (EVs).
- **Freight Logistics:** including freight vehicle platooning, efficiencies in distribution networks, and on-demand delivery services.

The Drivers of Change were developed based on 7 underlying assumptions:

- Climate change impacts will have cascading effects across many goal areas.
- Resiliency (including seismic readiness and natural disaster preparedness) underlies all ODOT goal areas.
- There will always be sustainability initiatives to protect environmental resources and habitat and to work to curb and reverse the effects of fossil fuel usage to decrease greenhouse gas emissions and improve air quality.
- Demographic changes such as the movement of the working age population towards more urbanized counties and rural areas losing population will frame the statewide needs of the transportation system for decades to come.
- Transportation revenue will continue to change due to declining fuel tax revenues and other factors.
- The statewide land use planning framework and Transportation Planning Rule will remain consistent to ensuring balanced land use development in coordination with transportation planning.
- Emerging vehicle and infrastructure technologies create workforce and supply chain impacts across many goal areas, with new workforce needed to plan, maintain, engineer and construct and changing transportation system.

Questions from the group:

- How was the degree of certainty determined?
 - Internal conversation within consultant team and Adam Argo's ODOT team.

Suggestions from group:

- How are the trends impacting choices or the transportation system? And what are the measures or leavers its related to?
 - It was suggested that another field in the table would be beneficial to indicate 'why it matters' or 'why we care' about each trend.

Present and Discuss Potential Assessment Tools and Assumptions

Brian Dunn and Tara Weidner, ODOT TPAU, introduced a series of assessment tools that might be beneficial as the ETIA program moves forward. The two tools presented included:

- STORM Analysis Toolkit
 - VisionEval
 - Oregon Statewide Integrated Model (SWIM)

STORM Analysis Toolkit

The STORM Analysis Toolkit helps to determine what tool is to use for a project and is generally categorized into 3 buckets – Strategic, Tactical, and Operational Models. Different tools are used for different reasons, including level of spatial detail (statewide, regional, local, etc), policies, investments, strategies, and response to other factors. ODOT TPAU groups modelling tools into 3 general buckets:

- Strategic Models are used for long range visioning, policy testing, uncertainty analysis, and high-level planning analysis, guide to where we want to go.
- Tactical Models are used to develop implementation plans, relies on fixed assumptions regarding land use, economic conditions & population.
- Operational Models are used for current and short-term implementation actions, such as signal timing and ramp metering.

VisionEval

VisionEval is a strategic high level analysis tool within the STORM toolkit. At its core, VisionEval is an exploratory tool for assessing risk/uncertainty in scenario planning visioning. Below is a list of broad inputs and outcomes that the tool is well equipped to address.

Broad Inputs

- Context Variables:
 - Demographics
 - Income Growth
 - Fuel Price
- Vehicles and Fuels
 - Vehicle and Fuel Economy
 - Fuels

- Commercial Fleets
- Systems and Operations
 - Intelligent Transportation Systems
 - Driving Efficiency Programs
 - TDM (home & work-based, ridesharing)
 - Parking Fees
 - Car Sharing
- Pricing
 - Pay as you drive insurance
 - Gas taxes, Road user fee, VMT fee
 - Congestion fee, Social costs/Carbon tax
- Transportation Options
 - Transit service
 - Biking and walking
 - Road growth
- Land Use
 - Future Housing (Single- & Multi-family)
 - Land Use density

Broad Outcomes

- VisionEval can inform several policy issues, such as:
 - Household travel costs
 - Transportation and energy costs
 - Air quality
 - Mixed-use development
 - Health impacts
 - Vehicle miles traveled
 - Travel delay
 - Fuel consumed
 - Walk trips and bike miles
 - GHG emissions
 - Equity

SWIM

The SWIM model is set up to test policies statewide by adjusting inputs depending on a variety of changes – if pricing for transportation is changed, population in certain areas will shift within the model.

The SWIM model:

- Based on state economic forecast
- Simulates population demographic characteristics
- Simulates the dynamic activity of people and business,
- Simulates industry activity: labor, inputs, final products
- Simulates land use for residential housing and businesses,
- Simulates movement of people and commodities
- Peer reviewed

Brian and Tara provided a short list of how the SWIM model operates.

- SWIM is unique nationally – it can evaluate:
 - **Economics** – imports, exports, market factors
 - **Freight** – commodity by mode
 - **Land Use** – SWIM responds and takes into account current market conditions
 - **Transportation cost impacts** – Impacts to transportation network can impact land uses and SWIM can simulate these possibilities
 - **Prioritize investment programs** – SWIM can help prioritize corridors or other transportation infrastructure to strategically determine where there would be less of an economic impact
 - **Reveals synergies/unintended consequences** – SWIM does fewer model runs, but it can be combined with other models to get most out of the analysis

Land Use Place Types

Tara briefly provided an overview of ODOT’s Land Use Place Types model. Place Types are data-driven ways to define and visualize the many aspects of land use-transportation interactions embodied in land use plans. It is context sensitive, as it compares existing built environment characteristics to what is expected to occur in the future, then analyzing how changes to the built environment can affect travel.

Discuss Priorities and Next Steps

Due to a condensed meeting there was little time for wrap-up discussion. The group reached a consensus on provided written comment and feedback on the Drivers of Change handout. The feedback will then be incorporated into a revised version by the consultant project team.