OREGON FREIGHT PLAN

An Element of the Oregon Transportation Plan

FINAL

Adopted June 15, 2011
(Revised November 17, 2017, and March 2023)

Oregon Department of Transportation

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Oregon Freight Plan

AN ELEMENT OF
THE OREGON TRANSPORTATION PLAN

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Acronyms/Abbreviations

ACRONYM/ ABBREVIATION	DEFINITION
ACT	Area Commissions on Transportation
BNSF	Burlington Northern Santa Fe
CMAQ	Congestion Mitigation and Air Quality
CRFC	Critical Rural Freight Corridors
CUFC	Critical Urban Freight Corridors
DEQ	Department of Environmental Quality
DERA	Diesel Emissions Reduction Act
DLCD	Department of Land Conservation and Development
EV	Electric Vehicle
FAST	Fixing America's Surface Transportation
FHBP	Freight Highway Bottlenecks Project
FHWA	Federal Highway Administration
FY	Fiscal Year
GARVEE	Grant Anticipation Revenue Vehicles
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GSP	Gross State Product
IIJA	Infrastructure Investment and Jobs Act
INFRA	Infrastructure for Rebuilding America
IRT	Idling Reduction Technology
ITB	Intermodal Terminals/Businesses
ITS	Intelligent Transportation Systems
LCDC	Land Conservation and Development Commission
MIRTA	Military Installations, Ranges, and Training Areas
MPO	Metropolitan Planning Organization
NAICS	North American Industry Classification System
NEPA	National Environmental Policy Act
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NHS	National Highway System
NMFN	National Multimodal Freight Network
NMFP	National Multimodal Freight Policy
OCTPS	Oregon Commercial Truck Parking Study
ODOT	Oregon Department of Transportation
OFAC	Oregon Freight Advisory Committee

ACRONYM/ ABBREVIATION	DEFINITION
OFICS	Oregon Freight Intermodal Connector System
OFP	Oregon Freight Plan
OHP	Oregon Highway Plan
OMD	Oregon Military Department
Oregon OEA	Oregon Office of Economic Analysis
OTC	Oregon Transportation Commission
OTP	Oregon Transportation Plan
PEL	Planning and Environmental Linkages
PHFS	Primary Highway Freight System
PPP	Public-Private Partnerships
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation
SRP	State Rail Plan
STIP	State Transportation Improvement Program
STS	Statewide Transportation Strategy
SWIM	Statewide Integrated Model
TEU	Twenty-Foot Equivalent Unit
TIFIA	Transportation Infrastructure Finance and Innovation Act of 1998
TPR	Transportation Planning Rule
TSP	Transportation System Plan
U.S. DOT	U.S. Department of Transportation
ZEV	Zero-Emission Vehicle

1 Introduction

1.1 OVERVIEW OF THE PLAN

Preserving and enhancing the efficiency of Oregon's freight system is essential to supporting economic development, prosperity, and the quality of life in Oregon. Whether it is carrying goods from Oregon manufacturers, farmers, and other producers to markets, or delivering goods to homes and stores for consumption, the movement of freight supports the daily functioning of the state's businesses and residents. This updated Oregon Freight Plan focuses on long-term trends while acknowledging near-term fluctuations in growth rates as a result of the COVID-19 pandemic and the subsequent recovery period. In 2021, freight-dependent industries like manufacturing, agriculture, construction, transportation and warehousing, and retail provided nearly 700,000 jobs.[1]

Anticipated growth in Oregon's population, freight volumes, and resulting congestion highlight the need to plan for transportation system improvements to meet requirements of shippers, carriers, and other freight system stakeholders. Oregon's population is projected to grow to approximately 5.3 million by 2045.[2] This increase represents a 0.8% annual growth rate from 2022 through 2045, which is faster than the growth rate expected for the United States (0.5%) during the same period.

In 2017, roughly 314 million tons of freight worth about $302 billion moved on Oregon's transportation system. These values are projected to grow 515 million tons of freight worth $581 billion by 2050, even after taking the impacts of the COVID-19 pandemic into account.[3] This growth will increase infrastructure and capacity needs and impact industries, communities, and the natural environment.

The Oregon Freight Plan (OFP) expresses a 25-year vision of a freight system that supports diverse industrial sectors, including both traditional resource-based industries (like agriculture and forestry) as well as the modern high-tech sectors. The freight system connects Oregon to the rest of the global supply chain while ensuring that all regions of the state have access to quality transportation services. It is a system that ensures the safety of its users while maintaining a sustainable future—

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1 Oregon Office of Economic Analysis, Annual Employment Data, June 2022. https://www.oregon.gov/das/OEA/Pages/forecastecorev.aspx
2 Oregon Office of Economic Analysis, Oregon Economic and Revenue Forecast, June 2022
3 Freight Analysis Framework version 5.2

- Socially sustainable (providing for the physical needs of the residents of Oregon)
- Economically sustainable (providing steady employment and financing the transportation system)
- Environmentally sustainable (incorporating stewardship of natural resources).

The OFP brings together issues affecting all freight-related modes of transportation and proposes strategies to maximize the effectiveness of the multimodal freight system. The OFP:

- Describes the economic effect of the state's freight-dependent industries, and the freight infrastructure that supports these industries and movements.
- Analyzes impacts of potential changes in commodity flows, the economy, and other factors of the freight system.
- Discusses possible implications of climate change on freight movements.
- Presents options for financing the state freight system and for evaluating the relative importance of undertaking specific improvements that would enhance freight movement.
- Presents strategies for creating and improving a safe, efficient, and sustainable freight transportation system.
- Was first approved in 2011 and updated in 2017 to comply with the Fixing America's Surface Transportation Act (FAST Act), which requires plan updates every five years. However, state plans and policies as well as overall trends and analysis date back to the original OFP in 2011.
- Focuses on refreshing economic and transportation network data, correcting outdated operation analysis and inventory of existing facilities, and ensuring compliance with all applicable Code of Federal Regulations. Policy updates are limited to bring the OFP into alignment with other state plans and policies that have been adopted since 2017.
- Provides a comprehensive policy revision for the OFP will occur in 2026, after the adoption of the Oregon Transportation Plan and the Oregon Highway Plan.

As a statewide plan adopted by the Oregon Transportation Commission (OTC), the OFP will guide the Oregon Department of Transportation's (ODOT) freight-related actions and investments and guide freight planning in state, regional, and local plans.

1.1.1 Oregon Transportation Plan Vision and Goals

By 2030, Oregon's transportation system supports people, places and the economy. We travel easily, safely and securely, and so do goods, services and information. Efficient vehicles powered by renewable fuels move all transportation modes. Community design supports walking, bicycling, travel by car and transit wherever appropriate. Our air and water are dramatically cleaner, and community sensitive and sustainable transportation solutions characterize everything we do.

Oregonians and visitors have real transportation choices and transfer easily between air, rail, motor vehicles, bicycles, and public transportation while goods flow just in time through interconnected highway, rail, marine, pipeline, and air networks. Our communities and economies – large and small, urban, and rural, coastal and mountain, industrial and agricultural – are connected to the rest of Oregon, the Pacific Northwest, and the world. Land use, economic activities and transportation support each other in environmentally responsible ways.

We excel in using new technologies to improve safety and mobility. We maximize the use of existing facilities across traditional jurisdictions and add capacity strategically. Public/private partnerships respond to Oregonians' needs across all transportation modes. Transportation system benefits and burdens are distributed fairly, and Oregonians are confident transportation dollars are being spent wisely. By 2030, Oregonians fully appreciate the role transportation plays in their daily lives and in the region's economy. Because of this public confidence, Oregonians support innovative, adequate, and reliable funding for transportation.

The OFP is a multimodal topic plan as required by the Oregon Transportation Plan (OTP). The OTP Vision defines the kind of transportation future we want to build and the outcomes we want to achieve. The 2006 OTP identifies seven goals:

- Mobility and Accessibility
- Management of the System
- Economic Vitality
- Sustainability
- Safety and Security
- Funding the Transportation System
- Coordination, Communication, and Cooperation

As an element of the OTP, the OFP will implement the OTP Vision and goals.

The OTP includes a general discussion of freight and calls for the development of the OFP to further its freight goals and policies.[4] The OFP focuses on the economic benefits that a strong freight transportation system will support.

[4] The current Oregon Transportation Plan was adopted in 1992 and updated in 2006. It is available online at https://www.oregon.gov/odot/planning/pages/plans.aspx

1.1.2 Oregon Freight Plan Vision

> By 2045, Oregon benefits from a reliable, multimodal freight transportation system that supports its quality of life. This multimodal freight transportation system supports a healthy economy by safely and efficiently moving goods within Oregon, regionally, nationally and internationally. The quality, dependability, and efficiency of Oregon's multimodal freight transportation system encourage businesses to remain in and move to Oregon, providing jobs in a diverse set of industries.

1.1.3 Oregon Freight Plan Initiation and Development

Over the last 20 years, ODOT and other state agencies have addressed freight in statewide multimodal, modal and topical transportation plans, including the OTP. The OTP includes a general discussion of freight in its identification of goals, policies and strategies for the state's multimodal transportation system. The OTP recommends that other multimodal, modal/topic and system plans further define the OTP's broad goals, policies, strategies and investment scenarios.[5] The OFP responds to this recommendation by taking freight planning in the state to the next level. It is the first plan at the state level focused entirely on the improvement of the freight system. The OFP builds on efforts of the OTC, the Oregon Freight Advisory Committee (OFAC), the state's ports, shippers, railroads, and other public and private stakeholders.

1.1.4 Oregon's Freight Plan Purpose and Implementation Statements

A Freight Plan Steering Committee (see Appendix A) of executive-level industry and public-sector stakeholders guided the development of the OFP. The committee developed the following purpose statement for the Plan that focuses the OFP vision:

> The purpose of the Oregon Freight Plan is to improve freight connections to local, Native American, state, regional, national and global markets in order to increase trade-related jobs and income for Oregon workers and businesses.

To achieve the state's freight planning goals, the OFP:

- Supports identifying, prioritizing and facilitating investments in Oregon's highway, rail, marine, air and pipeline transport infrastructure to further a safe, seamless multimodal and interconnected freight system.

[5] Volume 1 of the OTP contains detailed information on OTP goals, policies, strategies and investment scenarios.

- Identifies institutional and organizational barriers to an efficient and effective freight transportation system in Oregon and develops strategies for addressing issues associated with overcoming these barriers.
- Adopts strategies for implementation of OTP goals and policies related to the maintenance and improvement of the freight transportation system.

As the guiding statement for the OFP process, the purpose statement recognizes that freight system efficiency supports the competitiveness of the state's industries by providing efficient access to domestic and international markets. Market competitive industries contribute to economic growth across the state. Finally, the OFP furthers the goals of the OTP, including the development of strategies to make freight movements more efficient and to lessen the impact on Oregon's communities and natural environment. For each of the OTP goals, Chapter 7 sets forth specific OTP policies related to freight and identifies strategies and actions to implement them.

1.1.5 Freight Impacts

Development of the OFP required input by private and public stakeholders as a result of the importance of freight to, and impact on, communities, regions, and the state. Public-sector stakeholders rely on freight to support local, regional, and state industries; provide jobs to constituents; and maintain a high standard of living. Private-sector stakeholders rely on freight movements to and from various markets in an efficient and affordable manner. In turn, public and private stakeholders' decisions affect the freight system and surrounding communities. And, finally, freight movement creates environmental impacts that need to be recognized and minimized. Table 1.1 summarizes the relationships between public- and private-sector actions and the freight system.

As a result of different levels of government jurisdiction over freight infrastructure, conflicts can arise. For example, a local community's decision to develop a pedestrian oriented streetscape that does not adequately support truck traffic affects the efficiency and the quality of the regional and state freight system. Communication and cooperation among stakeholder groups is essential.

Table 1.1 Stakeholder Roles and Relationships

STAKEHOLDER	HOW STAKEHOLDERS IMPACT FREIGHT
Local Government	▪ Design and maintain local roads. ▪ Route of truck traffic through local communities. ▪ Make land use decisions that affect where freight-dependent industries are located and that affect how freight will interact with the community. ▪ Develop a local vision for portions of highways that also serve significant local needs. ▪ Work with railroads, trucking firms, shipping lines and others on the mitigation of impacts to the environment and communities.
Regional Agencies and Groups (includes metropolitan planning organizations and area commissions on transportation)	▪ Support statewide decision-making by prioritizing and supporting selection of necessary regional transportation and freight projects. ▪ Consider local/regional transportation and freight issues if they impact the state system. ▪ Recommend (ACTs) or direct (MPOs) projects in their area or jurisdiction to receive federal funds.
Port Authorities (Marine and Airports)	▪ Improve freight efficiency by managing and maintaining key intermodal freight facilities such as ports and airports, which improves economic opportunity and quality of life in the region and state. Ports and airports rely on the surface transportation infrastructure provided by railroads and road authorities to move goods.
State Agencies	▪ Plan for statewide improvements in the transportation and freight system. ▪ Design, construct, operate, and maintain multimodal state facilities.
Tribal Governments	▪ Consult with Tribal governments throughout the statewide and metropolitan planning and programming processes (23 USC 134 and 23 USC 135).
Private Sector	▪ Creates economic demand that generates freight traffic. ▪ Select modes and distribution patterns which will impact freight system efficiency, local/regional/state economies, environment and other critical factors.

Source: Oregon Freight Plan, November 2017

1.1.6 Plan Development[6]

The OTC, OFP Steering Committee, other freight transportation, industry, land use and environmental experts, regional and local governments, and other stakeholders were involved in developing the OFP (Figure 1.1). Groups included the following:

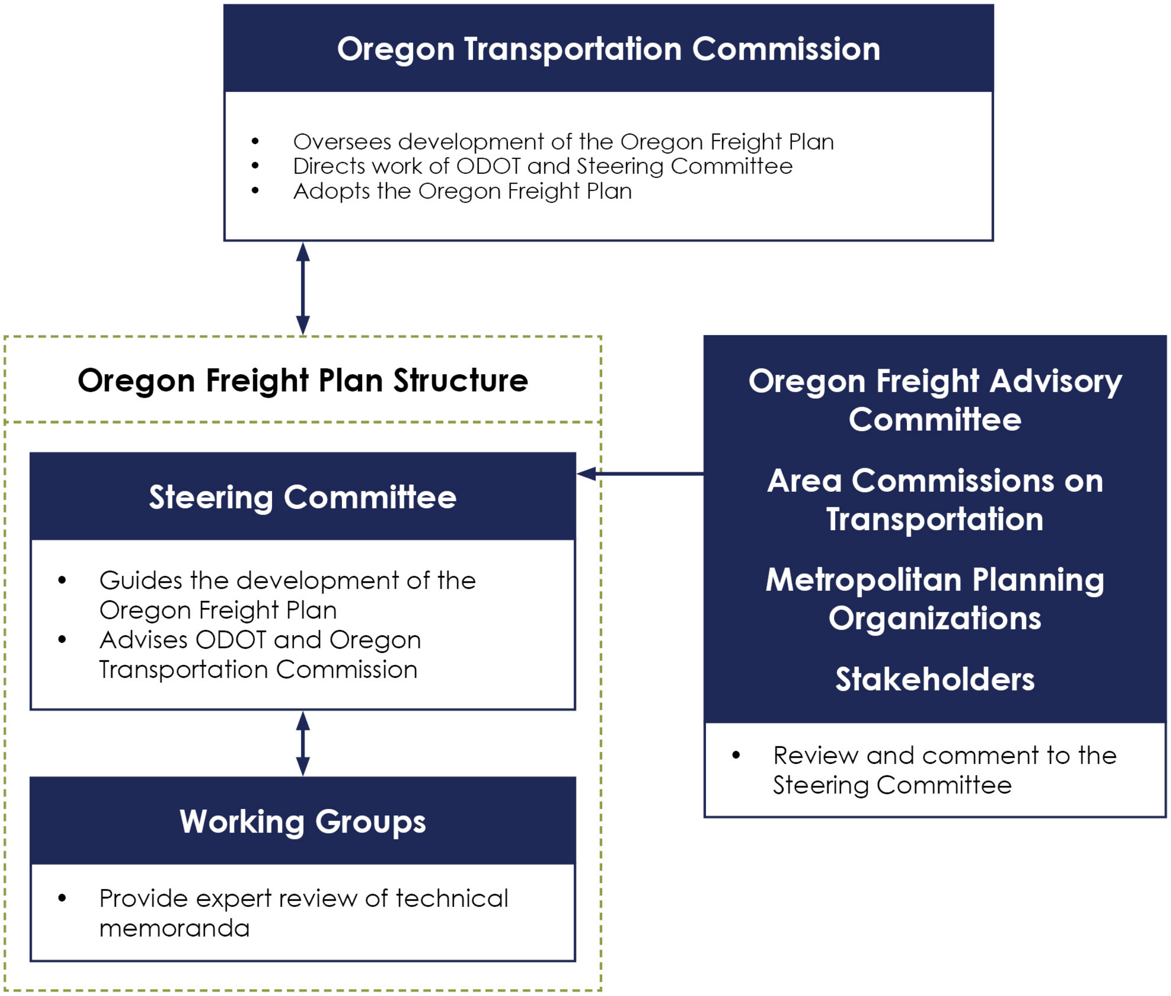
- *The Oregon Transportation Commission*: The OTC, a five-member commission appointed by the Governor, establishes state transportation policy and is responsible for guiding the planning and management of Oregon's transportation system. This includes adoption of the OFP as a component of the OTP. The OTC played a leadership role in the development of

[6] Information on the consultation process associated with the 2017 amendment can be found in Appendix A.

the freight plan by convening the OFP Steering Committee, monitoring plan progress and providing input on plan content, strategies and decisions. A commissioner chaired the Steering Committee.

- *The Freight Plan Steering Committee*: The Steering Committee, which included executive-level freight, industry, community and transportation professionals from around the state, provided overall direction to ODOT for development of the OFP, its contents and its strategies. Appendix A provides a list of Steering Committee members.
- *Freight Plan Working Groups*: Three Working Groups provided expert review of the technical memoranda prepared by consultants. Lists of Working Group members are provided in Appendix A.
- *The Oregon Freight Advisory Committee*: The OFAC is a multimodal advisory committee made up of shippers, carriers, intermodal operators and public agency representatives created by the state legislature to advise the OTC and ODOT about freight issues and high-priority freight projects. OFAC work was instrumental to the development of this OFP. Several of the OFAC members were members of the OFP Steering Committee and Working groups. In addition, the OFAC discussed the status of, and provided input to, the freight plan, and amendments and updates to it, at its quarterly meetings.
- *Oregon Area Commissions on Transportation*: The ACTs are advisory bodies of local and regional officials and other stakeholders chartered by the OTC; the 11 ACTs cover all parts of Oregon except the Portland metropolitan area and Hood River County. They provide comment on transportation plans and play an important advisory role in the State Transportation Improvement Program (STIP) in establishing area project priorities. Information and studies completed by the ACTs were consulted during the creation of this plan. Appendix B provides a list of ACTs.
- *Oregon Metropolitan Planning Organizations*: MPOs are responsible for planning, programming and coordinating federal transportation investments in Oregon's largest urbanized areas. Appendix B provides a list of MPOs in Oregon.
- *Topical Technical Papers*: The OFP has been informed by a series of topical technical papers developed in coordination with the Working Groups and Steering Committee during 2009 and 2010.

Figure 1.1 Stakeholder Groups Involved in the Development of the Oregon Freight Plan



Note: Information on the consultation process associated with the 2017 and the 2021 amendments can be found in Appendix A.

1.2 POLICY AND LEGAL CONTEXT OF THE PLAN

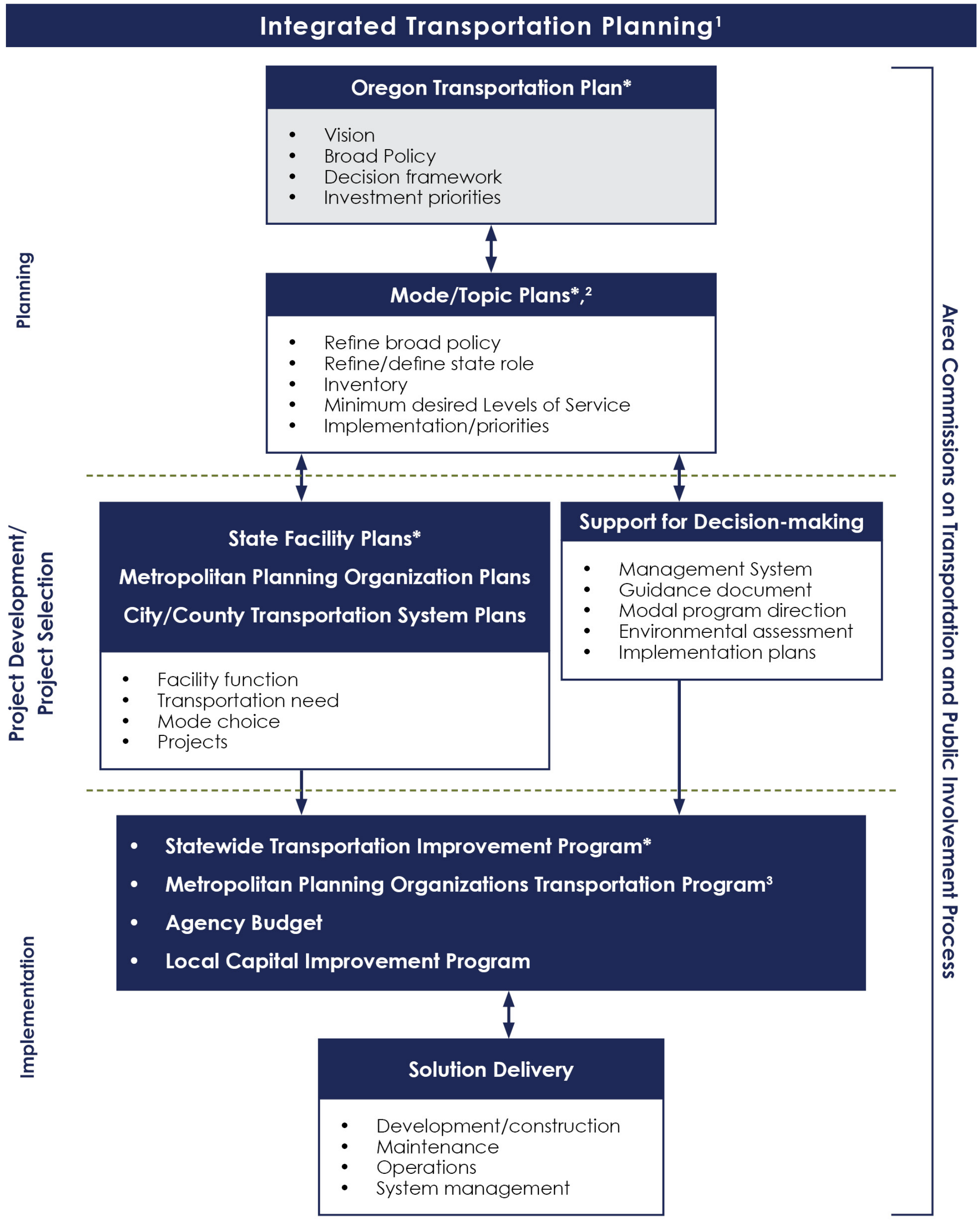
1.2.1 Consistency with Oregon Statewide Transportation Plans

1.2.1.1 Oregon Transportation Plan and Statewide Modal and Topic Plans

The OFP is one of several statewide transportation plans that further define and implement the OTP's goals, policies, strategies, and investment scenarios. The freight plan helps the OTC fulfill its responsibilities under Oregon Revised Statute (ORS) 184.619(1). Appendix C details how the OFP meets consistency and other requirements for multimodal, modal and topic plans, as specified in the OTP.

In addition to helping define and implement the OTP, the freight plan complements and helps to implement various statewide modal/topic plans, including the Aviation Plan, Highway Plan, Ports Strategic Plan, Rail Plan and Transportation Safety Action Plan. See Figure 1.2.

Figure 1.2 Relationship of Integrated Transportation Planning to the Oregon Transportation Plan and Statewide, Regional and Local Transportation Plans



*Oregon Transportation Commission Action.

1. Influenced by the Transportation Planning Rule
2. Aviation, Bicycle/Pedestrian, Freight, Highway, Public Transportation, Rail, Transportation Safety Action.
3. Metropolitan planning organizations' Transportation Improvement Programs must be included in ODOT's Statewide Transportation Improvement Program without modification. To ensure state priorities are considered, ODOT must be involved in each of the metropolitan planning organization's planning project selection process.

Source: Prepared by ODOT

1.2.2 Federal Requirements

1.2.2.1 Federal Regulations

Like the OTP, the OFP is required to comply with federal requirements. This includes:

- The state freight planning regulations as updated in the Infrastructure and Jobs Act (Public Law 117 58)
- The Passenger Rail Investment and Improvement Act of 2008The Federal Aviation Administration policy and guidance for aviation system planning.

Chapter 8 and Appendix C provides a detailed discussion of relevant federal legislation and requirements that apply to the Oregon Freight Plan and describes how the OFP maintains consistency with these requirements.

1.2.2.2 Oregon State Requirements

The Land Conservation and Development Commission (LCDC) has adopted 19 statewide land use planning goals that express Oregon's goals on land use, transportation, economic development and related topics. To implement Goal 12, Transportation, the LCDC adopted the Transportation Planning Rule, which requires ODOT to prepare a statewide transportation system plan, the OTP. The OTP is the long-range transportation system plan for the state. It identifies a system of transportation facilities and services adequate to meet identified state transportation needs. The OFP is part of the OTP. Regional and local transportation plans, in turn, must be consistent with the state transportation system plan (TSP). This requirement extends the OFP's influence to local and regional freight planning.

To facilitate coordination of land use planning activities among various governmental entities, Oregon statutes require that state agencies prepare coordination programs. ODOT's coordination program establishes procedures that ODOT uses to ensure compliance with statewide planning goals in a manner compatible with acknowledged city, county, and regional comprehensive plans. Appendix C provides OFP findings of compliance with statewide planning goals.

1.2.2.3 Oregon Transportation Commission Public Involvement Policy

To assist in meeting state and federal public participation requirements for statewide planning processes and the STIP development, the OTC has adopted a public involvement policy for the commission and ODOT activities.

The public involvement process for the OFP was consistent with the OTC's public involvement policy and included periodic briefings and discussions at OTC meetings, OFP Steering Committee and Working Group meetings, quarterly updates at OFAC meetings, newsletters on the freight plan website, meetings with stakeholder groups and interested parties to solicit comments and coordination internally within ODOT and with other governmental agencies. Further information on the public involvement process for the plan can be found in Appendix D.

1.3 SUMMARY OF OREGON FREIGHT PLAN CONTENTS

1.3.1 Plan Chapters

This OFP is organized into eight chapters:

- **Chapter 1 – Introduction.** Background and overview of the OFP, including its development, the plan structure, planning compliance and public involvement.
- **Chapter 2 – Economy and Freight Demand.** Oregon's current economic structure, including major industry sectors and key goods-dependent industries and anticipated economic trends and forecasts; this is followed by an overview of commodity flows in Oregon, including weight, value, mode splits and specific freight corridors.
- **Chapter 3 – Oregon Industries and Freight Movement.** Key industries in Oregon, their contribution to statewide economic output and jobs, and their needs, issues and opportunities as they relate to the freight plan.
- **Chapter 4 – Freight Systems.** Oregon's multimodal freight network, methodology of strategic system selection and corridor connectivity.
- **Chapter 5 – Freight and Climate Change.** Discussion about the impact of climate change on freight, Oregon's actions to mitigate greenhouse gases from freight and potential additional methods to reduce freight impact on greenhouse gases.
- **Chapter 6 – Funding.** Comparison of funding resources to funding needs, and identification of opportunities for closing the funding gap.
- **Chapter 7 – Freight Issues and Strategies.** Recommended policy, investment, operational and institutional strategies to maintain and improve freight mobility in Oregon and further the goals of the plan.
- **Chapter 8 – Federal Compliance.** Brings the OFP into compliance with the federal FAST Act and Infrastructure and Jobs Act (IIJA, Public Law 117 58).

2 Economy and Freight Demand

2.1 INTRODUCTION

Economic growth and the composition of Oregon's economy is an important driver of freight transportation demand. This chapter describes the state's economy and factors that may affect future growth patterns, followed by a discussion of current and expected freight demand on the state's transportation network.

This chapter is divided into the following sections:

- Summary of major Oregon economic and demographic trends and the relationship between these trends and freight demand
- Freight demand on Oregon's freight network
- Freight demand by Area Commissions on Transportation (ACTs)

2.2 OREGON'S ECONOMY

A review of the Oregon economy—in terms of gross state product (GSP), employment, population growth and industry trends—is critical to understanding future demand and use of the state's freight system.

2.2.1 Oregon's Gross State Product and Employment

In the long term, Oregon's GSP and employment are projected to grow. This updated OFP focuses on long-term trends while acknowledging near-term fluctuations in growth rates as a result of the COVID-19 pandemic and the subsequent recovery period. GSP—as a measure of the value added to products and services by all Oregon businesses and industries—is a broad indicator of the level and strength of economic activity in the state. In 2021, Oregon's GSP was $267 billion,[7] making it the 25th largest economy in the United States, (a near 10% increase in GSP from 2020).

Figure 2.1 shows the historical real growth rate in Oregon GSP from 1997 to 2021. Over this period, Oregon's GSP has grown at an annual rate of 2.7%. The total percentage of growth for Oregon's GSP between 1997 and 2021 was 90%, with nearly 23% occurring since 2014. While Oregon's GSP dipped during 2009 and 2010 during the Great Recession, the state had a prompt recovery and has steadily increased.

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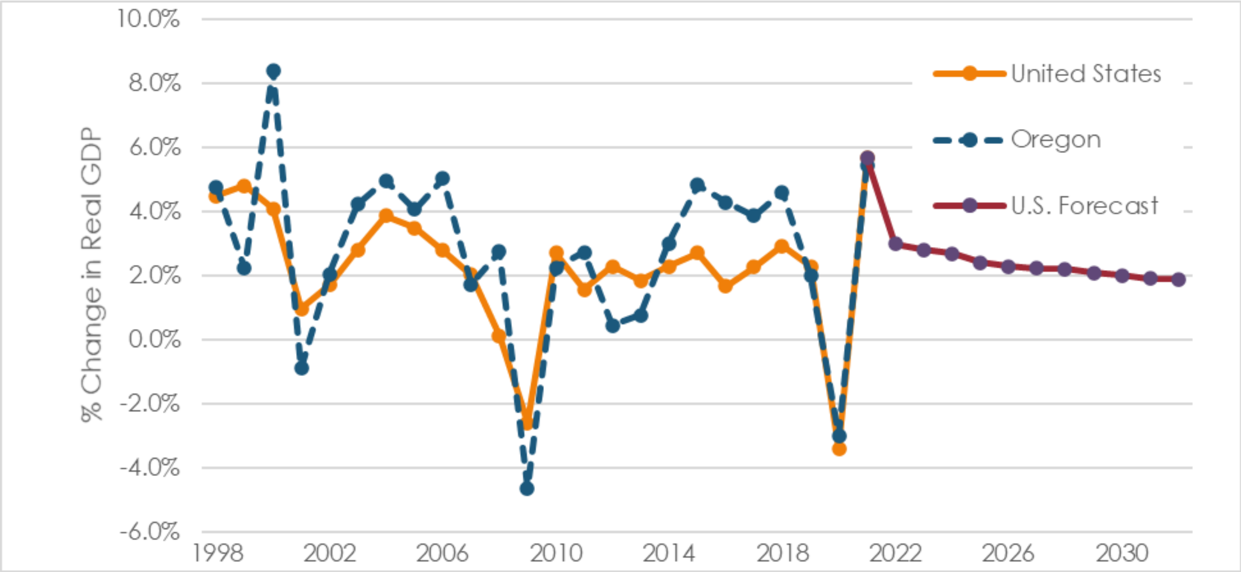
[7] Bureau of Economic Analysis. Gross Domestic Product by State. https://www.bea.gov/data/gdp/gdp-state. Accessed May 2021.

Figure 2.1 U.S. Annual Real Gross Domestic Product and Oregon Annual Real Gross State Product Growth Rates, 1998 to 2021 and 2021-2032 projection



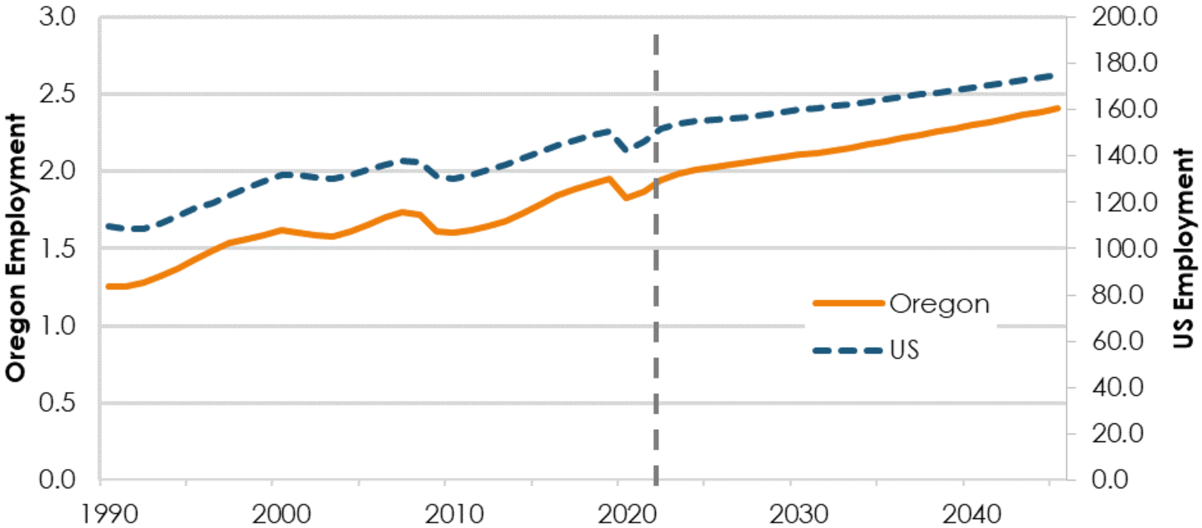
Sources: U.S. Department of Commerce / Bureau of Economic Analysis (March 2022) and Oregon Office of Economic Analysis Economic Indicators (June 2022)

In comparison, the annual growth rate of the U.S. economy over the same period was 2.20%, lower by 0.5% than the growth rate for Oregon. Additionally, total growth in U.S. gross domestic product (GDP) over the period between 1997 and 2021 was 69%, with nearly 15% occurring since 2014, well below the 23% occurring in Oregon referenced above. Per the Oregon Office of Economic Analysis Economic Indicators data from June 2022, the U.S. economy is projected to grow at an annual real growth rate of 2.3% through 2032. If the growth in Oregon economy grows at the same rate as the national average (as has been the case from 2019 to 2021), GSP can be expected to be 28% higher than today in real terms.

Employment is another key indicator of economic health. Oregon's total nonfarm employment was 1.87 million in 2021, an increase of 2.34% from 2020, signaling a rebound in state employment following the COVID-19 pandemic.[8] The Oregon Office of Economic Analysis (Oregon OEA) forecasts total employment growth of 28.6% between 2021 and 2045 (Figure 2.2), equating to an annual growth rate of 1.05%. This figure is similar to the compounded annual employment growth experienced in the preceding two decades (1.045%).[9]

8 https://www.oregon.gov/das/OEA/Documents/forecast0322.pdf
9 Oregon Office of Economic Analysis, Oregon Economic and Revenue Forecast, June 2022.

Figure 2.2 Oregon Employment, 1990 to 2045 (millions of jobs)



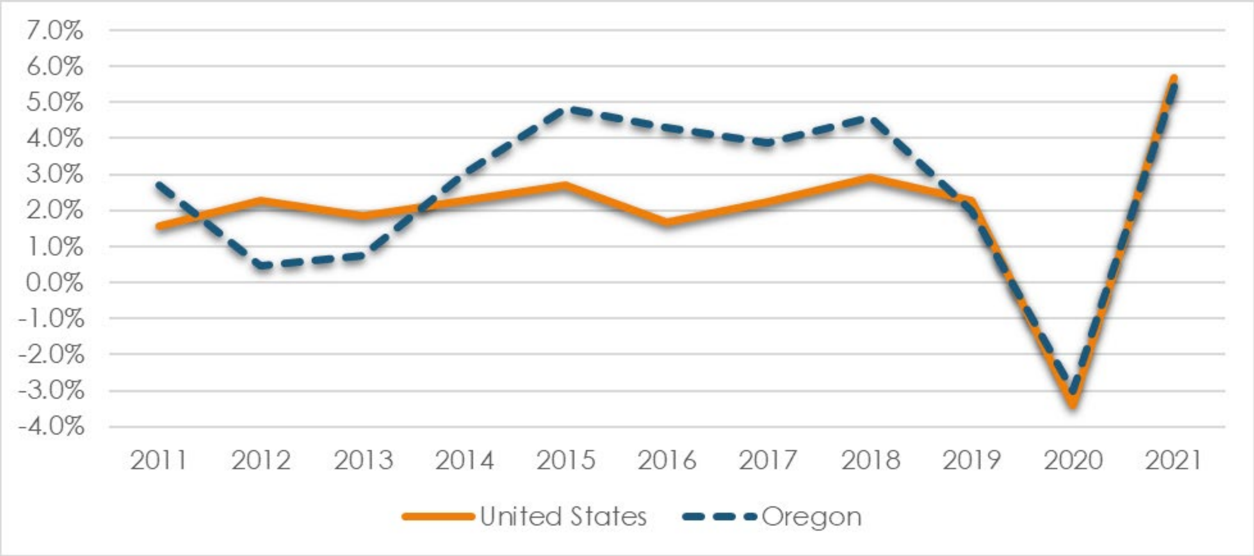
Source: Oregon Office of Economic Analysis (June 2022). Forecasts beyond 2032 assume constant compounded annual growth rate.

Analysis of Oregon OEA's forecast indicates that annual growth rate is expected to be 0.9% for Oregon, and 0.6% for the United States through 2032. These growth rates were used to forecast employment through 2045, with Oregon's total nonfarm employment expected to grow to 2.4 million, a 24% increase over 2022.

2.2.2 Oregon's Pronounced Business Cycles

As shown in Figure 2.1, Oregon's economic growth rates fluctuate more than that of the nation as a whole. Figure 2.3 highlights the significant impact the COVID-19 pandemic had on both Oregon and the United States, with both experiencing similar declines in annual GSP growth an annual GDP growth respectively in 2020. Oregon and the United States have recovered at nearly the same rate within the last year, with GDP growth rates of over 5%. In 6 of the 10 years depicted, Oregon grew more rapidly than the United States as a whole, while Oregon's economy has fluctuated in line with the national average since 2019. For only two years in the last decade has Oregon's rate of economic growth underperformed the national rate.

Figure 2.3 U.S. and Oregon Annual Gross Domestic Product Growth Rates, 2011 to 2021



Source: U.S. Bureau of Economic Analysis and U.S. Department of Commerce

2.2.3 Oregon's Growing and Aging Population

Population growth is another key indicator that can help predict long-term economic growth. Figure 2.4 shows that the population of Oregon is projected to grow to approximately 5.3 million by 2045.[10] This increase represents a 0.8% annual growth rate from 2022 through 2045. The United States is expected to grow at an annual rate of 0.5% over the same period, indicating higher population growth in Oregon through 2045.

Most population decline in Oregon between 2020 and 2045 is expected to be within areas outside urban growth boundaries, with 8 of all 36 counties expected to see a decrease in population over the time period.[11] Average growth across all Oregon counties is expected to be 12% through 2035. The Greater Portland Metropolitan Statistical Area is projected to increase 17% between 2020 and 2035, to above 2.9 million.[12]

Oregon population growth has and will continue to be driven by in-migration of working age adults attracted by job opportunities in the state, natural scenery and outdoor amenities, and relative affordability compared to California. In 2030, the Oregon population is expected to include fewer children between the ages of 5 and 17, more adults aged 20 to 64, and a significant increase in the number of residents over age 65. Population increases are expected across

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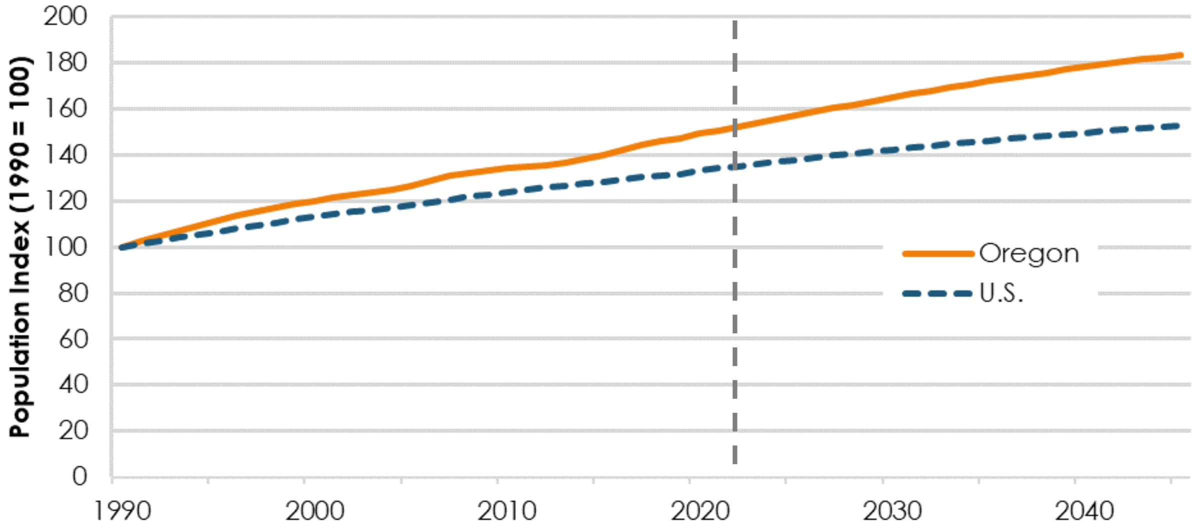
10 Portland State University, Population Research Center, "Oregon Final Forecast Table by Age", 2021.
11 Portland State University, Population Research Center, "Current Forecast Summaries for All Areas", 2021.
12 Metro Research Center, Oregon Metro, Population Projections, April 2016

various demographic groups within the state, which indicates a likely increase in consumption of goods and services, fueling continued economic growth.

Figure 2.4 Oregon vs. U.S. Population Index, 1990 to 2045 (in millions)



Source: Portland State University Population Research Center 2022 Population Forecast, and U.S. Census Bureau – U.S. Population Forecast (2022)

2.2.4 Oregon's Productivity

An index of nonfarm productivity has been growing faster in Oregon than the national average in recent years (Figure 2.5), which indicates that output is raising faster than labor inputs. This tends to create a competitive advantage for Oregon in both domestic and international markets. Factors that affect productivity include the following:

- Workforce Education – Of Oregon residents over age 25, 91.1% have completed a high school or equivalent degree, ranking the state 20th in the nation; 34.4% have a bachelor's degree or higher, ranking the state 16th; and 13.1% have completed an advanced degree, ranking the state 14th.[13]
- Workers Compensation Rates – Oregon ranked 45th in workers' compensation premium index rates.[14]
- Energy Prices – Oregon ranks 38th in the nation for total energy prices.[15] Oregon spends 21.48 nominal dollars per million British thermal units (Btu).[16] In terms of diesel prices to

13 U.S. Census Bureau, 2021.

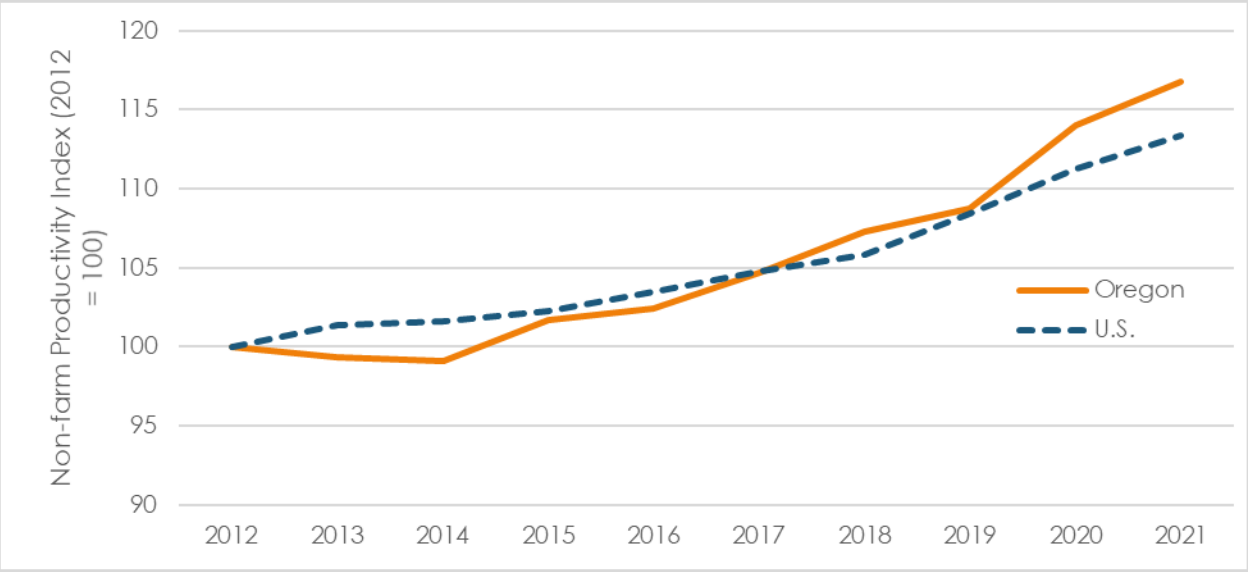
14 Oregon Department of Consumer and Business Services, Biannual Report, https://www.oregon.gov/dcbs/cost/Pages/premium-index-rates.aspx

15 U.S. Energy Information Administration (EIA), 2021

16 U.S. Energy Information Administration (EIA), Table E3 – Residential Sector Energy Price Estimates, 2019. https://www.eia.gov/state/seds/sep_sum/html/sum_pr_res.html.

power the majority of trucks and trains, Oregon also has relatively high costs. In June 2022, Oregon's cost per gallon of diesel was $6.03 per gallon, which was the 12th highest average price for diesel in the nation (including Washington, D.C.).[17]

Figure 2.5 Oregon vs. U.S. Nonfarm Productivity Index, 2012 to 2021 (2012 = 100)



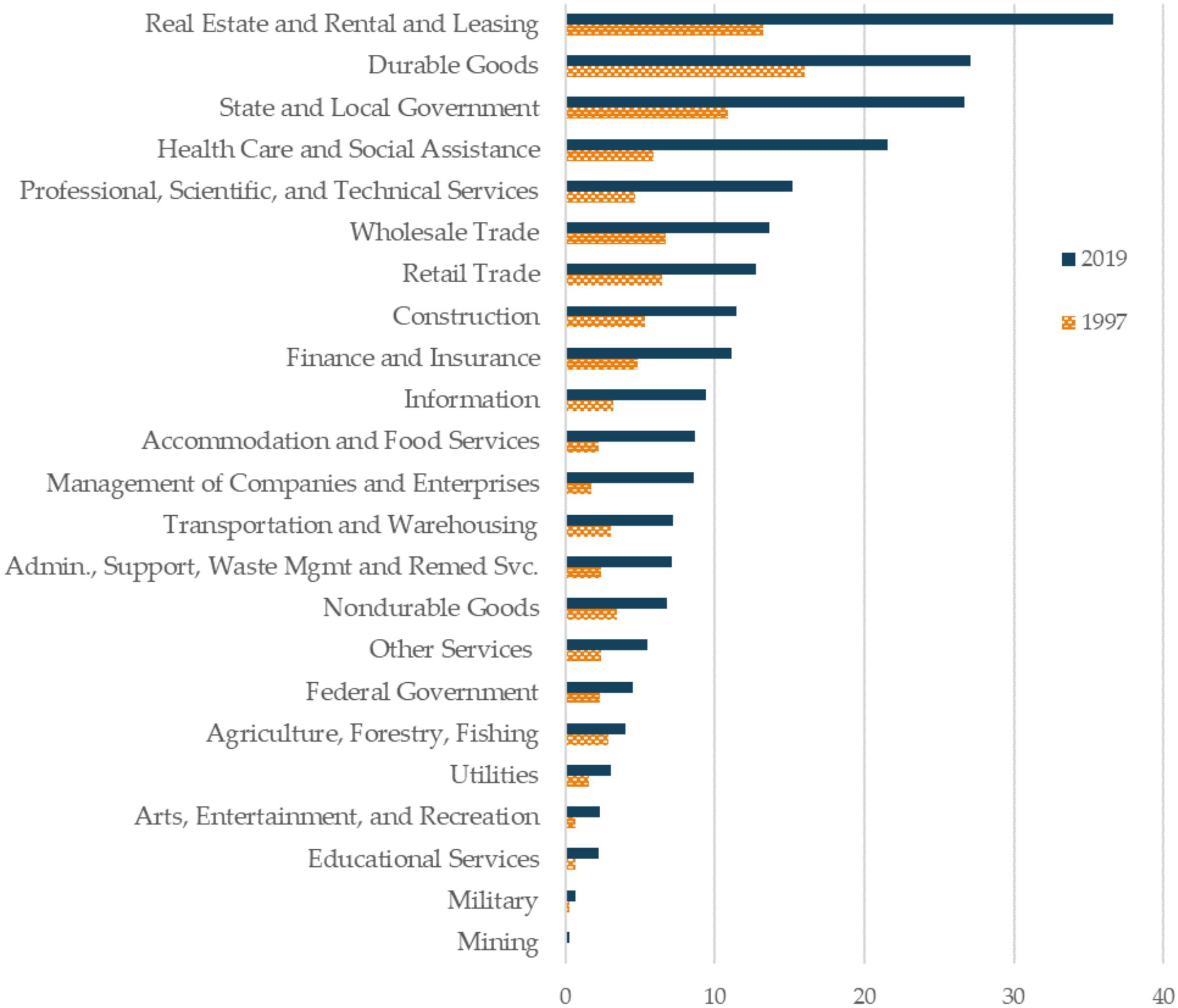
Source: U.S. Bureau of Labor Statistics – State and Regional Productivity Tables (May 2022), U.S. Bureau of Labor Statistics – Nonfarm Business Labor Productivity (September 2022). https://www.bls.gov/productivity/tables/

2.2.5 Transformation of Oregon's Economy

Oregon's economy has continued to change from a resource-based economy to a high-value-added manufacturing and service economy. Figure 2.6 compares documented real GSP by industry sector values in 1997 with real GSP by industry figures in 2019, capturing GSP growth and industry structure shifts over the last two decades, including developments induced by the Great Recession of 2008-09 but prior to disruption caused by the COVID-19 pandemic. Oregon's top private sectors in 2019 in terms of real GSP included the following sectors: Real Estate and Rental and Leasing; Durable Goods manufacturing; State and Local Government; and Health Care and Social Assistance. The Real Estate and Rental and Leasing sector accounted for 14.8% of the state's GSP in 2019, while Durable Goods manufacturing sector alone accounted for 11.0%.

[17] American Automobile Association (AAA). June 7, 2022. *Daily Fuel Gauge Report*.

Figure 2.6 Gross State Product by Oregon Industry Sector, 1997 and 2019 (in billions of 2022 dollars)



Sources: Oregon Office of Economic Analysis, 2022

Oregon saw GSP growth in durable goods manufacturing as a result of increased production of high-value products such as those manufactured by the computer and electronics industry, as well as increased employment in high technology jobs such as in the semiconductor industry.[18] Further, Management of Companies and Enterprises saw the largest percentage increase in GSP share, highlighting the sizable growth of professional services industry within the Portland metropolitan region and Oregon as a whole. This increase correlates to Oregon GSP's biggest contributor—Real Estate, and Rental, and Leasing—which accounted for $36.6 billion in total GSP in 2019, resulting in a 54% increase over the decade. Transportation equipment has seen a

[18] Oregon Office of Economic Analysis, 2022 https://oregoneconomicanalysis.com/2022/07/20/oregons-high-tech-sector-july-2022/

136% increase in GSP share over the last decade, indicating its growing importance to the freight industry within the state.

As of 2019, Oregon's natural resource-based industries—mainly comprising the Agricultural, Forestry, Fishing sector—contributed approximately 2.0% to GSP. Wood products manufacturing is the second largest manufacturing subsector but accounts for only a small portion (at just 1%) of total manufacturing value and GSP.

2.2.6 Oregon's Dependency on Trade and Freight Transportation

The Oregon OEA estimates that Oregon is the tenth to fifteenth most trade-dependent state in the nation.[19] The ranking illustrates the importance of export-oriented sectors, such as computer and electronics manufacturing, logistics and distribution, and processed foods to the Oregon economy. As shown in Table 2.1, manufactured products (such as computers and electronics) have medium to high dependency on highway, railroad, and water/marine transportation—and for some types of products—on air transportation. While professional and technical services are generally low freight dependent, they depend predominately on air freight when utilizing freight options.

Table 2.1 Oregon Transportation Dependency Rating of Oregon's Top Industries

INDUSTRY SECTOR	HIGHWAY	RAILROAD	WATER/ MARINE	AIR	PIPELINE
Agriculture, Forestry and Fishing	High	High (except fishing)	Medium	Low (except fishing)	Low
Computer and Electronics Manufacturing	High	Medium	Medium	High	Low
Food Manufacturing	High	Medium	Medium	Low	Low
Machinery Manufacturing and Metals Manufacturing	High	High	High	Medium	Low
Wood and Paper Manufacturing	High	High	High	Low	Low
Retail Trade	High	Medium (except long distance)	Medium	Low	Low
Services and Other	Low	Low	Low	Low	Low

Source: Cambridge Systematics with data from Parsons Brinckerhoff, "Relationship of Freight Transportation to Economic Development."

19 Oregon Office of Economic Analysis. April 2018: https://oregoneconomicanalysis.com/2018/04/11/oregon-trade-with-china-graph-of-the-week/

For Oregon businesses to grow, they must be able to ship goods quickly and effectively to U.S. and international markets. To retain or gain market share, Oregon businesses must be cost-competitive in both producing and shipping their goods to market. The same is true for raw materials, components, and other inputs transported to Oregon manufacturing and processing facilities. Many manufacturing businesses and other industries have adopted the just-in-time inventory strategy to reduce inventory and associated carrying costs, which requires a high degree of flexibility by suppliers. Just-in-time inventory strategies also make shipments more time sensitive as a result of decreased inventories at production locations. In turn, reduced congestion and low travel-time variability is important to facilitate businesses using the just-in-time model.

The retail trade industry is also affected by online retailing, or business-to-consumer shopping. Starting in March 2020 and throughout the COVID-19 pandemic, e-commerce sales continued to increase rapidly. As of first quarter 2022, e-commerce sales accounted for $230 billion, or 14.3% in total U.S. retail sales. This represents an increase of 6.7% compared to $216 billion in the first quarter of 2021 and a 52% increase over first quarter 2018 e-commerce sales ($112 billion), which accounted for 9% of total U.S. retail sales.[20] In the U.S., e-commerce is forecast to grow by 9.1% annually through 2030, estimating an e-commerce market size of $8.7 trillion by 2030.[21] This will result in a continued increase in the volume of small package deliveries to homes by carriers including UPS, FedEx, U.S. Postal Service, and other third-party logistics providers engaged in last-mile delivery strategies. As a result of these and other trends, the future of Oregon's economy will depend highly on dependable, flexible, and affordable freight transportation services.

2.3 FREIGHT DEMAND OVERVIEW – OREGON

Freight demand and the transportation modes chosen to accommodate this demand are driven by the characteristics of the economy that were discussed in Section 2.2. Industry growth or decline, shifting population patterns, and factors such as shifting international trade and logistics patterns all influence freight demand patterns.

Where, when, how often, and why businesses make freight movements depends largely on industry supply chains. Every shipper, carrier, and customer makes decisions frequently that will affect how goods move in Oregon and thus how the surrounding environment will be affected by freight. Figure 2.7 highlights the complexity of variables that each player in supply

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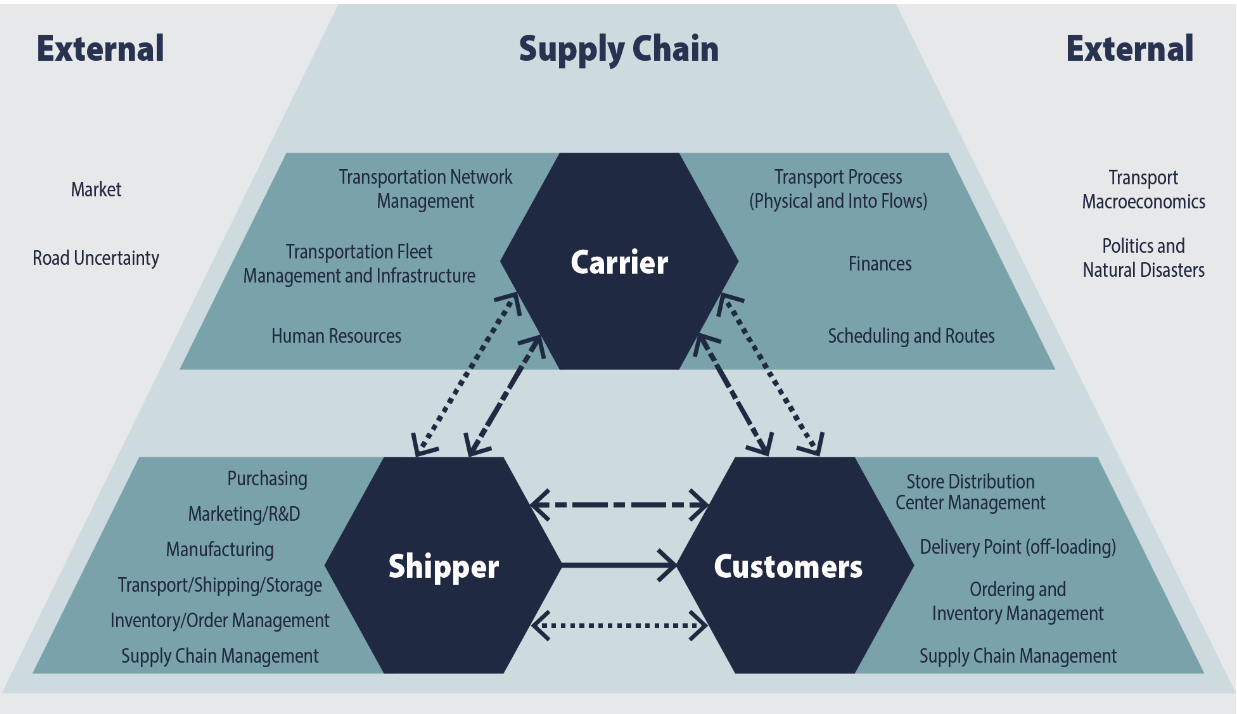
[20] Quarterly Retail E-Commerce Sales, 1st Quarter 2022, U.S. Census Bureau, US Department of Commerce, May 2022. https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf.

[21] Vision Research, Reported in MarketWatch, May 23, 2022. https://www.marketwatch.com/press-release/b2c-e-commerce-market-anticipated-to-grow-at-much-faster-rate-in-upcoming-years-2021---2030-2022-05-23

chains needs to consider, in addition to outside uncertainties such as the market, transport macroeconomics, disasters and others. In this figure, the shippers, carriers, and customers are shown to be the three main participants in the supply chain process. The variables directly surrounding each participant in the supply chain process are considerations that may affect the supply chain process, specific to that participant. External variables that may affect the supply chain process are shown in the periphery of Figure 2.7, including variables such as the market, politics, and macroeconomics. Both participant-specific and external variables have an impact on the supply chain and how freight moves in Oregon.

Figure 2.7 Supply Chain Nodes and Internal/External Factors that Create Uncertainty of Freight Movements



Source: Diagram concept and much of the content taken from "Establishing a Transport Operation Focused Uncertainty Model for the Supply Chain" Rodrigues et al., 14th International Annual EuROMA Conference, Ankara, June 2007. Diagram content was adjusted to focus on key contributors in the supply chain for the purposes of this freight plan.

A state's commodity flow profile is therefore a reflection of a state's socioeconomic and population profile as well as the industries and businesses that make up a state's economy. This section presents data and observations concerning the impact of future freight demand on policy and the statewide multimodal transportation system.

The Freight Analysis Framework (FAF), produced by the Federal Highway Administration (FHWA) and the Bureau of Transportation Statistics (BTS), is a nationwide multimodal commodity flow assessment that integrates data from a variety of sources to create a comprehensive picture of freight movement across states and within major metropolitan areas. The latest version of the dataset, FAF5 incorporates data from two primary sources – the 2017 Commodity Flow Survey (CFS), a shipper-based survey detailing domestic freight shipments by American businesses, and international trade data from the Census Bureau. FAF also incorporates data from agriculture, extraction, utility, construction, service, and other sectors.

The FAF5 provides estimates for tonnage and value by regions of origin and destination, commodity type, and mode for base year 2017 and a 30- year forecasts. FAF5 forecasts provide a range of future freight demands at five-year increments representing three different economic growth scenarios, through 2050, by various modes of transportation.

The Oregon GSP growth highlighted in prior sections signals an increase in demand for the freight system in general. In addition, a larger population will consume more food, clothing, housing, and other household goods, increasing freight demand. Incorporating these economic and demographic forecasts, FAF5 estimates significant increases in total freight traffic in Oregon (Table 2.2).

Table 2.2 Oregon Freight Tons and Value, All Modes (2017, 2025, and 2050)

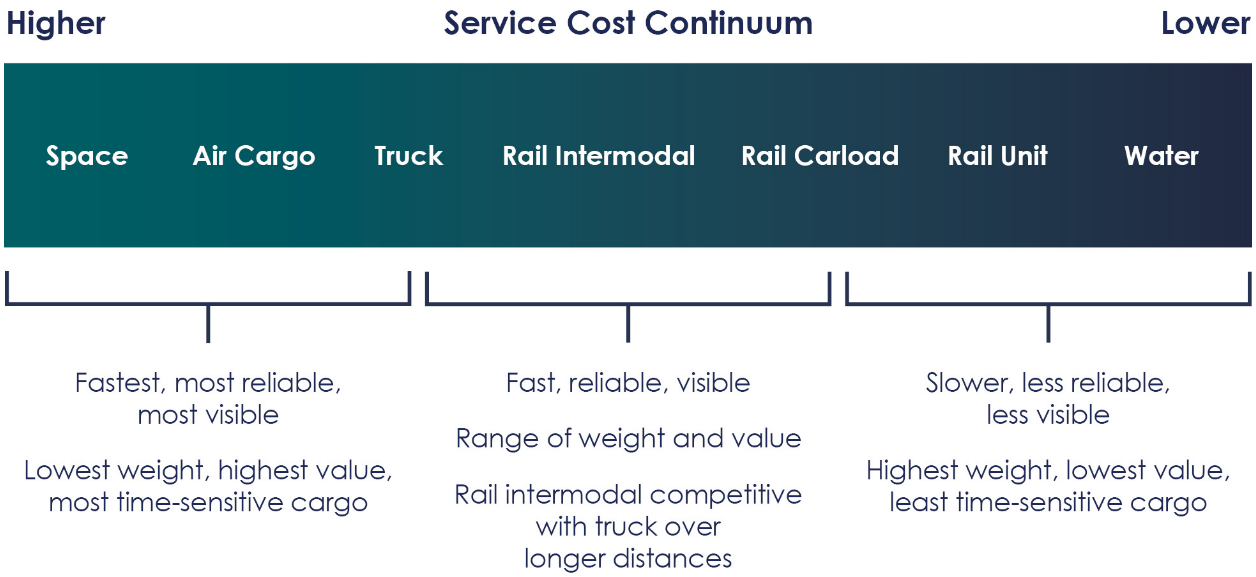
CATEGORY	2017	2025	2050	2017 TO 2050 % GROWTH
Weight (millions of tons)	314	341	515	64%
Value (billions of $)	302	342	581	92%

Source: Freight Analysis Framework v5.2
Note: The values in this table do not include freight movements that do not have an Oregon origin or destination.

2.3.1 Freight Demand by Mode

Several factors influence mode selection by industry and commodity. Cost of service and accessibility are key criteria when selecting mode for transport of goods. Figure 2.8 shows the type of cargo that certain modes tend to transport. For instance, water and non-intermodal rail modes tend to ship high-weight, lower-value products that are not time sensitive. Heavy commodities such as gravel sometimes uses barge and lumber sometimes uses rail. Therefore, businesses that require lower-cost transportation service and can deal with slower shipments turn to barge and rail carload or unit trains. On the other hand, trucks generally ship lighter goods that are of higher value and more time sensitive. Truck and intermodal rail are faster and more reliable than options with lower service costs. Finally, air cargo is used to ship the most time-sensitive and highest-value cargo. The air mode represents a small but increasingly important share of total freight movements.

Figure 2.8 Freight Transportation Service Spectrum



Source: AASHTO. 2018. *Freight Rail Bottom Line Report*.

As shown in Table 2.3, all major transportation modes—air, pipeline, rail, truck and water—will see growing volumes of freight, with air volumes growing the most in terms of total weight, followed by Multiple Modes & Mail. The Freight Analysis Framework developed these forecasts to include the latest post-COVID-19 pandemic projections. The projected 64% increase in freight tonnage moving into, out of, and within Oregon will place additional demands on the Oregon freight system. As a comparison, the U.S. freight system is expecting a 46% increase in total tonnage between 2017 and 2050, with a compound annual growth rate (CAGR) of 2.0%.[22] Oregon's expected CAGR for tonnage moving into, out of, and within Oregon is 1.5%.

[22] Freight Analysis Framework v5.2 analysis using FHWA FAF Data Tabulation Tool. https://faf.ornl.gov/faf5/dtt_total.aspx

Table 2.3 Oregon Freight Demand by Weight/Value (All Modes)

	Weight (Millions of Tons)					Value (Billions of Dollars)				
Mode	2017	2023	2050	2017-2050 Growth %	2017-2050 CAGR %	2017	2023	2050	2017-2050 Growth %	2017-2050 CAGR %
Air	0.1	0.1	0.2	109%	2.26%	10	11	20	97%	2.08%
Pipeline	52	55	84	61%	1.46%	11	11	15	42%	1.06%
Rail	19	19	34	83%	1.84%	7	7	13	80%	1.79%
Truck	218	229	356	64%	1.50%	215	229	406	89%	1.95%
Water	8	8	12	48%	1.19%	6	7	11	84%	1.86%
Multiple Modes & Mail	18	18	29	64%	1.51%	54	58	115	115%	2.35%
TOTAL	**314**	**329**	**516**	**64%**	**1.51%**	**302**	**322**	**581**	**92%**	**2.00%**

Source: Freight Analysis Framework v5.2
Note: Table does not include commodities traveling through Oregon, without an Oregon origin or destination.

Other important observations can be made from Table 2.3:

- The value of freight movements shows a steeper increase than tonnage. The value of freight moved into, out of, and within Oregon is expected to increase 92% between 2017 and 2050, which is substantially higher than the 64% increase in tonnage. The 2017 to 2050 CAGR of total tonnage is at 1.5%, while the CAGR of value of all commodities shipped is 2.0%. The increase in higher-value commodities on the freight system implies a greater reliance on truck and air cargo and the growing importance of reliability, urban mobility, and access to airports and international cargo handling facilities.
- Trucking will continue to be a dominant mode for freight transport. Truck tonnages will continue to increase the most in absolute terms (total tonnage and value). However, Table 2.3 shows that air and rail tonnage demand will increase at a more rapid rate than all other modes (including trucks), except the Multiple Modes & Mail mode, which represent small but important shares of overall freight demand. Increasing truck traffic places further demands on the system and requires substantial investment in maintenance of the existing highway and road network. The growth of truck share reflects the shift toward higher-value products and greater time sensitivity in product movements. With truck traffic anticipated to rise substantially in the future, roadway congestion issues, transport reliability, and road access issues will be exacerbated. Roadway issues are therefore anticipated to become an even greater focus of future freight planning in Oregon.
- Rapid increases in rail demand may create capacity issues. The 83% increase in rail tonnage moving into, out of, and within Oregon will create capacity issues on major corridors,

especially around Portland and along the Columbia River Gorge.[23] Capacity issues will affect all industries that use freight rail, including the lumber and transportation equipment industries. Failure to address capacity issues may result in increased diversion of commodities to other modes.[24]

- A substantial increase in air freight by tonnage is expected. Airfreight demand in Oregon is expected to increase sharply as a result of projected increases in the high-value-manufacturing (i.e., computer and electronics products) and professional service industries. The expected 109% increase in airfreight tonnage between 2017 and 2050 will require improved access to airports as freight demand grows. Improving access will make it easier and more efficient for trucks to get to airports to pick up and unload cargo. Capacity for the cargo airports (primarily Portland International Airport) is not expected to be an issue during the planning period.

2.3.2 Commodity Movements and Freight Demand

Different modes are used to move key commodities into, out of, and within Oregon. For example, marine vessels are often used to carry heavy, low-value items, within states or between regions. Airfreight often carries low-weight, high-value goods to markets across the world. Table 2.4 highlights the major commodities carried into, out of, and within Oregon by mode in 2017 and the expected yearly growth rate of tonnage and value between 2017 and 2050.

Figure 2.9 to present an overview of the top commodities that used the freight system in 2017, by tonnage and value, compared to those that will be using the freight system in 2050.

[23] The data on rail tonnages does not include data on through movements that have neither an origin nor a destination within the state. Through tonnage and value were not available in the commodity flow data. However, through movements are discussed further in Section 4.5 of this plan

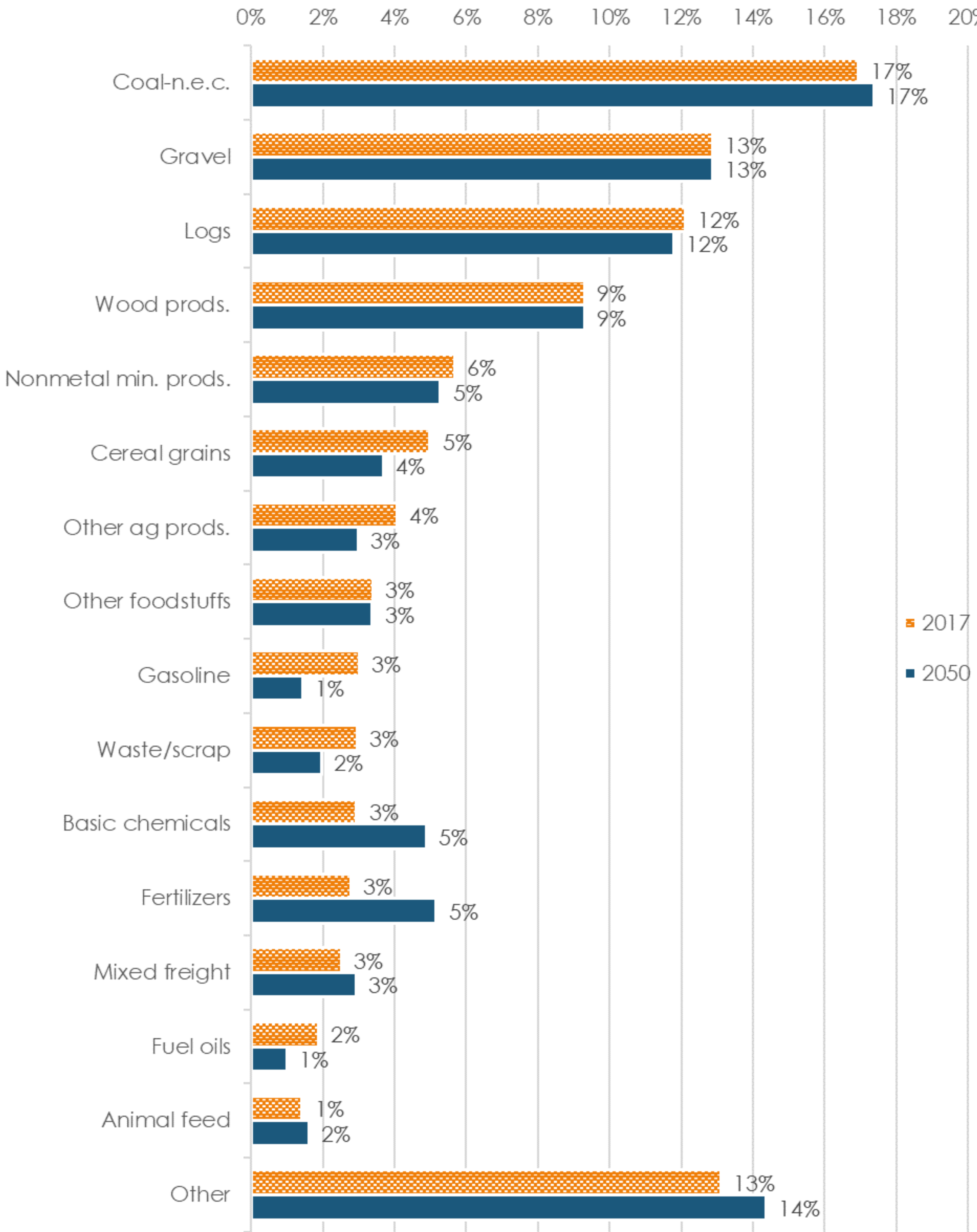
[24] Failure to address rail capacity issues will also affect efforts to increase passenger rail options.

Table 2.4 Growth of Top Commodities by Mode (Into, Out of, and Within Oregon)

MODE	TOP COMMODITIES (TONNAGE)	CAGR % 2017-2050	TOP COMMODITIES (VALUE)	CAGR % 2017-2050
Truck Freight	Gravel	1.5%	Mixed freight	2.0%
	Logs	1.4%	Electronics	1.8%
	Wood products	1.6%	Machinery	1.8%
	Nonmetal mineral products	1.3%	Motorized vehicles	1.8%
	Other ag products	0.7%	Wood products	1.7%
Rail Freight	Fertilizers	4.2%	Motorized vehicles	1.9%
	Wood products	0.9%	Wood products	1.3%
	Cereal grains	1.1%	Other ag products	-0.1%
	Other ag products	-0.3%	Fertilizers	4.1%
	Waste/scrap	0.3%	Transport equipment	1.2%
Water/Marine Freight	Cereal grains	1.2%	Motorized vehicles	2.44%
	Gravel	2.3%	Fuel oils	-0.6%
	Fuel oils	-0.6%	Paper articles	1.7%
	Gasoline	-1.6%	Cereal grains	1.2%
	Waste/scrap	0.3%	Gasoline	-1.6%
Air Freight (including truck-air)	Machinery	1.9%	Electronics	2.3%
	Electronics	2.4%	Machinery	1.6%
	Textiles/leather	2.7%	Precision Instruments	2.2%
	Misc. manufacturing products	3.0%	Pharmaceuticals	2.4%
	Plastics/rubber	3.0%	Textiles/leather	2.7%
Pipeline	Coal-n.e.c.	1.5%	Coal-n.e.c.	1.6%
	Gasoline	-1.7%	Gasoline	-2.3%
	Fuel oils	-1.9%	Fuel oils	-2.4%
	Basic chemicals	3.7%	Basic chemicals	3.7%
Multiple Modes and Mail	Cereal grains	0.1%	Electronics	1.8%
	Wood products	1.4%	Pharmaceuticals	3.6%
	Basic chemicals	3.6%	Misc. manufacturing products	3.2%
	Nonmetal min. products	1.4%	Precision instruments	3.0%
	Other foodstuffs	1.0%	Textiles/leather	2.4%

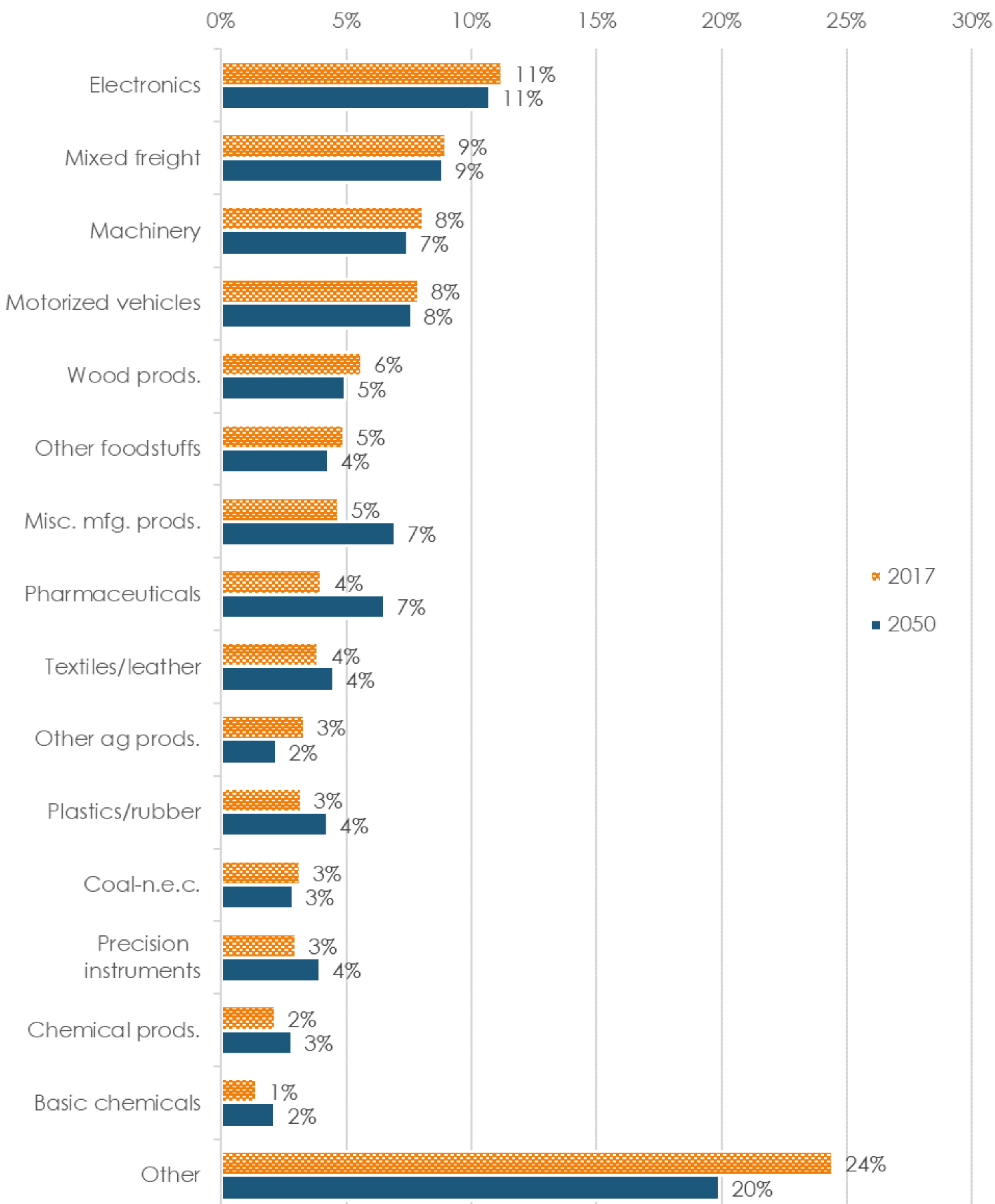
Source: Freight Analysis Framework v5.2

Figure 2.9 Breakdown of Commodity Shipments – Freight Tonnage, All Modes, In/Out/Intra – 2017 and 2050



Source: Freight Analysis Framework v5.2

Figure 2.10 Breakdown of Commodity Shipments – Value of Freight, All Modes, In/Out/Intra, 2017 and 2050



Source: Freight Analysis Framework v5.2

The information in Table 2.4, Figure 2.9, and Figure 2.10 has the following implications for freight transportation in Oregon:

- The largest single commodity in 2017 was coal-n.e.c. (which includes mostly natural gas), which is expected to retain the same share out to 2050. Most of this growth will take place by pipeline mode. The second largest commodity in 2017 was gravel, which is also expected to stay constant in tonnage share by 2050.[25] Pharmaceuticals is one of the fastest growing high-value commodities in the state, with a 7% value share in 2050, growing from a share of 4% of total value in 2017.
- Behind fertilizers, the basic chemicals industry is the fastest growing user of the rail system by weight in Oregon, excluding through rail shipments. Rail infrastructure in the regions where chemical products are picked up will need to be able to handle the increased demand for rail freight to move these goods. This will require the public sector to work with private-sector railroad companies to ensure adequate supply of rail infrastructure. Keeping a share of heavy goods, such as farm products, on rail can reduce the maintenance costs of Oregon roads and therefore should be considered in planning for future investments. Trucks are critical to moving heavy goods throughout Oregon. The location of industries that require permitted loads may change over time; the monitoring of where clusters of industries that require permitted loads are locating will reduce disruptions in the flow of goods.
- Several commodities will continue to rely on timely delivery through air freight. The growth in air freight is expected to come from electronics, machinery, and precision instruments, in terms of value. It will be critical to ensure the industries that produce these commodities have adequate access to airports and that bottlenecks between production facilities and the airport are minimized.
- Machinery will continue to be moved by truck, air, and marine modes. Because the machinery manufacturing industry is one of the largest contributors to manufacturing GSP in Oregon, it is critical that this industry have adequate airport access. For machinery exported or imported by water, it is critical that trucks can make timely and reliable deliveries to or from port facilities.

[25] Oregon's permitting system for truck loads that exceed standard limits can be broken into three general components: 1) trucks moving divisible loads may carry up to 105,000 pounds but axle weights must be standard, comply with Oregon's bridge formula, and be of standard widths and heights; 2) trucks moving non-divisible loads up to 98,000 pounds may have slightly higher than standard axle weights, must not exceed 12 feet in width and 13 feet, 6 inches in height and must meet the bridge formula; and 3) trucks moving non-divisible loads exceeding 98,000 pounds, with widths greater than 12 feet and height greater than 13 feet, 6 inches (very small percentage of trucks that require a permit). These latter trucks may exceed axle weights but usually do not exceed the bridge formula.

- Transportation equipment movements will continue to increase. This commodity will continue to increase for both truck and rail. It will be the top commodity by value moved on rail in 2050. On truck, it will also increase in terms of value.
- Fertilizers, meat/seafood, and nonmetallic minerals will continue to dominate goods moved by water. It is important to have adequate connections from point of production to ports for these commodities to meet the expected demand for water movements. Adequate access and routing to and from ports for trucks, including those requiring permits, as well as the consideration of additional rail service may be necessary to facilitate movement of these heavier goods to and from ports.

2.3.3 Freight Demand – By Direction

Inbound, internal, and outbound movements are all expected to grow at a moderate rate through 2050. Table 2.5 shows baseline tonnages for 2017 and expected tonnages for 2025 and 2050 by direction of movement.

Table 2.5 Oregon Commodity Flow Tonnage by Direction, 2017 to 2050

DIRECTION	YEAR			CAGR 2017-2050
	2017	2025	2050	
Inbound	82,041	88,790	128,179	1.36%
Internal	167,684	181,689	268,782	1.44%
Outbound	64,655	70,965	118,536	1.85%

Source: Freight Analysis Framework v5.2
Note: The values in this table do not include freight movements that do not have an Oregon origin or destination.

Through traffic exists on Oregon highways, railways, waterways, and pipelines. Chapter 4 discusses through traffic for each mode.

Table 2.6 highlights the top commodities by tons and value moving into, out of, and within Oregon in 2017 and growth to 2050.

Table 2.6 Top Commodities by Direction, 2017-2050

	TOP COMMODITIES (TONNAGE)	CAGR % 2017-2050	TOP COMMODITIES (VALUE)	CAGR % 2017-2050
Inbound Shipments	Coal-n.e.c.	0.8%	Electronics	2.1%
	Basic chemicals	3.1%	Motorized Vehicles	1.5%
	Cereal grains	0.2%	Machinery	1.7%
	Wood products	1.1%	Pharmaceuticals	3.6%
	Fertilizers	4.2%	Mixed freight	2.0%
	Other ag products	0.0%	Miscellaneous manufacturing products	3.1%
	Other foodstuffs	1.2%	Textiles/leather	2.1%
	Gasoline	-2.1%	Coal-n.e.c.	1.0%
Outbound Shipments	Coal-n.e.c.	2.4%	Electronics	1.7%
	Wood products	1.4%	Machinery	1.7%
	Other ag products	1.0%	Mixed freight	1.9%
	Other foodstuffs	1.7%	Motorized vehicles	2.2%
	Gravel	2.3%	Wood products	1.4%
	Nonmetal min. products	2.2%	Other foodstuffs	1.8%
	Mixed freight	1.9%	Other products	0.9%
	Animal feed	2.0%	Precision instruments	3.1%
Internal Shipments	Logs	1.4%	Mixed freight	2.0%
	Gravel	1.5%	Electronics	1.6%
	Nonmetal min. products	1.2%	Wood products	1.9%
	Wood products	1.7%	Machinery	2.0%
	Cereal grains	0.9%	Motorized vehicles	2.1%
	Coal-n.e.c.	2.1%	Gasoline	-0.4%
	Gasoline	-0.4%	Other foodstuffs	1.5%
	Waste/scrap	0.2%	Plastics/rubber	2.9%

Source: Source: Freight Analysis Framework v5.2
Note: The values in this table do not include freight movements that do not have an Oregon origin or destination.

Information in Table 2.5 and Table 2.6 has the following implications:

- Outbound tonnage, compared to inbound and internal, will grow fastest. Table 2.5 shows that the amount of freight originating in Oregon is expected to remain lower than the amount of freight coming into Oregon in 2050. However, outbound freight is growing at a higher rate than inbound freight, reducing this gap. Directional imbalances in freight flows could impact service levels for certain modes and need to be monitored as an issue for the freight community. Outbound tonnage for all modes is expected to grow at a CAGR of 1.9%

between 2017 and 2050, while inbound and internal movements are both expected to increase annually by around 1.4%. This reflects relative growth in Oregon's export-oriented commodities that are critical to overall economic growth, including coal-n.e.c. (mostly natural gas), wood products, and other agricultural products. As a result, it will be critical to continue to maintain and improve connections between Oregon and the rest of the world for all modes to support this expected increase in exports.

- Internal freight movements will remain substantial. The movement of goods within Oregon (more than 269 million tons in 2050) will remain higher than both inbound and outbound shipments combined, indicating that transportation connections within and between cities and industries need to be maintained and potentially enhanced to meet this growth. Given the high level of anticipated growth in internal freight movements, strategies should be examined to encourage shorter haul freight rail movements where there is measurable public benefit (such as reduction of highway investment and maintenance needs) and where the economics of freight rail can be made competitive with trucking.
- Many important inputs for Oregon industries will continue to be imported. Strong continued growth of inbound electronics and machinery shipments by value will most likely be production inputs for the computer and electronics sector, a major export area for the state. It will be critical to Oregon industries to make sure that the transportation system supports reliable and timely service to get these goods into the state.
- A major driver in the growth in commodities supporting personal consumption is population growth. The expected growth rate of Oregon's population (.8% annual through 2045) is partially responsible for high expected growth rate of inbound and internal shipments of commodities, such as foods, electronics, and pharmaceuticals.

2.4 FREIGHT DEMAND OVERVIEW – OREGON AREA COMMISSIONS ON TRANSPORTATION

This chapter has highlighted key statewide trends in freight demand. Another perspective from which to analyze freight demand is that of ACTs, advisory bodies chartered by the OTC. ACTs address all aspects of transportation (road, marine, air and transportation safety) with a primary focus on the state transportation system.[26,27] Figure 2.11 shows Oregon ACTs.

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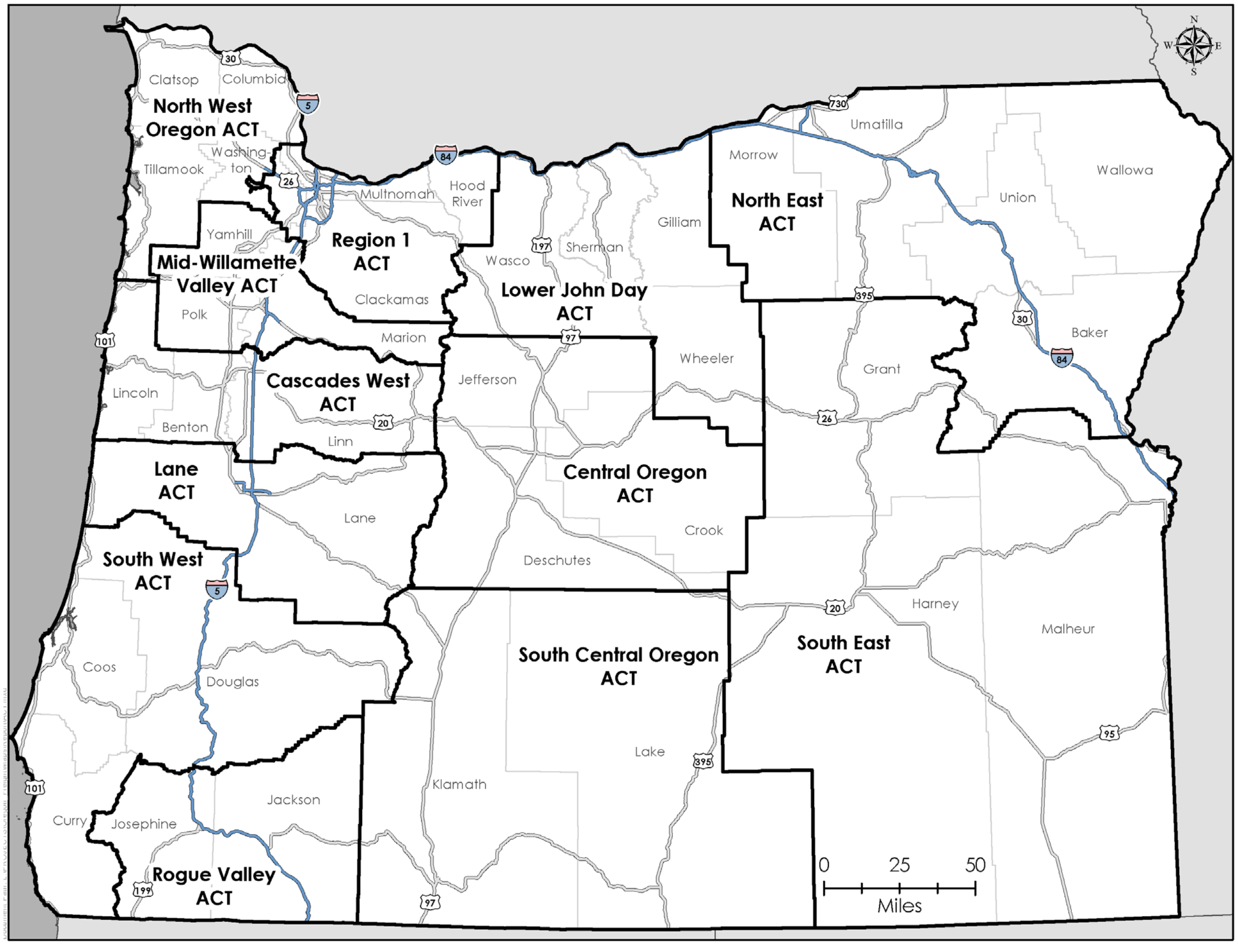
26 https://www.oregon.gov/ODOT/Get-Involved/Pages/Area_Commissions.aspx.

27 ACTs play an important advisory role in the development of the Statewide Transportation Improvement Program (STIP), which schedules funded transportation projects. ACTs establish a public process for area project selection priorities for the STIP. Through that process and following adopted project eligibility criteria, they prioritize transportation problems and solutions, and recommend projects in their area to be included in the STIP.

Figure 2.11 Oregon Area Commissions on Transportation



2.4.1 North West Area Commission on Transportation

The North West ACT includes Clatsop, Columbia, and Tillamook Counties, and approximately two-thirds of Washington County. About 180,000 people reside in this area, representing more than 4% of Oregon's total population.[28] Population centers include Astoria, St. Helens, and Tillamook. Table 2.7 lists North West ACT commodity flow shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group represents the largest share (38%) of the production value in the North West ACT but only a 6% share in terms of tonnage in 2019. This pattern is expected to continue into the future, with value forecast to decrease about 31% over 2) years at a CAGR of -1.5%. The next largest commodity groups

28 Population estimates in this chapter section are certified July 2021 from the PSU Population Research Center, Population Report Tables. Note that population percentages for The North West and Region 1 ACTs are estimated based on the Washington County split. https://www.pdx.edu/population-research/population-estimate-reports

produced by value are Petroleum, Coal, and Chemicals and Other/Miscellaneous, with CAGRs of 11% and 70%, respectively, over the next 20 years.

Table 2.7 North West Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	38	-1.5	-31	24	4	0.2	0	3
Food or Kindred Products	13	0.9	16	14	13	0.6	8	11
Petroleum, Coal, Chemicals	17	0.7	11	18	16	0.5	6	13
Pulp or Paper Products	4	1.5	30	4	2	1.6	33	2
Other/Miscellaneous [29]	17	2.8	70	26	6	1.4	27	7
Forest or Wood Products	9	1.7	37	11	31	1.7	37	34
Clay, Minerals, Stone	2	1.1	20	2	27	1.7	34	29
Total	**100**	**0.4**	**9**	**100**	**100**	**1.0**	**24**	**100**

Source: Oregon Statewide Integrated Model (SWIM), Version 2.5 (https://www.oregon.gov/odot/Planning/Pages/Technical-Tools.aspx#SWIM)

The Forest or Wood Products group represents the largest share of the North West ACT production in terms of tonnage, but a fairly small share in terms of value. Commodity production for this group is expected to increase 37% in of both tonnage and value, both increasing at a CAGR of 1.7%.

Growth by tonnage in the Clay, Minerals, and Stone group is expected to be larger than the other commodity groups, although this group represents a fairly small share of regional production by value and is subject to variation in production levels due to economic conditions. The Pulp and Paper Products group's regional share of production is similarly affected by economic conditions, meaning production levels and growth depend on the overall strength of

[29] Other/Miscellaneous includes mixed freight; waste and scrap; miscellaneous manufactured products; furniture, mattresses; textiles; leather; and other textile articles.

the economy. When the economy expands or contracts, commodity production varies more for these two groups than the other five groups in the North West ACT.

Table 2.8 shows North West ACT consumption of various commodity groups. Forest or Wood Products is expected to grow by nearly 2% each year and represent the largest portion of regional tonnage (34%) by 204. The Machinery, Instruments, Transportation Equipment, and Metals group represents a much smaller portion of the regional total but is anticipated to gain the largest proportion in terms of both value and tonnage during this period.

Table 2.8 North West Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value, and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	25	4.6	143	40	3	2.5	61	3
Food or Kindred Products	17	1.3	25	14	12	0.8	12	11
Petroleum, Coal, Chemicals	16	1.8	38	14	14	1.4	29	15
Pulp or Paper Products	4	-1.3	-27	2	1	0	-5	1
Other/Miscellaneous	29	1.1	19	22	7	0.9	16	7
Forest or Wood Products	6	2.1	47	6	29	1.9	41	34
Clay, Minerals, Stone	3	1.8	38	3	33	0.4	4	28
Total	**100**	**2.1**	**54**	**100**	**100**	**0.9**	**21**	**100**

Source: SWIM

2.4.2 Region 1 Area Commission on Transportation (Portland Metropolitan Area)

The Region 1 ACT contains the majority of Oregon's population, representing approximately 40% of statewide population. This area includes about one-third of Washington County, Multnomah, Hood River, and Clackamas Counties. A large amount of commodity production for the state comes from the Region 1 ACT. Table 2.9 lists the Region 1 ACT commodity production shares and forecast growth rates. In 2019, Machinery, Instruments, Transportation Equipment and Metals group production represented the largest share of the area commodity production in terms of value (28%), and a relatively small share in terms of tonnage (5%). This share of total area production is expected to continue, with the value expected to increase more than 75% over the next 20 years, increasing at a CAGR of 2.9% by value and 1.4% by tonnage.

In 2019, the Forest and Wood Products group represented more than 21% of the total value of commodity production in the area in terms of value (6% by tonnage). This commodity group is expected to grow at a higher CAGR rate than other commodity groups (2.5% by value and 2.4% by tonnage). By 2040, it is expected to account for 24% of tonnage in the Region 1 ACT.

Table 2.9 Region 1 Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	28	2.9	75	31	5	1.4	28	4
Food or Kindred Products	18	2	44	16	16	1.8	40	16
Petroleum, Coal, Chemicals	16	1.9	40	15	18	1.3	25	17
Pulp or Paper Products	5	1.8	38	4	2	1.7	35	2
Other/Miscellaneous	25	2.7	65	26	9	1.3	25	8
Forest or Wood Products	6	2.5	59	7	21	2.4	56	24
Clay, Minerals, Stone	3	1.6	34	2	29	1.4	29	28
Total	**100**	**2.2**	**59**	**100**	**100**	**1.5**	**35**	**100**

Source: SWIM

Table 2.10 displays the consumption in the Region 1 ACT. The Clay, Minerals, and Stone, and Petroleum, Coal, and Chemicals groups account for the largest portion of tonnage consumed in the Region 1 ACT in both 2019 and 2040 (nearly 50% combined).

Table 2.10 Region 1 Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	40	-0.8	-20	28	4	1.5	31	4
Food or Kindred Products	14	1.7	35	17	14	1.5	30	14
Petroleum, Coal, Chemicals	17	1.7	35	19	22	1.7	36	22
Pulp or Paper Products	3	1.8	38	3	2	1.6	34	2
Other/Miscellaneous	18	2.4	58	25	7	1.9	41	7
Forest or Wood Products	5	1.7	37	6	21	2	45	23
Clay, Minerals, Stone	2	1.3	26	2	29	1.4	27	27
Total	**100**	**0.7**	**16**	**100**	**100**	**1.4**	**33**	**100**

Source: SWIM

2.4.3 North East Area Commission on Transportation

The North East ACT is predominantly rural and contains 3% of the state population. This ACT includes Morrow, Umatilla, Union, Wallowa and Baker Counties. Population centers for the ACT include Hermiston, Pendleton, LaGrande and Baker City.

Table 2.11 lists the North East ACT commodity production shares and forecast growth rates. In 2019, Food or Kindred Products was the principal commodity, making up 29% of the regional production in terms of value and more than 14% by tonnage. However, the amount of production is expected to increase by only 0.4% by value and decrease by 0.3% by tonnage over the next 20 years. Other/Miscellaneous is the next largest commodity group in terms of value (18%) but is quite low in tonnage. In 2019, the Forest or Wood Products group represented 18% of the North East ACT commodity production by value, but the largest share by tons (43%). Tonnage for this commodity group is expected to increase 46% over the next 20 years—the largest growth among groups—but increase by only 43% in terms of value, dropping its share of regional production to 12%.

Table 2.11 North East Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	17	7.6	343	36	1	0.6	8	1
Food or Kindred Products	29	0.4	3	14	14	-0.3	-10	10
Petroleum, Coal, Chemicals	12	7.3	322	24	7	1.2	22	6
Pulp or Paper Products	4	-3.1	-51	1	2	-0.4	-12	1
Other/Miscellaneous	19	0.9	15	11	4	1.3	26	4
Forest or Wood Products	18	2	43	12	43	2.1	46	49
Clay, Minerals, Stone	2	2.9	75	2	29	1.4	29	29
Total	**100**	**3.6**	**109**	**100**	**100**	**1.2**	**29**	**100**

Source: SWIM

The fastest growing commodity groups for the North East ACT are the Petroleum, Coal and Chemicals, and Machinery, Instruments, Transportation Equipment, Metals groups. Both groups are expected to at least double their share of regional production by value over the next 20 years. The relative growth of these groups in tons is not high; they are expected to represent only 2% of regional commodity production by tons combined in 2040. After Forest or Wood Products, the Clay, Minerals, and Stone group is expected to grow the largest in terms of tonnage at 29%.

Table 2.12 shows consumption in the North East ACT by tonnage and value during this time period While Machinery, Instruments, Transportation Equipment, and Metals represent a small portion of products consumed by tonnage, it will grow at a faster rate than most other commodities (50% during this time period). Consumption of Forest or Wood Products is expected to grow and will represent 45% of regional tonnage in 2040.

Table 2.12 North East Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Year Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	24	2.5	62	27	2	2.2	50	2
Food or Kindred Products	19	0.1	-2	13	13	-0.9	-21	8
Petroleum, Coal, Chemicals	15	3.6	100	21	6	1.7	35	7
Pulp or Paper Products	2	0.4	4	2	1	0.4	3	1
Other/Miscellaneous	27	1.7	36	26	7	1.7	34	8
Forest or Wood Products	9	1.6	34	9	40	2	44	45
Clay, Minerals, Stone	3	2.2	50	3	31	1.3	24	30
Total	**100**	**1.7**	**43**	**100**	**100**	**1.2**	**28**	**100**

Source: SWIM

2.4.4 South Central Area Commission on Transportation

The South Central ACT is predominantly rural and accounts for less than 2% of the state population. The ACT consists of Klamath and Lake Counties and population centers include Klamath Falls and Lakeview.

Table 2.13 lists the South Central ACT commodity production shares and forecast growth rates. The Food or Kindred Products group is the largest commodity group produced in the South Central ACT. This group represents nearly one-third of the commodity production by value and 14% by weight. As a proportion of all commodities in the region, production is expected to decline in this group over the next 20 years but will remain a major commodity group for the region.

Table 2.13 South Central Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	16	0.8	13	13	1	0.4	3	1
Food or Kindred Products	30	1.4	27	27	14	0.8	13	13
Petroleum, Coal, Chemicals	10	3.8	109	16	5	1.7	36	6
Pulp or Paper Products	4	-3.6	-56	1	2	-2.6	-46	1
Other/Miscellaneous	24	2.2	49	25	3	3.9	111	6
Forest or Wood Products	14	2	45	15	40	1.9	43	45
Clay, Minerals, Stone	2	2.5	59	2	34	0.7	10	29
Total	**100**	**1.5**	**38**	**100**	**100**	**1.1**	**26**	**100**

Source: SWIM

The Forest or Wood Products group makes up about 14% of commodity production by value and nearly 40% of production by tons. This commodity group is expected to grow at a high rate, of 1.9% per year, resulting in an expected increasing share of regional production. Production levels within this category varies significantly depending on economic conditions. Most of the other commodity groups' production shares are expected to remain the same over time aside from the Clay, Minerals, and Stone group, which is expected to decrease the most in terms of weight. The Other/Miscellaneous group is expected to grow the most in terms of tonnage, but the share will remain quite small for the area.

Table 2.14 shows consumption by value and tonnage for various commodities within the ACT. The Forest or Wood Products group represents the largest share by weight in the region in 2019 and is expected to grow at an annual rate of 2.8%. By 2040, this commodity group is expected to account for 41% of commodity movement by weight in the region.

Table 2.14 South Central Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	20	2.7	66	21	2	1.6	33	2
Food or Kindred Products	18	1.7	34	15	12	0.7	11	10
Petroleum, Coal, Chemicals	15	2.7	66	16	8	1.9	41	8
Pulp or Paper Products	2	3.4	93	2	1	2.1	48	1
Other/Miscellaneous	35	2.8	70	37	7	1.4	27	7
Forest or Wood Products	7	2.8	72	8	33	2.8	72	41
Clay, Minerals, Stone	3	0.3	2	2	36	1.2	23	32
Total	**100**	**2.3**	**61**	**100**	**100**	**1.6**	**39**	**100**

Source: SWIM

2.4.5 Rogue Valley Area Commission on Transportation

The Rogue Valley ACT includes Josephine and Jackson Counties located on the California-Oregon border. Accounting for over 7% of the state's population, it includes the population centers of the Rogue Valley Metropolitan Planning Organization (MPO) (Medford vicinity) and Middle Rogue MPO (Grants Pass vicinity). Table 2.15 lists the Rogue Valley ACT commodity production shares and forecast growth rates. The largest commodity group is Foods or Kindred Products in terms of value, and Forest or Wood Products in terms of tons, followed closely by the Clay, Minerals and Stone group. None of these groups is expected to grow particularly fast over the next 20 years. The Petroleum, Coal, and Chemicals group is expected to more than double over the next 20 years in terms of value but remain the same share in terms of tons. Production levels within this category and the Machinery, Instruments, Transportation Equipment and Metal group vary significantly, depending on economic conditions.

Table 2.15 Rogue Valley Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	11	4.9	163	16	1	1.3	24	1
Food or Kindred Products	30	3.1	81	31	16	1.2	24	15
Petroleum, Coal, Chemicals	13	3.9	114	16	6	1.9	41	6
Pulp or Paper Products	2	0.8	13	1	1	1.2	21	1
Other/Miscellaneous	23	2.8	69	21	4	2.5	61	5
Forest or Wood Products	18	0.8	12	11	38	1.9	43	40
Clay, Minerals, Stone	3	3.5	97	3	34	1.4	28	33
Total	**100**	**2.8**	**78**	**100**	**100**	**1.4**	**35**	**100**

Source: SWIM

The Food or Kindred Products group's share of Rogue Valley ACT production is expected to remain stable over time while value is expected to increase more than 81% over the next 20 years.

As shown in Table 2.16, Forest and Wood products is by far the largest commodity group by weight both in 2019 and 2040. Machinery, Instruments, Transportation Equipment, and Metal represents 22% of commodities consumed and this group is expected to grow faster than other commodities in this region by both tonnage and value over the next 20 years.

Table 2.16 Rogue Valley Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	22	3.5	95	27	2	3.1	79	2
Food or Kindred Products	19	1.2	23	14	14	1	17	12
Petroleum, Coal, Chemicals	17	2.9	73	19	7	2	43	8
Pulp or Paper Products	3	1.3	25	2	1	0.6	9	1
Other/Miscellaneous	29	2.5	59	28	7	1.8	39	8
Forest or Wood Products	8	2.4	57	7	35	2	45	38
Clay, Minerals, Stone	3	1.3	24	2	34	1.2	22	32
Total	**100**	**2.3**	**62**	**100**	**100**	**1.4**	**33**	**100**

Source: SWIM

2.4.6 Lower John Day Area Commission on Transportation

The Lower John Day ACT includes Wasco, Sherman, Gilliam and Wheeler Counties. Less than 1% of the state's population resides within this ACT. Table 2.17 lists the Lower John Day ACT commodity production shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group and Food and Kindred Products group represents the major commodities produced within this ACT in terms of value. Together they make up over half the commodity production for the area. The Food and Kindred Products group is expected to grow modestly. Growth is expected for the Machinery, Instruments and Transportation Equipment group, with production more than doubling over the next 20 years. This commodity group is subject to varying levels of production depending on economic conditions.

Table 2.17 Lower John Day Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	24	1.1	21	20	1	0.5	5	1
Food or Kindred Products	18	2	43	18	13	0.4	4	11
Petroleum, Coal, Chemicals	11	1.8	39	11	7	0.5	6	6
Pulp or Paper Products	1	4.5	142	2	1	3.6	100	2
Other/Miscellaneous	24	2.9	72	29	4	1.1	20	4
Forest or Wood Products	18	1.8	40	18	40	1.5	30	44
Clay, Minerals, Stone	3	-0.8	-19	2	33	0.8	12	31
Total	**100**	**1.7**	**41**	**100**	**100**	**0.8**	**18**	**100**

Source: SWIM

Clay, Minerals, and Stone group commodity production are expected to decline over the next 20 years in terms of value. Most commodities will increase modestly in terms of tonnage with Pulp and Paper products growing rapidly at 3.6% CAGR, although this group represents only a small regional share by both weight and value. In terms of consumption, as shown in Table 2.18, several commodity groups will decline in terms of tonnage during the forecast period. Only Forest or Wood Products, Petroleum, Coal, and Chemicals, and Machinery, Instruments, Transportation Equipment, and Metals commodity groups show substantial growth in terms of tonnage consumption in this ACT between 2019 and 2040.

Table 2.18 Lower John Day Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	50	0.3	1	41	2	1.4	28	3
Food or Kindred Products	13	1.8	37	14	12	-0.5	-15	8
Petroleum, Coal, Chemicals	10	4.4	134	19	6	2.6	64	7
Pulp or Paper Products	2	-3.1	-51	1	1	-1.8	-35	0
Other/Miscellaneous	16	0.3	1	13	7	0.5	6	6
Forest or Wood Products	5	2.8	68	7	35	2.6	64	46
Clay, Minerals, Stone	4	2.5	59	5	37	0	-4	28
Total	**100**	**1.0**	**24**	**100**	**100**	**1.0**	**24**	**100**

Source: SWIM.

2.4.7 Central Oregon Area Commission on Transportation

The Central Oregon ACT includes Jefferson, Deschutes, and Crook Counties. Nearly 6% of Oregon's population resides within this ACT, and it includes the Bend MPO. Table 2.19 lists this ACT's commodity production shares and forecast growth rates. Machinery, Instruments, Transportation Equipment and Metals is the largest commodity production group for this ACT, making up 28% of value. This group is not expected to grow over the next 20 years. The Forest or Wood Products group is the largest commodity group in terms of tons. The Forest or Wood Products group is expected to increase more than 41% over the next 20 years both in terms of value and tons.

Table 2.19 Central Oregon Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	21	0.2	0	16	1	0.2	-1	1
Food or Kindred Products	28	1.8	40	29	14	1.4	26	14
Petroleum, Coal, Chemicals	11	2.8	70	14	6	2.1	48	7
Pulp or Paper Products	2	-1.3	-28	1	2	-0.6	-15	1
Other/Miscellaneous	20	2.8	69	25	4	2.5	61	5
Forest or Wood Products	15	0.9	16	13	37	2.1	46	41
Clay, Minerals, Stone	2	1.4	29	2	35	1	18	31
Total	**100**	**1.4**	**34**	**100**	**100**	**1.3**	**31**	**100**

Source: SWIM

The Petroleum, Coal and Chemicals group represents less than 11% of the total commodity production in the Central Oregon ACT, but the forecast growth rate, at 2.8% CAGR, is relatively high. This commodity group and the Machinery, Instruments, Transportation Equipment and Metals group vary in the level of production depending on economic conditions.

Table 2.20 shows commodity consumption by value and weight in the Central Oregon ACT. Forest or Wood Products represent the largest portion of the regional volume and is expected to increase to 40% during the forecast period. The Clay, Minerals, and Stone commodity group accounts for the next largest regional share by weight during the forecast period.

Table 2.20 Central Oregon Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	30	0.9	15	22	2	0.7	10	2
Food or Kindred Products	15	2.1	48	14	12	1.3	24	11
Petroleum, Coal, Chemicals	15	5	168	25	7	2.5	61	9
Pulp or Paper Products	2	1.1	19	1	1	1.4	28	1
Other/Miscellaneous	28	2.5	59	29	8	1.1	19	7
Forest or Wood Products	8	2	45	7	37	1.9	41	40
Clay, Minerals, Stone	3	1.4	27	2	34	0.9	15	30
Total	**100**	**2.2**	**59**	**100**	**100**	**1.3**	**30**	**100**

Source: SWIM

2.4.8 Mid-Willamette Valley Area Commission on Transportation

The Mid-Willamette Valley ACT includes Marion, Yamhill and Polk Counties. Nearly 13% of the state's population resides in this ACT, and it includes the state capital of Salem. Table 2.21 lists this ACT's commodity production share and forecast growth rates. The Food or Kindred Products group makes up the largest share of commodity production by value for this ACT. Growth is forecast to be modest, but the share of production is expected to be stable. The level of production varies, depending on economic condition.

Table 2.21 Mid-Willamette Valley Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	18	1.6	32	18	2	0.8	12	1
Food or Kindred Products	26	1.3	25	24	14	0.9	16	12
Petroleum, Coal, Chemicals	14	2	43	16	9	1.3	24	8
Pulp or Paper Products	3	2.4	56	3	1	1.3	25	1
Other/Miscellaneous	22	1.6	33	22	5	1.9	41	5
Forest or Wood Products	14	1.4	28	13	38	2	43	42
Clay, Minerals, Stone	3	1.6	32	3	31	1.2	23	29
Total	**100**	**1.3**	**32**	**100**	**100**	**1.3**	**30**	**100**

Source: SWIM

The Pulp or Paper Products commodities represent the fastest growing group in this region by both weight and value; however, their share is very small. The Forest or Wood Products, Petroleum, Coal and Chemicals products account for the largest portion of regional volume during the forecast period.

Table 2.22 shows consumption for various commodities in the Mid-Willamette Valley. In terms of tonnage, consumption of all commodities in the ACT is expected to grow significantly (between 20% and 56%, depending on the group) during the forecast period.

Table 2.22 Mid Willamette Valley Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	19	3.2	85	20	2	1.8	38	2
Food or Kindred Products	19	1.2	22	14	13	1.1	20	12
Petroleum, Coal, Chemicals	20	5.2	176	31	10	1.7	36	10
Pulp or Paper Products	3	2.5	59	3	1	2.4	56	1
Other/Miscellaneous	28	2.2	49	24	7	2	43	7
Forest or Wood Products	8	2.1	48	7	34	2.3	54	38
Clay, Minerals, Stone	4	0.5	7	2	33	1.2	22	30
Total	**100**	**2.7**	**76**	**100**	**100**	**1.5**	**36**	**100**

Source SWIM.

2.4.9 Cascades West Area Commission on Transportation

The Cascades West ACT includes Lincoln, Benton and Linn Counties. About 6.5% of the state's population resides within this ACT, and it includes the Corvallis MPO. Table 2.23 lists this ACT's commodity shares and forecast growth rates. Food and Kindred Products is the major commodity production group by value, with 30% of the area total. Growth is forecast to be modest for this group within the Cascades West ACT, with production increasing 24% during the forecast period and regional production share decreasing slightly. Production levels vary significantly, depending on economic conditions.

Table 2.23 Cascades West Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	17	2.2	49	17	1	1.9	42	1
Food or Kindred Products	30	1.3	24	26	15	1.2	22	14
Petroleum, Coal, Chemicals	12	3.7	105	17	6	1.6	33	6
Pulp or Paper Products	3	-0.4	-12	2	1	0.9	15	1
Other/Miscellaneous	19	2.7	67	23	4	2.6	63	5
Forest or Wood Products	17	0.6	8	13	40	1.2	23	38
Clay, Minerals, Stone	2	2.6	64	2	32	1.6	34	34
Total	**100**	**1.7**	**43**	**100**	**100**	**1.2**	**27**	**100**

Source: SWIM.

Forest or Wood Products is the next largest commodity production group in terms of tonnage, making up about 40% of this ACT's production with its regional share expected to remain flat into the future. The Other/Miscellaneous group tonnage is expected to grow over the next 20 years at CAGR rates of 2.6%. However, this commodity group has a fairly small share of the Cascades West ACT's production and will increase in share modestly in the future. The Forest or Wood Products group represents a large share of commodity production in terms of tons, but it's regional share is expected to remain flat during the forecast period.

In terms of consumption, Table 2.24 shows the regional shares of commodities and growth rates. Forest of Wood Products and Clay, Minerals, and Stone represent the largest tonnage shares (37% and 33%, respectively) and are expected to remain flat over the next 20 years.

Table 2.24 Cascades West Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	32	0.6	7	16	2	2	43	2
Food or Kindred Products	16	2.1	47	11	13	1.4	27	12
Petroleum, Coal, Chemicals	15	4.3	129	16	7	2.2	50	8
Pulp or Paper Products	3	2.7	67	2	1	2.3	55	1
Other/Miscellaneous	24	7.5	335	48	6	2.4	58	8
Forest or Wood Products	8	1.9	40	6	37	1.7	36	38
Clay, Minerals, Stone	3	1.9	40	2	33	1.4	27	32
Total	**100**	**3.8**	**117**	**100**	**100**	**1.4**	**33**	**100**

Source: SWIM

2.4.10 South West Area Commission on Transportation

The South West ACT includes Douglas, Coos and Curry Counties. Nearly 5% of the state's population resides in this ACT. Table 2.25 lists this ACT's commodity shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals, and Forest or Wood Products groups make up just over half of this ACT's commodity production in terms of value. The Food and Kindred Products, and Other/Miscellaneous groups make up just over half of the ACT commodity production in terms of value. The Forest or Wood Products group makes up a very large share of commodity production by tons.

Table 2.25 South West Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	13	2.3	54	15	1	0.8	13	1
Food or Kindred Products	28	1.2	23	26	13	0.2	0	12
Petroleum, Coal, Chemicals	13	3.4	93	19	6	1.9	42	8
Pulp or Paper Products	2	0.1	-2	1	1	-0.2	-8	1
Other/Miscellaneous	25	1.7	35	26	4	2.2	51	6
Forest or Wood Products	17	-0.5	-14	11	41	0.6	9	39
Clay, Minerals, Stone	3	1.2	23	2	33	0.8	11	33
Total	**100**	**1.4**	**34**	**100**	**100**	**0.5**	**11**	**100**

Source: SWIM.

The Petroleum, Coal, and Chemicals group is expected to grow rapidly in terms of value, at 3.4 percent per year. Tonnage for this commodity group is expected to increase as well, but not quite to the same extent. The South West ACT's Pulp or Paper Products group is expected to decline. The forecast CAGR is negative, resulting in an expected 25% decrease in commodity production for this group in terms of value and tons.

Table 2.26 South West Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	28	2	45	28	2	1.2	23	2
Food or Kindred Products	16	1.6	33	15	12	1	16	12
Petroleum, Coal, Chemicals	16	1.8	38	15	7	1.3	24	7
Pulp or Paper Products	2	-1.2	-27	1	1	-0.1	-7	1
Other/Miscellaneous	25	3.2	84	32	8	0.2	-2	7
Forest or Wood Products	8	0.9	14	7	37	1.5	31	41
Clay, Minerals, Stone	4	-1.9	-36	2	34	0.5	5	30
Total	**100**	**1.7**	**43**	**100**	**100**	**0.8**	**18**	**100**

Source: SWIM.

2.4.11 South East Area Commission on Transportation

The South East ACT area is predominantly rural, including Grant, Harney and Malheur Counties. Population centers for this ACT include Ontario and Burns. Table 2.27 lists this ACT's commodity production shares and forecast growth rates. The Food and Kindred Products group is the principal commodity produced, making up 36% of the regional production in terms of value and 17% by weights. However, the amount of production of this commodity is expected to decrease rapidly, at -1.7 percent in terms of value and 2 percent in terms of tonnage.

Table 2.27 South East Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	14	0.5	5	15	1	-0.5	-15	1
Food or Kindred Products	36	-1.7	-33	24	17	-2	-37	11
Petroleum, Coal, Chemicals	8	2.4	57	13	4	2.5	61	7
Pulp or Paper Products	4	-0.2	-9	3	1	-0.5	-14	1
Other/Miscellaneous	20	0.6	8	21	4	0.7	10	4
Forest or Wood Products	17	1.4	29	21	41	1.1	19	48
Clay, Minerals, Stone	2	2	44	2	30	0.1	-3	29
Total	**100**	**0.1**	**1**	**100**	**100**	**0.1**	**1**	**100**

Source: SWIM.

Most other commodities are expected to decline or remain flat in terms of both value and tonnage produced in this ACT during the forecast period. The Petroleum, Coal and Chemicals group, with tonnage CAGR of 2.5%, is the only commodity group forecast to grow substantially during the forecast period.

Table 2.28 show consumption trends in the South East ACT over the next 20 years. Most products are expected to decline or remain flat both in terms of value and tonnage in the ACT. However, Forest or Wood Products will see moderate growth in both tonnage and value and is anticipated to represent 44% of regional tonnage in 2040.

Table 2.28 South East Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	32	-2	-38	24	2	-2.3	-41	1
Food or Kindred Products	17	0.1	-3	19	12	0	-6	11
Petroleum, Coal, Chemicals	16	0.7	10	21	8	0.1	-2	7
Pulp or Paper Products	2	-0.7	-18	2	1	0.2	0	1
Other/Miscellaneous	24	-1.4	-30	20	8	-0.1	-7	7
Forest or Wood Products	6	1.7	36	10	37	1.5	31	44
Clay, Minerals, Stone	2	1.1	19	3	31	0.1	-3	28
Total	**100**	**-0.9**	**-17**	**100**	**100**	**0.3**	**7**	**100**

Source: SWIM.

2.4.12 Lane County Area Commission on Transportation

The Lane County ACT is a mix of rural and urban activity. Approximately 9% of the state's population resides in this county, which includes the Eugene/Springfield MPO.

Table 2.29 lists the Lane County ACT commodity production shares and forecast growth rates. The Food and Kindred Products group makes up 31% of the share of commodity production by value, and 16% by tons. Production within this group is expected to increase 34% by value over the next 20 years.

Table 2.29 Lane County Area Commission on Transportation Production Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	17	0.2	0	13	1	0.4	4	1
Food or Kindred Products	31	1.6	34	32	16	1.2	22	15
Petroleum, Coal, Chemicals	12	1.2	23	11	6	1.3	25	6
Pulp or Paper Products	2	-0.4	-12	1	1	0.8	13	1
Other/Miscellaneous	20	2.5	61	26	4	2.6	62	5
Forest or Wood Products	16	0.7	11	14	36	1.6	32	37
Clay, Minerals, Stone	2	1.8	38	2	35	1.5	31	35
Total	**100**	**1.2**	**28**	**100**	**100**	**1.2**	**29**	**100**

Source: SWIM

Tonnage of the Forest or Wood Products group is expected to grow at a CAGR of 1.6% over the next 20 years. Commodities in this group are heavy, making up 32% of this region's commodity production by tons in 2040. Clay Minerals or Stone is also a commodity contributing to significant tonnage flows, accounting for 35 percent of tonnage.

Table 2.30 shows the consumption trends for Lane County over the next 20 years. By tonnage, Forest or Wood Products and Clay, Minerals and Stone represent the largest share throughout the forecast period.

Table 2.30 Lane County Area Commission on Transportation Consumption Shares by Commodity Group, 2019 to 2040 (by tons, value and growth rate)

	VALUE				TONS			
	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040	Region Share 2019	CAGR	20-Yr % Forecast Change	Region Share 2040
Machinery, Instruments, Transportation Equipment, Metals	21	3.7	106	27	2	2.5	60	2
Food or Kindred Products	17	1.6	34	15	14	1.3	24	13
Petroleum, Coal, Chemicals	19	1.7	37	17	7	2.2	50	8
Pulp or Paper Products	2	4	118	3	1	1.9	41	1
Other/Miscellaneous	30	2.2	51	29	7	2.2	51	8
Forest or Wood Products	8	1.7	36	7	35	1.5	31	34
Clay, Minerals, Stone	3	1.7	34	2	35	1.6	32	34
Total	**100**	**2.2**	**57**	**100**	**100**	**1.4**	**35**	**100**

Source: SWIM

2.5 CONCLUSION

Generally, Oregon's economy has grown significantly in recent years. The value of freight transported in Oregon has grown from $253 billion[30] in 2010 to $302 billion in 2017. It is expected to continue to grow and increase the demand for freight accordingly, with an estimated $581 billion transported by 2050.

The value of freight movements is estimated to show a steeper increase than the tonnage of freight transported. The value of freight moved into, out of and within Oregon is expected to increase 92 percent between 2017 and 2050, higher than the 64 percent increase in tonnage. Electronic instruments are forecast to grow from 14% of value in 2017 to 16% by 2050 and pharmaceuticals are expected to grow from 4% to 7% during that same period, which indicates a shift to higher-value commodities transported. Other high-value commodities such as machinery and transportation equipment accounted for another 17% of the value transported. Food and agricultural products (15% of total by value) and lumber and paper products (9% of total by value) are other commodities that contribute significantly to the Oregon economy.

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[30] Table 2-2 Oregon Freight Tons and Value, All Modes. Oregon Freight Plan, 2011. Accessed October 7, 2022.

Trucking retains the highest mode share for freight movements in, out and within Oregon, at 70% mode share in 2017 by tonnage, compared to 73% mode share in 2010.[31] Air and rail freight are the fastest growing modes, with estimated growth in tonnage of 103 percent and 84 percent respectively by 2050 (from 2017). Fertilizers are the fastest growing rail freight commodity, with an estimated compounded annual growth rate of 4.2% between 2017 and 2050. Pharmaceuticals, machinery, and electronics are the top commodities contributing to air freight growth.

In general, ACTs with sizeable urban areas are expected to see the largest growth in terms of production and consumption. Region 1 ACT (Portland metropolitan area) is expected to grow production of high-value machinery, instruments and transportation equipment by 74 percent by 2040. Other notable growth commodities include petroleum, coal and chemicals, whose production or consumption are expected to grow over 100 percent by 2040 in each of the Rogue Valley, Cascades West, Central Oregon, Lower John Day, and North East ACTs.

31 Table 2-3 Oregon Freight Demand by Weight/Value (All Modes). Oregon Freight Plan, 2011. Accessed October 7, 2022

3 Oregon Industries and Freight Movement

3.1 INTRODUCTION

A state's economy and industry structure—its major businesses, their suppliers, the markets they serve and their growth prospects—directly affect the demand on its freight transportation system. Understanding how Oregon industries rely on transportation is critical to developing a system that meets user needs. A well-functioning system supports industry competitiveness and ensures a healthy Oregon economy in the future.

To better understand the relationship between industry needs and the freight transportation system, data analyses and in-depth interviews with Oregon businesses, industry stakeholders, and companies that use Oregon's multimodal transportation network were completed. Results of this process included the following:

- Identification of key Oregon industries
- Analysis of the impact of key industry supply chain operations on Oregon's freight transportation system
- Understanding of the critical issues that companies in these key industries encounter when moving their products on the Oregon freight system

Oregon employment by major industry group was analyzed (Table 3.1). The industries not included in "services and all other" were identified as key for a number of reasons:

- They represent significant sectors in Oregon based on a number of economic measures (for example, contribution to state gross domestic product, contribution to state employment, overall payroll ranking).
- They have substantial transportation system requirements and are highly freight dependent.
- A sizable portion of their production costs consist of transportation costs.

Table 3.1 Oregon Employment by Major Industry Group

INDUSTRY TITLE (NAICS CODE)[1]	2021 EMPLOYMENT[2]	2021 SHARE OF TOTAL EMPLOYMENT
Agriculture, Forestry, Fishing (111)	52,758[3]	2.8%
Computer and Electronics Manufacturing (334)	37,900	2.0%
Food Manufacturing (311)	28500	1.5%
Metals and Machinery Manufacturing (331, 332, 333)	36,300	1.9%
Transportation Equipment Manufacturing (336)	10,700	0.6%
Wood and Paper Manufacturing (321)	22,700	1.2%
Wholesale Trade (42)	75,400	4.0%
Retail Trade (44)	209,400	11.2%
Construction	110,900	5.9%
Transportation and Warehousing, and Utilities	77,200	4.1%
Services and All Others (5)[4]	1,211,842	64.7%
TOTAL NONFARM EMPLOYMENT	**1,873,600**	**100.0%**

[1] North American Industry Classification System (NAICS)

[2] Oregon Office of Economic Analysis, Annual Employment Data, June 2022. https://www.oregon.gov/das/OEA/Pages/forecastecorev.aspx

[3] Oregon Employment Department "Employment and Wages by Industry, Oregon Annual 2021." This number also represents employment for Hunting, Mining and Logging.

[4] The "Services and All Others" category includes a wide range of industries, but primarily includes service-sector industries—such as financial activities, government, real estate and educational and health services that generate limited freight transportation demand and are thus less dependent on freight services. These industries were not profiled in this chapter but are included for context in this table.

3.2 INDUSTRY CONTRIBUTION TO OREGON'S ECONOMY

The following sections discuss the contribution of the key industries to Oregon's economy in terms of 1) output and Oregon GSP share, 2) anticipated industry growth, and 3) implications of industry growth for the freight system.

3.2.1 Output and Oregon Gross State Product Share

Table 3.2 describes the industry contribution to total Oregon GSP and the total Oregon manufacturing GSP of each of the major industry groupings. As is true of much of the U.S. economy, the majority of Oregon GSP is concentrated in service-sector industries that are not generally dependent on freight transportation services.

However, the key freight-dependent industries highlighted in Table 3.2 provide many of the products that Oregon trades with other parts of the United States and the world and representing a critical component of the state's economy.

Table 3.2 Industry Contribution to Gross State Product (millions; 2020)

INDUSTRY SECTOR*	2020 GSP (IN MILLIONS)	PERCENTAGE OF TOTAL MANUFACTURING GSP	PERCENTAGE OF TOTAL GSP
Agriculture, Forestry & Fishing	$4,455	N/A	1.80%
Computer & Electronics Manufacturing	$15,947	46.50%	6.40%
Food Manufacturing	$3,888	11.60%	1.60%
Machinery Manufacturing	$1,842	5.50%	0.80%
Metals Manufacturing	$2,804	3.60%	1.20%
Transportation Equipment Manufacturing	$1,396	4.20%	0.60%
Wood and Paper Manufacturing	$3,396	10.20%	1.40%
Wholesale Trade	$13,549	N/A	5.60%
Retail Trade	$13,185	N/A	5.40%
Real Estate and Rental and Leasing	$36,664	N/A	15.00%
Construction	$11,745	N/A	4.80%
Service and All Others*	$134,906	18.40%	55.40%
TOTAL	**$243,777**	**100%**	**100%**

Source: U.S. Department of Commerce / Bureau of Economic Analysis, March 2022

* The "Services and All Others" category includes a wide range of industries, but primarily includes service-sector industries, such as financial activities, government, real estate and educational and health services, which generate limited freight transportation demand and are thus less dependent on freight services. The 18.4% of total manufacturing GSP in the "Service and Others" Industry Sector includes apparel, chemical, plastics/furniture manufacturing and others.

Several observations can be drawn from the data in Table 3.1 and Table 3.2:

- Oregon relies heavily on the manufacturing sector. Manufacturing makes up 10.0% of Oregon employment, and 13.8% of GSP. Comparatively, only 11.2% of the U.S. total gross domestic product and 8.6% of Washington State's GSP come from the manufacturing sector.[32] Oregon's dependence on manufacturing sector leaves the state vulnerable as a result of cheaper labor in overseas manufacturing. Due to the state's reliance on this industry, it is important that the transportation system serves the businesses in the manufacturing industry to keep costs low and remain competitive in the global economy.
- Computer and electronics manufacturing is a major contributor to total state GSP and state manufacturing GSP. In the past several decades, Oregon has seen a strong increase in high-technology companies and their contribution to GSP. In 2020, while jobs at computer and electronics manufacturing firms accounted for 2.0% of total state employment, 46.5% of state

32 Bureau of Economic Analysis: Regional Economic Accounts at: https://www.bea.gov/regional/index.htm.

manufacturing GSP came from this sector. As the state succeeds in attracting more computer and electronics manufacturing firms—which have high-value-added product content and require workers with higher-than-average skills—Oregon's manufacturing GSP (actual value and share of total GSP) will likely increase. In April 2022, Intel—with more than $52 billion in total investment into Oregon's economy since operations began—broke ground on its $3 billion expansion project for its Hillsboro factory that will focus on semiconductor research and development.[33] This expansion project is expected to spur further economic growth in computer and electronics manufacturing at a site that already employs nearly 22,000 employees in Hillsboro.

- High-tech companies have high or medium dependence on all modes of transportation except pipelines. These companies also have complex international supply chains. Because volumes increase for the state, it will be essential to enhance freight mobility on these modes—particularly truck and air—and facilitate better connections between modes to satisfy the needs of this critical industry group.[34] This reliance on a strong freight network is expected to increase as the global semiconductor shortage continues. Domestic production has been expanding since the COVID-19 pandemic, and volumes of domestic semiconductor/computer chips are to increase as companies like Intel continue to ramp up production to meet growing domestic demand. As part of the 2021 Infrastructure Investment and Jobs Act, nearly $52 billion in federal subsidies were announced to address the issue and to fuel domestic chip manufacturing (from which Intel aims to benefit from), which will further increase the importance of a strong freight network within the state.
- Industries in decentralized locations are important contributors to the Oregon economy. Agriculture, forestry and fishing, and wood and paper manufacturing are critical components of Oregon's economy, particularly where employment and rural economic vitality are concerned. These industries, which accounted for 4.0% of total state employment, rely on having multimodal transportation access and tend to be distributed in remote and rural areas. Bulk commodities, such as wood products, are often trucked to reload facilities and transferred into rail containers, railcars, or ocean containers to be moved to destinations across the United States and the world. Rural production areas are not always served by multiple modes of transportation (i.e., barge and rail), thereby restricting modal choice. Transportation costs for these sectors usually make up a large percentage of the cost of goods, so constrained access or mobility can drive up operating

33 https://www.intel.com/content/www/us/en/newsroom/news/intel-marks-grand-opening-3b-factory-expansion-oregon.html#gs.4fthae, Accessed June 2022.

34 See Table 2.1 in Chapter 2 for more detail.

costs. To ensure the support of these basic industries, multimodal access and mobility must be preserved and improved, when viable.

- Another important industry to the Oregon economy, retail trade, is also decentralized. Retail trade accounts for over 11% of Oregon employment and about 5.7% of Oregon GSP. The retail industry is heavily dependent on truck transportation infrastructure and access to carry goods to and from stores distributed across the state. Transportation costs often are the single largest contributor to retail trade operations.[35] Nationally, retail and wholesale trade required $0.107 of transportation services to produce a dollar of output in 2020.[36] To ensure the smooth functioning of this vital industry, truck mobility and access, particularly in urban and suburban locations, must be improved where needed.
- The construction and real estate industries have continued to grow due to the growing population in the Portland metro region. Between 2018 and 2021, the construction sector's GSP value has increased by 17.5%, with 9.1% of that increase occurring since 2019. While many sectors saw a dip in their total GSP values during the COVID-19 pandemic, the construction sector's GSP grew 2.3%, indicating the industry's increasing importance in recent years, and its reliance on the freight network for the delivery of materials. As global shortages and price increases of construction materials and labor continued through 2021, the United States saw a 0.9% decrease in the construction sector's gross domestic product value. Washington State also saw a similar decrease of 0.8%, indicating Oregon's relative strength in the construction sector, signaling its growing influence on the state's economy as metropolitan areas across the state continue to expand.

35 U.S. Department of Transportation, Bureau of Transportation Statistics, Industry Snapshots.https://www.bts.gov/archive/publications/industry_snapshots/a_special_report_from_the_2012_transportation_satellite_accounts/ch6#footnote-5923-2-backlink

36 U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Economic Trends, https://data.bts.gov/stories/s/ny5d-7xny

3.2.2 Anticipated Industry Growth in Freight Shipments

Figure 3.1 highlights the anticipated growth in tonnage shipments of key freight-dependent industries through 2050. Growth estimates were only available for commodity tonnage; however, changes in tonnage output correlate with the size and level of activity of industries. The data shows moderate- to high-growth and slower-growth industries in terms of tonnage movements. High-growth freight-dependent industries include the following:[37]

- **Food or Kindred Products**. Movements related to this sector are expected to grow at an annual rate of 1.5% through 2050.
- **Base Metal and Machinery**. The volume of commodity movement related to metals and machinery is expected to grow 1.2% annually through 2050.
- **Petroleum, Coal, Chemicals**. Movements related to this sector are forecast to see 1.9% growth through 2050.
- **Clay, Minerals, Stone**. Movements are expected to increase at a rate of 1.5% annually through 2050.
- **Machinery, Instruments, Transportation Equipment, Metals**. Volumes of commodity movements associated with these products are expected to grow at a steady pace of 2.2% per year through 2050.
- **Pulp or Paper Products**. Movements are forecast to grow at 1.4% per annum through 2050.
- **Forest or Wood Products**. Movements related to these products are expected to grow steadily through 2050 at a rate of 1.8% annually.
- **Other/Miscellaneous**. This category, inclusive of all other products not listed above are anticipated to see the volume of commodity movements increase by 1.8% annually through 2050.

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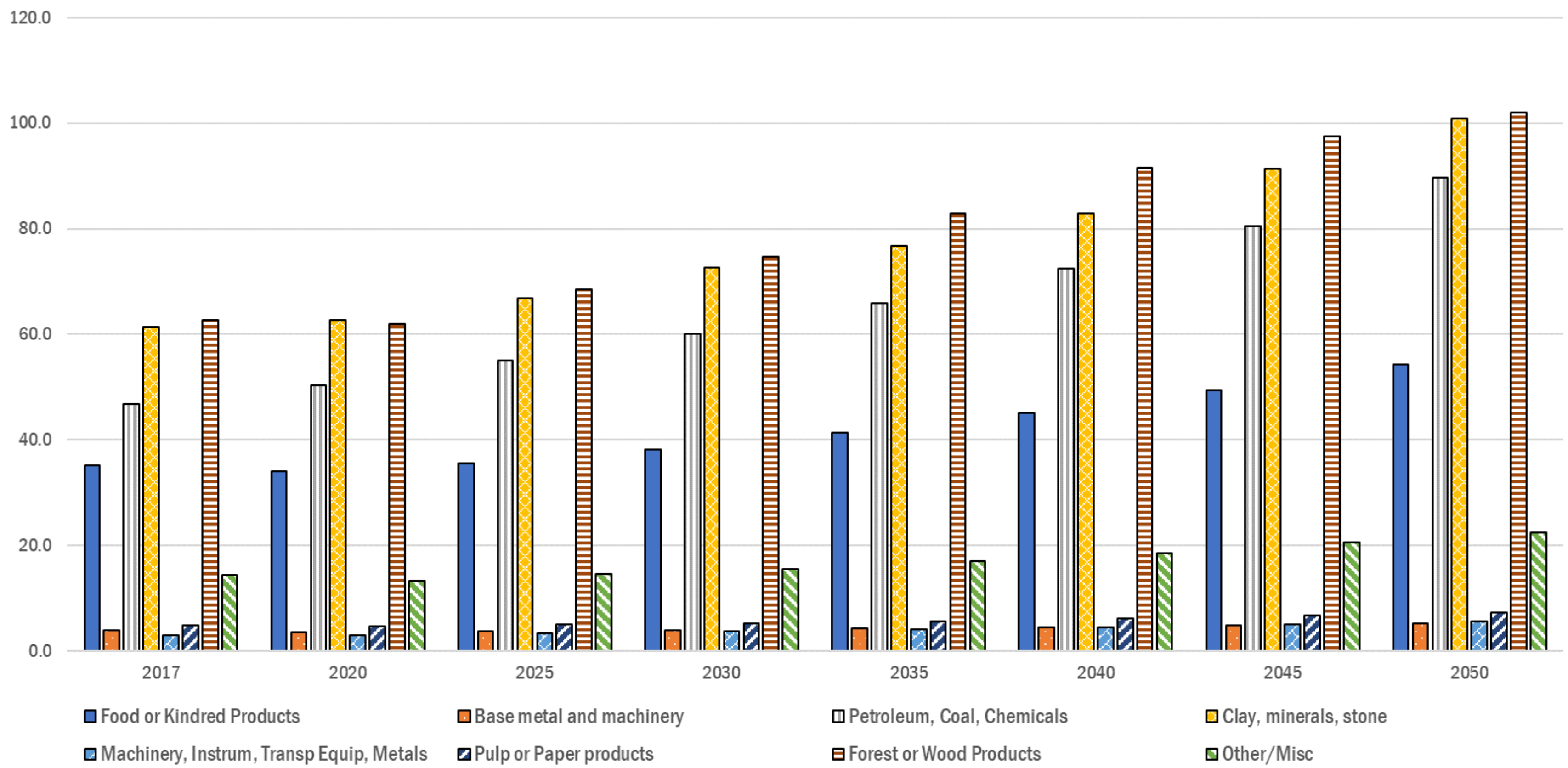
[37] FAF5.2.

Figure 3.1 Projected Growth of Commodity Tonnage with Oregon Origin Related to Key Freight-Dependent Industries (2017 to 2050)



Source: FAF5.2

Notes:

[1] Retail trade and wholesale trade were not included in the tonnage overview because tonnage conversion data are not available for these industries.

[2] Tonnage does not translate into the value of goods or economic output.

3.2.3 Implications of Industry Growth for the Freight System

Implications for Oregon freight transportation can be drawn from the data in Figure 3.1:

- High growth in volume of goods will occur in the computers and electronics manufacturing industry. The growth in economic importance (and increased freight tonnage in support of this growth) of computer and electronics manufacturing and the industry's reliance on air and trucking and complex global supply chains will result in an increasing need to strengthen the intermodal connections between these modes and to focus efforts on improving overall system reliability. The COVID-19 pandemic disrupted global supply chains in ways that highlighted the reliance on a cohesive global supply chain to deliver products in the computers and electronics industries, and pressures remain to enhance the entire supply chain to ensure timely delivery.
- Many of Oregon's resource-based industries will still play an important role in the state's economy and a critical role in the economies of many rural and coastal areas. However, the Class I railroad business model currently focuses on long-haul freight movements. This consolidation of service and the unprofitable nature of some carload movements have reduced rail service to some Oregon's resource-based industries that move their railcar cargo in small lots. Oregon grain shippers continue to struggle to obtain competitive pricing from Class I railroads because of their low volumes and relatively short hauls. Grain growers usually move goods from rural Oregon, east of the Cascade Range, to grain export facilities on the Columbia River and the Puget Sound. However, a reload facility in Nyssa, OR is scheduled to go online in 2023, providing an instate option for the export of grain and onions. The change in Class I railroad operations makes rail a less viable option to move goods from the field to these export facilities. Shifting these commodities to trucks has both a cost and competitiveness impact for these sectors and has potential implications for road maintenance and congestion.
- Ocean freight congestion from Asia to the United States has been a challenge through the COVID-19 pandemic, making reliance on marine transport risky in the near-term and fueling a modal switch to air cargo for some industries through 2024, possibly longer. There is steep competition for air-cargo space, and the limited service and scale of air cargo at the Portland International Airport poses regional challenges for industries that rely on air cargo to distribute and receive goods and services.
- Competitive rail rates are a challenge for several industries looking to expand operations across Oregon, especially in rural areas with limited rail and intermodal freight facility. The lack of competitive rail rates has affected costs of operations.

- Challenges related to truck driver shortages combined with the growth in reliance on this mode in recent years have created challenges for a number of industries. Not only are truck drivers difficult to find, but options such as third-party providers can be costly and difficult to hire during peak season. As a result, ensuring transportation access and routes that can handle heavier loads is particularly important.

3.3 INDUSTRY LOCATION AND CLUSTERING

While many of Oregon's industries are located near Portland and around the I-5 corridor, many others—especially Oregon's resource-based industries—are located in rural areas throughout the state. Industry site location can be influenced strongly by the nature of the products that are grown, processed or manufactured, domestic or international trade orientation, and the type of transportation modes required.

3.3.1 High-Value Industries

The computer and electronics manufacturing industry is clustered almost entirely within the Portland metropolitan area and Willamette region. In general, this urban clustering provides the following benefits to these industries, which help them to be successful:

- Access to transportation infrastructure that facilitates exports (including airports, highways and rail), which is critical to these export-heavy industries
- Availability and relatively low cost of utilities and land on the urban fringe
- Ability for companies to draw on a pool of highly skilled employees (such as engineers and computer technicians) from the Portland metropolitan region

Firms within high-value-added manufacturing industries (such as machinery manufacturing) are relatively mobile and tend to locate near places with access to ports and relatively congestion-free highway corridors. However, larger manufacturers tend to be stationary due to the investment and infrastructure required to sustain their production sites.

Green technology is a sector that Oregon seeks to promote and develop. Wind turbine farms have clustered along the Columbia River Gorge and central and eastern Oregon, where strong wind currents combine with sparsely populated land to facilitate the installation of wind farms. Oregon is also becoming a hub for solar power manufacturing. Solar energy firms are located in urban areas (including Hillsboro, Gresham, Salem, and Eugene) where plentiful higher-skilled labor and large land parcels are available.

In 2019, the Oregon State Legislature passed HB 2618, Relating to solar incentives; and prescribing an effective date,[38] which created a new Oregon Department of Energy solar rebate program that allows residential solar energy customers and low-income service providers in Oregon to receive rebates for solar energy systems in an attempt to increase the state's manufacturing and use of solar power.

Companies in the wholesale trade, footwear, apparel, and recreation products sectors are predominantly located in the Portland metro region because of easy access to maritime, air, truck, and rail transportation. These industries also have a strong import orientation, which makes access to various modes critical.

3.3.2 General Manufacturing Companies

General manufacturing companies are located across Oregon, with many concentrated in the Portland and Salem urban areas. Metals manufacturers are clustered in the northwest portion of the state, particularly in the Portland metro and upper Willamette Valley areas. Most food manufacturers are located in the western half of the state, with a heavy concentration around Portland and Salem. Some clusters are in eastern Oregon near the Columbia River. Outside of these urban clusters, this industry is somewhat more dispersed than others because location decisions tend to be driven by proximity to cheaper, inexpensive land, rail corridors, and raw materials (e.g., agricultural inputs).

3.3.3 Natural Resource-Dependent Industries

Natural resource-dependent industries tend to be in the state's rural areas. Fishing companies are naturally located on the coast near their supply source, though they generally have sales offices in the Portland region.

Wood manufacturers are based in mountainous areas, largely west of the Cascade Range, close to where timber is harvested to reduce transportation costs, which make up a high percentage of the products' total market price. Clusters of wood and paper mills and production facilities are located throughout the Portland metro area, upper Willamette Valley, and coastal, southwest, and central Oregon.

The agriculture sector tends to be fixed by location but is also relatively dispersed throughout the state, depending on resource type. Most farms agricultural reload and processing facilities are spread throughout the upper Willamette Valley, and western, central, eastern, and southern

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38 https://olis.oregonlegislature.gov/liz/2019R1/Measures/Overview/HB2618

Oregon, where land is rich and abundant. Within this diverse industry cluster, specific industries tend to cluster in certain regions:

- Many of Oregon's vineyards are located in the Willamette Valley, as well the Columbia River, Umpqua, Rogue and Applegate Valleys because of the nature of the soil and climate.
- Growers of nursery stock and trees used in residential and commercial landscaping are highly concentrated in the Willamette Valley.

3.3.4 Transportation and Logistics Service Companies

Service companies, such as those in the transportation, logistics and distribution sector, serve domestic and international shippers across Oregon and operate where their customers are located.

3.4 INDUSTRY TRANSPORTATION SYSTEM AND SERVICE REQUIREMENTS, ISSUES AND OPPORTUNITIES

3.4.1 High-Value Industries

High-value industries are characterized by complex, long-distance supply chains that require materials from all over the world. In turn, many of the products produced by these high-value industries are also sold globally. As a result, these industries depend on smooth functioning marine and air transport. Domestic shipments of high-value industries move by truck and, to a lesser extent, on rail, and reliability on these modes is critical. Companies that manufacture high-value products have the following transportation requirements:

- **Access to international air-cargo service at Portland International Airport**. Since the majority of the finished products in this sector are high-value, time-sensitive, and/or relatively small, they utilize airfreight to international and out-of-state domestic customers. Therefore, having adequate, reliable, and direct international air carrier service at Portland International Airport is important. Otherwise, products must be trucked to Seattle-Tacoma International Airport or San Francisco International Airport, which may increase costs and transit time. In addition, to satisfy promised delivery dates to their customers, technology firms must be able to access Portland International Airport reliably and consistently via the road and highway network to meet airfreight deadlines.
- **Dependable transit times to and from the Port of Portland**. Raw materials and components required by these industries for production often arrive by ship from Europe and Asia. Ensuring these goods can move quickly through the Port of Portland and over the surface transportation system is important to the just-in-time manufacturing processes of this industry cluster.

- **Supply chain consistency and reliability**. Predictable supply chains are essential to manage the complexity of materials arriving worldwide and mitigate the risk of business interruption. High-value industries are less price-sensitive than other industries regarding transportation costs and are more concerned about transportation service reliability. This requirement has become even more crucial following the COVID-19 pandemic because supply chains continue to readjust to a new normal that includes less predictability due to economic, environmental, and geopolitical factors. Additionally, the rise of e-commerce has led to an increasing importance of last-mile delivery options and increased access to logistics centers and warehouses for centralized distribution of goods.
- **Access to regions of new industry development**. Green energy businesses are branching out to rural parts of the state to develop infrastructure such as wind farms. Growth in the wind industry will depend on having sufficient transportation to rural locations and planned wind farm facilities for delivering the heavy and large wind turbine components. As of 2020, there were 46 wind farms across the state with others under construction, highlighting the increasing reliance on wind energy as a renewable source to reduce carbon emissions. Wind power accounts for nearly 12% of Oregon's electricity generation.[39]

3.4.2 General Manufacturing Industries

Food and metals manufacturers depend on having low-priced transportation options, supply chain consistency and reliability, transportation modal choice, and access to fast, refrigerated transportation modes to ship perishable goods. A supply of industrial land near major markets is also essential to keep transportation costs down for these industries.

Supply chain consistency and reliability are essential to companies in the wholesale trade, footwear, apparel and recreation equipment industries. They are less transportation price-sensitive than firms in other industry clusters, such as agriculture and forest products.

3.4.3 Resource-Dependent Industries

Wood and paper manufacturers rely heavily on trucks and Class I and short-line railroads to get their goods to market and on barges for shipment of raw materials. Though wood and paper manufacturers source many inputs from Oregon and the Pacific Northwest, they also ship to and from many international locations, using marine ports on the Pacific, Gulf and Atlantic Coasts, and several international land border gateways with Canada.

[39] https://www.oregon.gov/energy/energy-oregon/Pages/Wind.aspx

Overall, resource-dependent industries receive a high percentage of value-added from transportation, which means that the overall direct effect of freight investments on them is high. Some of the critical transportation system needs of these industries include the following:

- **Supply chain dependability**. These industries rely on a steady flow of raw materials to function; therefore, fast and reliable transportation is critical, in particular if the commodity being shipped is perishable.
- **Modal choice**. Resource-dependent shippers need modal flexibility (depending upon the products being transported), so having access to all modes—Class I and short-line railroads and intermodal facilities, barge, ocean transport, air service (for certain exported perishable agricultural products), and truck—is especially important.
- **Access to the nation's marine and land border crossing/gateways**. These industries make use of ports on all three coasts of the United States, as well as several land border gateways with Canada like Blaine, Washington, to import raw materials and export finished goods.
- **Widespread truck network**. These industries rely on trucking for many trips that are less than 500 miles in length, to and from locations all around the Oregon and bordering states.
- **Special equipment and designated routes for trucks that require permits.** Some agricultural products and fish are highly perishable, so access to refrigerated equipment in all modes (rail, truck, air, and barge) is essential. Some products like mining and construction materials are heavy, so having an adequate number of over-dimensional truck routes across the state facilitates safe, timely, and cost-effective transportation of heavy loads.

3.4.4 Transportation and Logistics Service

Companies in the transportation, logistics, distribution, and warehousing industry require consistent transit times to ensure customer satisfaction, on-time delivery of manufacturing inputs and finished products, access to all modes of transport, and smooth connections between transportation modes.

3.5 CRITICAL INDUSTRY ISSUES

A survey was conducted for the 2011 OFP, which detailed critical issues, trends, and opportunities identified by shippers and carriers across Oregon. To update these findings, stakeholder interviews were conducted and completed in 2022, with stakeholders representing the following eight freight-dependent industries on the state freight network in urban and rural areas across Oregon:

- Wood and paper manufacturing
- Electronics manufacturing
- Agriculture
- Food manufacturing
- Aggregate materials
- Transportation Equipment
- Chemicals, petroleum, and coal products
- E-commerce

Many of the challenges identified in the original survey have been augmented by the COVID-19 pandemic, truck driver shortages, supply chain disruptions due to weather events and geopolitical forces, as well as significant increases in e-commerce delivery volume across the state and nationally, leading to increased truck trips in urban area.

The COVID-19 pandemic highlighted key supply chain vulnerabilities within Oregon and across the United States—including low inventory logistics strategies, dependence on China for manufacturing, international trade wars, and inadequate safety protocols—that created risks in supply chains. During the pandemic, supply chain and logistics sectors saw unprecedented shifts in consumer demand toward essential goods, labor shortages in many sectors vital to Oregon's economic growth, and a sizable increase in online shopping as further detailed in Section 2.2 of this plan. Despite the initial difficulties, suppliers and manufacturers have pivoted. Warehousing is in short supply in urban centers as companies look to restructure their supply chains. In the near- to mid-term, supply chain resilience strategies will continue to include understanding and activating alternative sources of supply, which may affect existing supply chains and freight networks within the state.

- **Increased demand for warehouse and distribution space.** An additional 1.6 million square feet of industrial, manufacturing, and warehouse development was added to the Portland metro region in the first half of 2022, primarily driven by warehouse and distribution demand which accounts for 95% of new square footage. The vacancy rate for warehouse and distribution facilities in the Portland metro region was low, at 4.1% as of Q2 2022.[40] This results from a combination of changes in the retail sector related to e-commerce and response to supply chain issues related to the continued disruptions from the pandemic both of which are likely furthering truck traffic in the region.

- **Supply chain disruptions**. The COVID-19 pandemic has exposed the risk of U.S. reliance on manufacturing capacity in China. Supply chain managers have accepted the importance of diversifying sources of manufacturing capacity and bringing some production closer to the point of consumption, such as increased production capacity for semiconductors in the Portland region led by Intel. Increased automation and small batch production are making onshoring more economically feasible for some industries.
- **Reduction in office space needs.** Corporations anticipate reducing their office space requirements, which will reduce commuting and change the style of office products required. With concerns about fuel costs, faster time to market, and climate change, increased regional production was already a consideration for manufacturers. Supply chains are likely to use more regional production. Depending on the sector, this will lead to more domestic sourcing.
- **Truck driver shortages.** According to the American Trucking Associations, the trucking industry is short by nearly 80,000 drivers as of 2021, which is expected to increase to over 160,000 by 2028.[41] The effect of these shortages are higher costs, less reliable truck supply and delayed shipments, usually felt more acutely in areas (such as rural areas within Oregon) with lighter freight volumes.

3.5.1 High-Value Industries

Several issues can adversely affect the critical transportation functions of high-value industries:

- **Highway congestion issues within the Portland metro area and around Portland International Airport.**
  - Congestion and bottlenecks on highways leading to/from Portland International Airport can result in cost and transit time reliability issues for industries that depend on air freight.
  - Congestion and traffic in the Portland metro region have led to a shift toward local shuttles by some manufacturers, according to stakeholder interviews.

40 Colliers, Portland Industrial Q2 2022 Report.

41 https://www.trucking.org/sites/default/files/2021-10/ATA%20Driver%20Shortage%20Report%202021%20Executive%20Summary.FINAL_.pdf

- **Limited direct international air freight service at Portland International Airport and ocean carrier service at Port of Portland**.
  - The availability of air-cargo services and marine cargo services is volatile. Adding or removing a single flight at Portland International Airport may have far-reaching impacts on supply chains throughout the region. For example, airlines may remove service because of market conditions or add service to a new market, which might reduce travel time and cost for Oregon businesses significantly. This type of change in freight carriers and destinations affects distribution patterns and costs for those industries that rely on air freight to get goods to lucrative overseas markets. A similar situation exists at Portland's marine terminals as demonstrated by the loss of container service in 2016. Container service has resumed as of 2022; however, container TEU (twenty-foot equivalent unit) volume is a fraction of the typical amount prior to the loss of service.
  - Congestion in getting to ports in other metropolitan areas has increased interest using the Port of Portland. However, challenges with limited container service frequency and destinations prevent its use as a consistent alternative for many industries.
  - For the electronics and computer manufacturing sector, ocean freight congestion from Asia to the United States has been a severe challenge during the pandemic. Ocean delays of 80 to 100 days at the Ports of LA and Long Beach have made the ocean unviable, resulting in the need to fly even capital equipment by air.
  - Another challenge related to consumer demand and expectations relates to speed-to-market. Consumers continue to drive toward faster delivery services, including same-day and next-day services. Two-day was somewhat standard, but with the Amazon effect, the ongoing disruption of the retail market resulting from an increase in e-commerce, many customers now want or expect deliveries within hours. There are limited next-day FedEx options to southern Oregon, requiring the use of Portland or Sacramento for air cargo and the need to locate additional distribution facilities in other regions. Specific safety concerns surrounding US-97 for trucks, passenger cars, and recreation, while alternate routes on US-58 and through Bend are also both congested.

- **Permitted load truck standards and regulations**.
  - Size and weight permitting are necessary to protect transportation infrastructure from excessive wear, especially from trucks with significantly higher weights per axle. Highways are designed to specific national or state standards, which are exceeded by trucks that require permits. These trucks are a low percentage of truck movements; however, industries clustered in certain areas can benefit from or need access to trucks that require permits. For example, the wind industry requires transportation of wind

turbines, which are heavy and over-dimensional. A well-functioning and user-friendly permitting system requires knowing where these movements are concentrated and understanding these industries' logistics patterns and common routes. It may be possible to offer more permitting opportunities or to selectively upgrade roads, bridges and tunnels to accommodate permitted loads. In some cases, it may also be cost-effective for the state to assist short-line railroads with track upgrades to maintain adequate service for the shipment of heavy loads.

- A recent concern regarding permitted load truck standards and regulations is that these weight restrictions across interstates may not consider the additional weight of electric-vehicle (EV) trucks. In some cases, these can weigh 5,000 pounds more than their diesel equivalent, and while the U.S. Department of Transportation allows for a 2,000-pound exemption, this does not cover the added weight of the vehicle. While Oregon regulations allow for nearly 105,000-pound loads to be trucked, neighboring states do not have supporting regulatory limits, which can be a challenge for some industries. Multiple respondents highlighted the desire to partner with other states to increase weight limitations where possible. This has become of increasing concern because driver and truck shortages, volatile fuel prices, and transportation equipment shortages affect most freight-dependent industries within the state. Thus, some companies are looking to maximize utilization through higher truck loads.

- **Weather-related delays**.
  - Some major corridors–including I-5, I-84, I-205, U.S. 26, U.S. 30, and facilities over the Siskiyou Pass–are often affected by weather-related road closures.

- **Pavement Conditions and Quality Control**
  - Quality has become the main challenge for industries such as the electronics and computer industry since the COVID-19 pandemic, stemming from a combination of lack of experienced resources at ports and in transit, as well as increased congestion at these facilities. The lack of experience, high turnover, and congestion has led to cutting corners through operational processes and procedures resulting in a lower quality of service. Pavement conditions on U.S. 26 are a particular concern for high-value industries, including electronics manufacturing, which relies heavily on this route for travel to and from the Portland International Airport and Hillsboro. Expensive and sensitive capital equipment travels via truck in these areas, and road conditions should be prioritized.

- **EV Adoption**
  - Charging infrastructure is by far the biggest barrier to further implementation and use within the industry with challenges related to existing charging stations and time needed to charge a truck. There is no public infrastructure for commercial vehicles. The only existing place for charging EV trucks in Oregon is Daimler in partnership with PGE on Swan Island.
  - Hydrogen is part of the zero emissions strategy for the industry moving forward because hydrogen fuel cells can extend the range of EVs. However, there is a need for public charging infrastructure and public hydrogen fueling.
  - There has been slower ramp up of the EV market nationally and in Oregon than expected with heightened demand likely in the 5+ year timeframe. Fleet turnover will take time due to the slow nature of EV adoption.

- **Transportation Costs**
  - The increase in the cost of fuel has influenced fuel surcharges imposed by trucking companies to mitigate their risk, but that affects industries that rely on trucking for freight transport.
  - Costs related to transportation of goods and materials has increased with rising fuel costs and have been worsened by a shortage of trucking equipment. Managing the cost of trucking has become the largest concern for players in the market. Even with rising commodity prices, this is the largest component of costs for heavy commodities such as construction aggregates, worsened by a shortage of trucks to meet demand.

3.5.2 General Manufacturing Industries

Companies in these sectors are affected by the following challenges:

- **Growing transportation delays from increasing highway congestion and lack of highway system redundancy**.
  - Shippers report negative impacts from increased highway and bridge congestion in the Portland metro region. Also reported is lack of adequate highway system redundancy that would enable the motor carriers to route around traffic bottlenecks.
  - Trucking is another challenge because there were not enough trucks to cater to volumes that were coming into Oregon and elsewhere during and after the COVID-19 pandemic.

- **Growing rail congestion and general rail issues**.
  - Some shippers noted in interviews that local Class I railroad yards are congested, particularly around Portland. Periodic rail equipment shortages make rail a less

attractive option for some shippers, which can lead companies to use trucks instead of rail. This, in turn, increases transport costs. Most shippers are limited to one Class I railroad, which can limit options for service and competition for pricing.[42] Other challenges exist, including the Class I railroads' current pricing structure, which favors more efficient longer trains traveling long distances. Shippers requiring short haul moves or with insufficient cargo volume are sometimes priced out of the rail market. Rail access is limited in certain rural areas where shippers would like to use rail. Some stretches of short-line railroad track are deteriorating or cannot handle heavier loads.

- Truck and truck driver shortages along with congestion in the Portland metro region have increased interest in expanding rail access and use across a wide range of industries.
- The Wood and Paper industry is seeking a rail spur at the facility in Westport. This rail spur would allow more volume to travel by rail therefore taking trucks off the road, which would both increase rail use across the state and reduce some congestion in areas seeing high volumes of truck traffic. Additionally, log tonnage over the Longview Bridge is expected to increase, and forest fires have shifted demand to coast-range tree farms but inefficiency of trucking in Portland has made rail a more viable transport strategy, which will require increased access intermodal access.
- For some industries, rail access continues to be a challenge for operations, with a desire for more intermodal rail hubs across the state, including locations such as Medford, because Stockton, CA, is the closest intermodal rail terminal for food manufacturers in southern Oregon.
- Challenges with rail also exist due to the limitation of current rail infrastructure within the state, including lower rail line ratings that require freight to move more slowly in some areas.

- **Bridge restrictions**.
  - These restrictions are critical to keeping bridges safe for a long period of time and reducing damage to bridge infrastructure because damage prevention saves money for repairs. However, these restrictions affect routing choices for some general manufacturing companies with heavy loads, such as food or beverage products. Oregon has replaced or repaired hundreds of bridges with Oregon Transportation Investment Act III Bridge Program funds.[43] Still, it is important to get a clear picture of route and

42 "Oregon Freight Rail System." Prepared by Parsons Brinckerhoff for the Oregon Rail Study, April 2010.

43 Background Brief: Legislative Committee Services: Bridges. State of Oregon at https://www.oregonlegislature.gov/lpro/Publications/BB2014Bridges.pdf

logistics patterns for major industries and to consider upgrading any industry-critical bridges that require work.

- **Increased demand for industrial land supply on waterfronts and in urban areas**.
  - As a result of increased maritime trade to support marine-dependent industries, such as wood and paper manufacturing, the demand for waterfront terminal facilities and waterfront industrial land supply will increase. However, pressure exists to convert industrial land to other uses, such as residential or commercial land. The Metro Regional Freight Strategy suggests that "industrial sanctuaries should continue to be considered a unique and protected land use" in the Portland metro region.[44] A focused effort to protect industrial land throughout the state is important to maintain Oregon industry competitiveness and viability.
- **Ocean carrier and direct international air freight service schedules at the Port of Portland**.
  - At times, limitations in port calls or flight schedules can cause companies to use alternate gateways such as the Puget Sound ports of Seattle-Tacoma, or San Francisco-Oakland, which increase costs and transit times.
  - Increasing congestion on roads in the Portland metro region has increased interest in use of a Port of Portland and marine strategy as an alternative option for freight movement; however, limitations in port calls and flight schedules have remained a key concern in the updated survey responses.
  - Due to the limited shipping lines and destinations, the Port of Portland can't be used for a larger portion of container business for some industries, which has required ports in Washington and California to be used.

3.5.3 Resource-Dependent Industries

The following challenges affect companies in this sector:

- **Congestion on major freight corridors**.
  - In interviews, shippers have continued to report that increasing congestion is a major concern, especially in Oregon's urban areas and on the I-5 Interstate Bridge. While this was a concern when the original survey and interviews took place, its continuance is a signal that safer and more reliable options are key to businesses relying on truck transportation.

[44] The Metro "Regional Freight Strategy," which was released in December 2018.

  - Within the fertilizer industry, chemicals coming from China and finished product from China and India has been severely affected by the COVID-19 pandemic and geopolitical and environmental factors. Facilities in the United States are working overtime due to supply chain challenges and trade embargos against Russia amid its conflict with Ukraine, which has fueled high commodity prices industrywide. Additionally, fertilizing companies compete with growers for trucks/drivers at the same peak times, which drives prices up to almost double during peak season and directly influences transportation delays. Specific issues on Highway 39 exist due to the high volume of grain and farmer trucks.
  - There will be a shift to freight hauling supporting Alaska operations in north Portland or Rainer, as real estate prices in Seattle are pushing more companies to Tacoma, which are easily served from Portland and Rainer, and flatbed trucking to those locations will increase. Meanwhile, long-haul trucking will decrease due to difficulty with driver availability. Port of Portland is now receiving containers, and stakeholders will shift freight flow coming in and out of Portland, floating into Port of Portland or Rainer.

- **Lack of highway system redundancy**.
  - Few roads connect the Oregon coast and coastal range to major population centers in Oregon, including the Willamette Valley and beyond the state, as well as to the Port of Portland and Portland International Airport. Because road and highway system redundancy is lacking, companies in the forestry and fisheries industries that harvest and process products off the Oregon coast and in the coastal range face supply chain disruptions when winter weather-related events (like flooding, landslides, and downed trees cause road closures) or increased summer traffic slows down driving speeds. This key concern was mentioned throughout the updated survey and interview responses, indicating the continued challenges surrounding existing road infrastructure and the importance of intermodal options and development of new freight routes beyond the main arterial routes through the state to support and grow vital industries. As more extreme weather-related events continue to be seen within the state, freight network improvements are needed.

- **Lack of motor carriers to support rural shippers.**
  - Shippers in some rural areas reported having difficulty procuring sufficient empty trucks during certain times of the year. Access to adequate motor carrier service is often limited when motor carriers are resistant to serve rural areas because there often is no return cargo to create a revenue paying round-trip. Therefore, trucks either return empty or motor carriers charge higher rates than for their urban customers.

- **Truck permitting issues and diminished routing choices.**
  - Good connectivity of routes available to permitted loads is important to industries, because reduced transit time lowers costs and increases competitiveness. Shippers mentioned the lack of over-dimensional routes in certain areas.
  - The COVID-19 pandemic has led to large-scale remodeling of the supply chain that has dramatically increased demand domestically. Global trade and supply chain issues have led to more interest in domestic manufacturing and sourcing over the past several years. With the shortage of trucks and drivers, it will be important to continue and expand over-dimensional routes.
- **Challenges with rail service.**
  - Forestry shippers lack nearby rail access in certain rural areas where timber harvesting and processing occur. Grain growers have not been able to consistently attain dependable and affordable rail service. In addition, inadequate maintenance and insufficient capacity on some short-line railroads can negatively affect shippers. This is a continuing long-standing issue, with interviewees concerned about the lack of rail access, lack of competitive rates, and growing competition for trucks and other transit modes during peak times. While most interviewees expect an increase in business, including in agriculture and forestry, the lack of rail access threatens market goals.
- **Climate-related challenges.**
  - Challenges within the Agriculture sector are subsequently affecting food manufacturing, including persistent drought conditions in southern Oregon that have affected businesses with historic drought levels seen in 2021 and likely to continue with climate change. Other challenges include access to water for some areas, along with the risk of losing crops due to unseasonable and rising temperatures.
- **Equipment Availability**
  - Within the agriculture sector, the Midwest is driving the market with its corn and soybean production, and more needs to be done to address the competitive landscape as it relates to overlapping peak seasons and heightened demand for trucks nationally.
- **Service Companies.**
  - Companies in this sector are challenged primarily with growing congestion, particularly in and around the Portland metropolitan region. Decreasing direct commercial airline flights due to systemwide capacity reductions may impact Portland's competitiveness in the service and other industry sectors.

4 Freight Systems

4.1 INTRODUCTION

The previous chapters provide background on the economy, freight demand and critical freight-dependent industries, and their supply chains. This chapter focuses on describing the freight transportation system and its importance to the industries that use the system. The chapter is divided into the following sections:

- **Freight System Overview.** This section provides an overview of the multimodal freight system in Oregon, with a focus on truck, rail, marine, and aviation, and the connectivity between these modes.
- **Strategic Freight Network Selection Methodology and Description.** This section provides a system description of how the freight-dependent industries of Oregon use major multimodal corridors that support the Oregon economy. The information is used to define a list of Strategic Freight Corridors by industries for the entire state.
- **Strategic Freight Corridors and Connectivity.** This section provides a description of system elements (roads, rail lines, marine facilities, airports and pipelines) that help connect centers of economic activity for freight-dependent industries with Strategic Freight Corridors.

4.2 FREIGHT SYSTEM OVERVIEW

A multimodal network that includes highways, local roads, rail, air, marine and pipeline operations provides freight mobility in Oregon. The following infrastructure comprises Oregon's transportation system:

- 7,979 miles of state highways.
- 642 miles of other state roads; 32,699 miles of county roads; 11,314 miles of city roads; 24,999 miles of federal agency roads, and 1,740 miles of tribal roads. These roads help connect Oregon industries, businesses, population centers, and other freight-generating facilities to the major freight transportation corridors.[45]
- 2203 miles of privately owned route-miles of rail track; 82 miles of publicly owned track; 1,111 miles of Class I carrier-operated track; 1,174 miles of Class III short-line-operated track

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[45] Oregon Department of Transportation. August 2021. *2020 Oregon Mileage Report*. Transportation Data Section Road Inventory & Classification Services. https://www.oregon.gov/odot/Data/Documents/OMR_2020.pdf

and switching railroad track.[46] This includes two major transcontinental railroads: the Burlington Northern Santa Fe (BNSF) Railway and Union Pacific.

- 13 Class I railyards and six facilities that have the capacity to load and unload unit trains.
- Five deep-draft marine port locations.[47]
- Two marine highways.[48]
- 97 public-use airports.[49]
- Nine pipelines to move petroleum and natural gas.[50]

4.2.1 Oregon Highway System[51]

The north/south Interstate 5 (I-5) and east/west I-84 corridors carry the majority of freight traffic in Oregon and provide Oregon with freight system connections with national and international destinations. I-5 forms part of an international freight corridor connecting Oregon with California and Mexico to the south and Washington and Canada to the north, while I-84 provides connection to the east including Idaho, Utah, and other states.

Several state highways offer important opportunities for freight movement because of their location and connectivity to a variety of markets. Large sections of the state, where no interstates are nearby, rely on state highways to transport import and export goods. Within major urban areas, the complex road network of arterials and connectors is critical for freight movement. The Federal Highway Administration designates local arterial roadways leading to marine facilities and other modal terminals as Intermodal Connectors on the National Highway System.

The 1999 Oregon Highway Plan (OHP) amended in 2015 establishes long-range policies and investment strategies for the state highway system. These policies include the designation of a system of freight routes. The OHP freight routes provide for highway freight through movements and connectivity across the state. Many of the OHP freight routes serve as connectors between the coast or specific communities and the interstate system. The strategies

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46 Oregon Department of Transportation, Rail and Public Transit Division, 2022.
47 Oregon Public Ports Association. 2022. Oregon Ports. https://www.oregonports.com/oregon-ports
48 U.S. Department of Transportation, Maritime Administration. 2022. America's Marine Highways. https://www.maritime.dot.gov/grants/marine-highways/marine-highway
49 Oregon Department of Aviation. 2018. *Oregon Aviation Plan v6.0*. https://www.oregon.gov/aviation/plans-and-programs/Pages/oap.aspx
50 Oregon Department of Transportation. 2006. *Oregon Transportation Plan*, Volume 2 – Technical Appendix 1, Description of the Transportation System. https://www.oregon.gov/odot/Planning/Documents/OTP_Volume_II.pdf
51 See Chapter 9 for discussion of National Highway Freight Network established under Map-21 and the FAST Act.

and action items identified in Chapter 8 of the OFP should be used with the OHP policies and investment strategies when planning for freight on the state highway system.[52]

4.2.2 Rail System

Two Class I railroads predominate Oregon's rail network: Union Pacific and BNSF. The state's rail system consists of 2,85 route-miles of track. The two Class I railroads account for 1,111 miles of track and 22 non-Class I railroads (short-line railroads) share the remainder. Non-Class I lines serve an important role in the North American rail sector. Overall, approximately one-quarter to one-fifth of traffic handled by Class I railroads start or end trips on a short-line railroad. Short-line market share relative to Class I railroads is minimal and is difficult to quantify because they are interconnected with Class I operations. The majority of short-line railroads in Oregon were once branch lines that were owned and operated by Class I railroads, and in many cases, they continue to function similarly to a branch line. For example, 100% of the freight traffic on a given short line may be routed through and by a Class I carrier, with industries submitting shipping documents to the Class I carrier and the Class I carrier in effect subcontracting the short-line railroad to deliver goods to their network for wider distribution. This type of arrangement applies to the majority of short lines in the state. Class I railroads rely particularly on their short-line connections to serve the forest products industry, one of Oregon's key freight-dependent sectors. Of the short lines operating in Oregon, only one (Portland & Western) is classified as a regional railroad because it operates at least 350 miles of route; the rest consist of shorter local railroads and switching or terminal services railroads.

Oregon's entire rail network is part of the national rail network because all tracks connect to a Class I railroad. The Oregon network is concentrated in the western part of the state, where the forest products industry, agricultural producers, and population centers rely on moving significant freight volumes. The following five main lines, or principal routes, provide mobility throughout Oregon and connect Oregon to the national network:

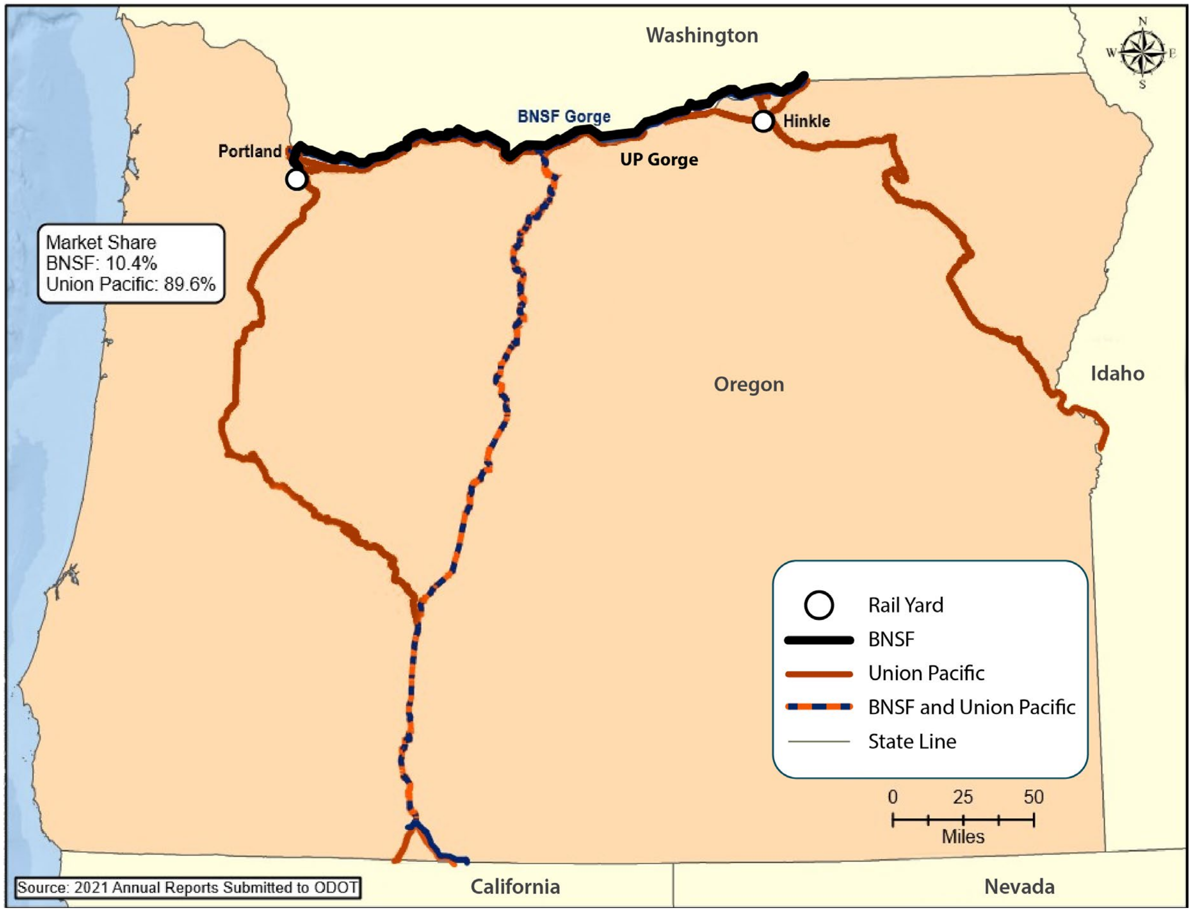
- BNSF Railway (shared by Union Pacific Railroad), northward to Seattle and Canada and eastward to the northern tier states via a crossing of the Columbia River between Portland and Vancouver, Washington
- Union Pacific Railroad, northward to Spokane, Washington, and Canada via the Hinkle Yard (near Umatilla)

52 Oregon Department of Transportation. 1999. 1999 Oregon Highway Plan (including amendments November 1999 to May 2015): An Element of the Oregon Transportation Plan. https://www.oregon.gov/odot/Planning/Documents/OHP.pdf

- Union Pacific Railroad, eastward toward the intermountain states and central tier states via La Grande
- BNSF Railway, crossing the Columbia River into Oregon via Vancouver and Wishram, Washington, and going southward to California through Bend and Klamath Falls
- Union Pacific Railroad, southward from Portland to California via Eugene and Klamath Falls

Figure 4.1 shows where these Class I corridors are located. The Hinkle and Pasco rail yards, along with the yards in Portland, are important hubs for rail freight traffic moving through Oregon. For further details, see the *2010 Oregon Rail Study*.[53]

Figure 4.1 BNSF and Union Pacific Class I Rail Corridors in Oregon



Source: Oregon Department of Transportation, Rail and Public Transit Division and GIS Unit. 2021.

53 Oregon Department of Transportation, Rail Division. 2010. *2010 Oregon Rail Study*. http://www.oregon.gov/ODOT/RPTD/RPTD%20Document%20Library/Oregon-Rail-Study-2010.pdf

One factor that could affect freight rail capacity in Oregon is the potential increase in passenger service. As passenger trains increase, tracks could become increasingly congested, which could affect freight rail efficiency. To preserve efficient movement of goods and people, rail improvements must be made so that both freight and passenger capacity needs are met now and into the future.

4.2.3 Marine System

Oregon's marine freight network consists of several waterways and numerous ports. Oregon's waterways serve a large portion of the state through water access to the Pacific Ocean, the Columbia River, and Snake River. The U.S. Department of Transportation's Marine Administration has designated two major Oregon marine corridors—the Columbia/Willamette/Snake River corridor from the Pacific Ocean to Lewiston, Idaho, and the north-south corridor on the Pacific Ocean along Oregon's coast—as marine highways.[54] Marine highways are eligible for federal funding for improvements and are selected because they have potential to relieve congested truck and rail corridors. The Columbia and Willamette River corridor was named M-84 and the Pacific Coast route was named M-5.

M-84 connects the ocean Port of Astoria and Oregon's major deep-draft port (Portland) with Lewiston, Idaho, and all ports on the Columbia River between the two. In addition, the Pacific Coast Ports of Coos Bay and Newport offer marine outlets for goods moving to and from the central and southern coastal regions of the state. However, they would need substantial road and rail infrastructure improvements to serve a greater proportion of the state and national markets and handle shipping containers. The Port of Coos Bay has been seeking funding for a $1.2 billion investment for the Pacific Coast Intermodal Port but had not secured funding as of January 2023.[55] M-5 designation is for the entirety of the Oregon Coast along the Pacific Ocean. In total, 23 Oregon port districts operate along the Pacific Coast and the Columbia River system, five of which qualify as deep-draft freight terminals under U.S. Army Corps of Engineers' standards for channel depth (greater than 15 feet):

- Coos Bay and Newport along the coast
- Astoria and Columbia County along the Columbia River
- Portland along the Columbia and Willamette Rivers

54 https://www.maritime.dot.gov/grants/marine-highways/marine-highway
55 https://www.portofcoosbay.com/news-releases/2023/1/31/us-department-of-transportation-announces-mega-grant-awards

In addition to port districts, the marine system serves many terminals that private-sector entities entirely own and operate.

The Portland harbor, located at the confluence of the navigable portion of the Columbia and Willamette Rivers, handles the majority of marine freight in Oregon.[56] The Columbia River's 43-foot channel depth gives Portland access to Pacific Rim trade, however, the newest container vessels draw more than 50 feet of water and must add a day of travel up the Columbia River due to its inland location.[57] From ports to the east of Portland, barges bring agricultural, wood, and other products to Portland's marine terminal facilities. Portland harbor constitutes a 12-mile stretch of the Willamette River and 2 miles along the Columbia River within Portland's northern industrial districts.

While many of the Oregon ports include a domestic shipping component, the majority of cargo is concentrated in a few locations. Approximately 85% of marine cargo is shipped through the Port of Portland, which includes private facilities in the Portland harbor. The remaining 15% are divided among the Ports of Astoria, Coos Bay, Morrow, Umatilla and Arlington. All of these ports are seeking to retain existing marine cargo flows or enhance tonnage to their ports via state and federal grant processes.[58]

Several locks were built in Oregon. The major locks on the Columbia River are located at McNary Dam, The Dalles Dam, Bonneville Dam, and John Day Dam. Channel and jetty maintenance, improvements, dredging, and operational locks are all necessary to increase freight throughput and decrease delay and costs for marine freight. Repair and maintenance of jetties on the coast and the jetty on the Columbia River are necessary to protect navigational channels and marinas. Investments in navigational aids are necessary to improve safety and efficiency on the marine freight network. Figure 4.2 displays Oregon ports as well as locks and marine highways.

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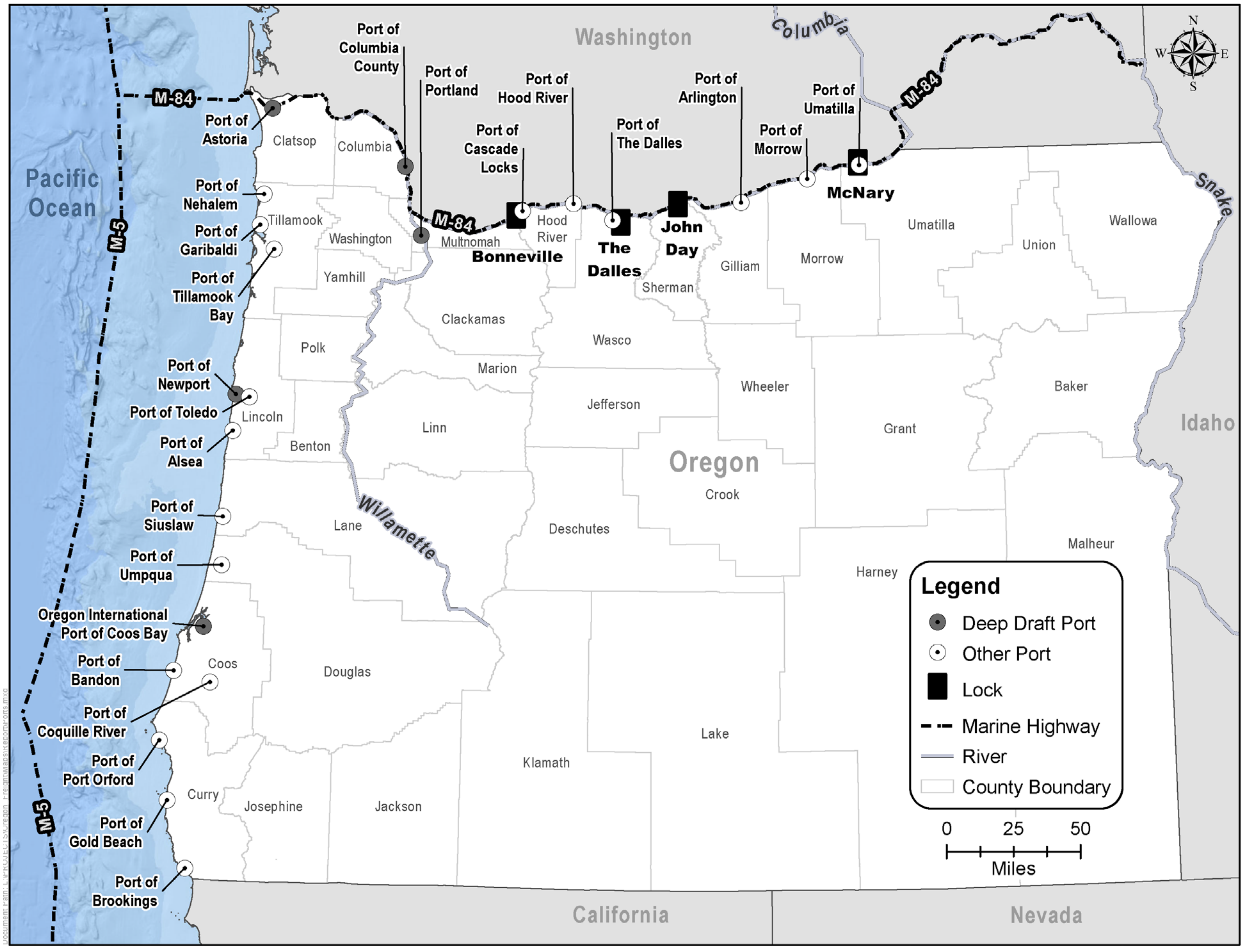
[56] Parsons Brinckerhoff. December 2009. *Ports 2010: A New Strategic Business Plan for Oregon's Statewide Port System*. https://www.oregon.gov/biz/Publications/Ports/2010PortPlan.pdf

[57] BST Associates, Port of Portland Container Service Forecast and Economic Contribution Assessment, Final Report, October 27, 2021.

[58] https://www.oregon.gov/biz/Publications/Ports/2010PortPlan.pdf

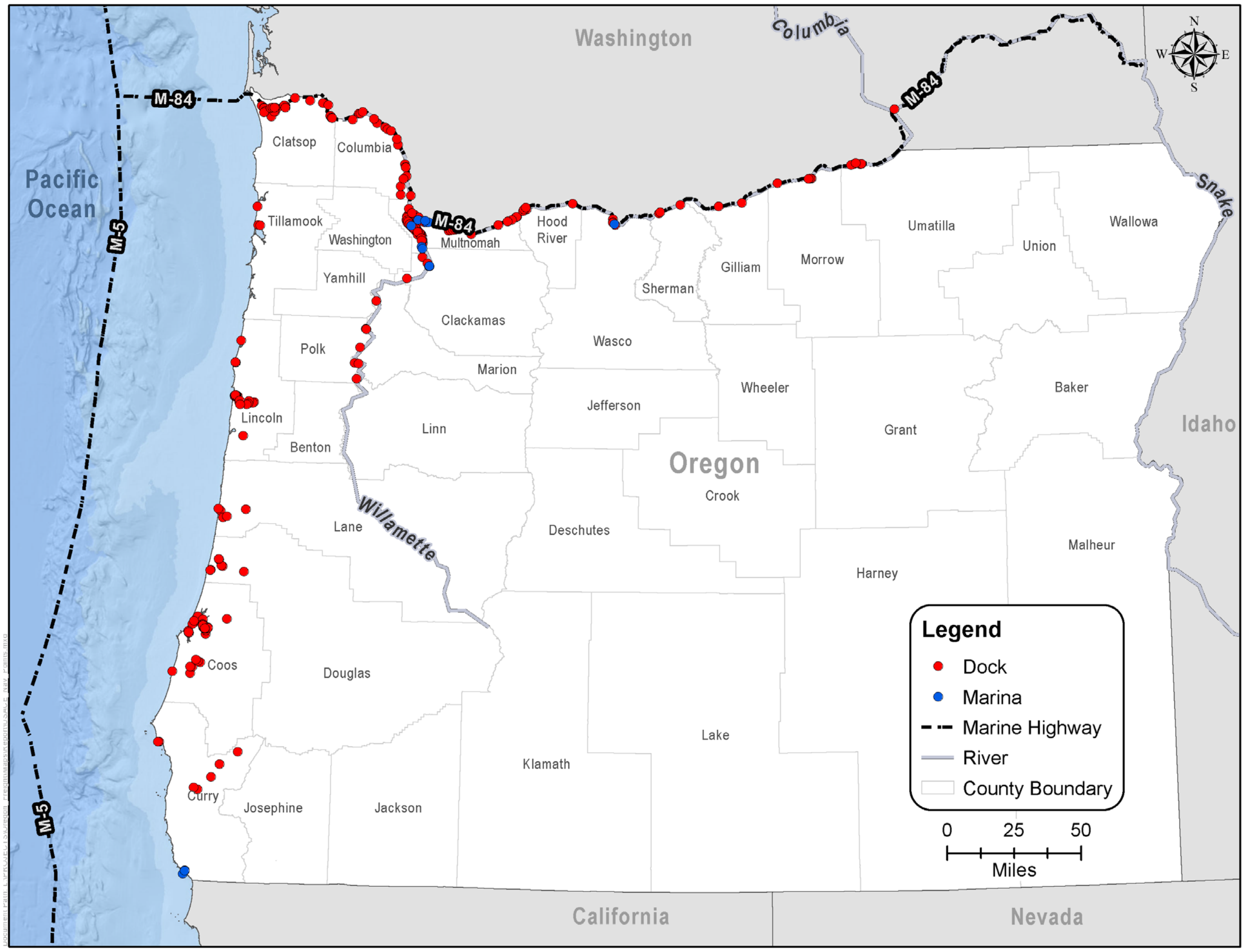
Figure 4.2 Oregon Ports, Locks, and Marine Highways



Source: WSP Analysis of Oregon Geospatial Enterprise Office Data. 2020.

In addition to public ports, Oregon has a number of private commercial docks. Figure 4.3 displays all commercial public and private docks and marinas in the state.

Figure 4.3 All Commercial Docks and Marinas in Oregon



Source: WSP Analysis of U.S. Army Corps of Engineers (USACE) data. [USACE Institute for Water Resources, Navigational Infrastructure: Port and Waterways Facilities](). February 2023. https://publibrary.planusace.us/#/document/ee9fb670-0452-462b-ce5b-359742699112

Oregon has a total of 332 docks, 151 of which are associated with the state's public ports and 181 of which are privately owned. Table 4.1 tabulates the number of docks by county.

Multnomah County has the most docks at 120 followed by Coos and Clatsop Counties at 47 and 37, respectively.

Table 4.1 Public and Private Docks by County

COUNTY	DOCKS
Benton	0
Clackamas	4
Clatsop	37
Columbia	23
Coos	47
Curry	11
Douglas	9
Gilliam	2
Hood River	6
Lane	5
Lincoln	32
Linn	0
Marion	7
Morrow	6
Multnomah	120
Polk	2
Sherman	3
Tillamook	4
Umatilla	8
Wasco	6
Yamhill	0

Source: WSP Analysis of U.S. Army Corps of Engineers (USACE) data. USACE Institute for Water Resources, Navigational Infrastructure: Port and Waterways Facilities. February 2023. https://publibrary.planusace.us/#/document/ee9fb670-0452-462b-ce5b-359742699112

4.2.4 Intermodal Terminals

Intermodal freight movement helps move goods efficiently from one mode to another, including marine terminals and truck-rail facilities that ultimately help move goods to and from international markets. The state conducted an inventory of intermodal terminals/businesses as part of the Oregon Freight Intermodal Connector Study (OFICS) that sought to identify needs and conditions of the existing NHS freight intermodal connectors, and to identify additional intermodal connectors beyond those. Appendix C of the study includes a list of intermodal terminals/businesses along with their commodity, location and whether or not they are in the NHS.[59] Chapter 8 describes this study, findings, and identified needs in more detail.

59 Link to OFICS appendix: https://digital.osl.state.or.us/islandora/object/osl%3A102529/datastream/OBJ/view

4.2.5 Aviation System

The Oregon Aviation Plan (2018)[60] includes 97 public-use airports in the state's airport system. The Portland International Airport, operated by the Port of Portland, handles the majority of the airfreight movements in the state. Despite the dominance of Portland International Airport, other regional airports in Oregon provide capacity for the movement of airfreight.

The Oregon Aviation Plan contains a system of five airport classification categories:

- **Category I –** commercial service airports
- **Category II –** urban general aviation airports
- **Category III –** regional general aviation airports
- **Category IV –** local general aviation airports
- **Category V –** remote access/emergency service airports

Of the five categories, measurable air-cargo shipment volumes occur only at 14 Category I, II, and III airports listed in Table 4.2 and shown in Figure 4.4. These airports provide integrated express air-cargo service 5 days a week.

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60 https://www.oregon.gov/aviation/plans-and-programs/Pages/oap.aspx#fce64a72-e3c7-4cc8-a961-dfb843a1f804

Table 4.2 Oregon Aviation Plan Classified Airports

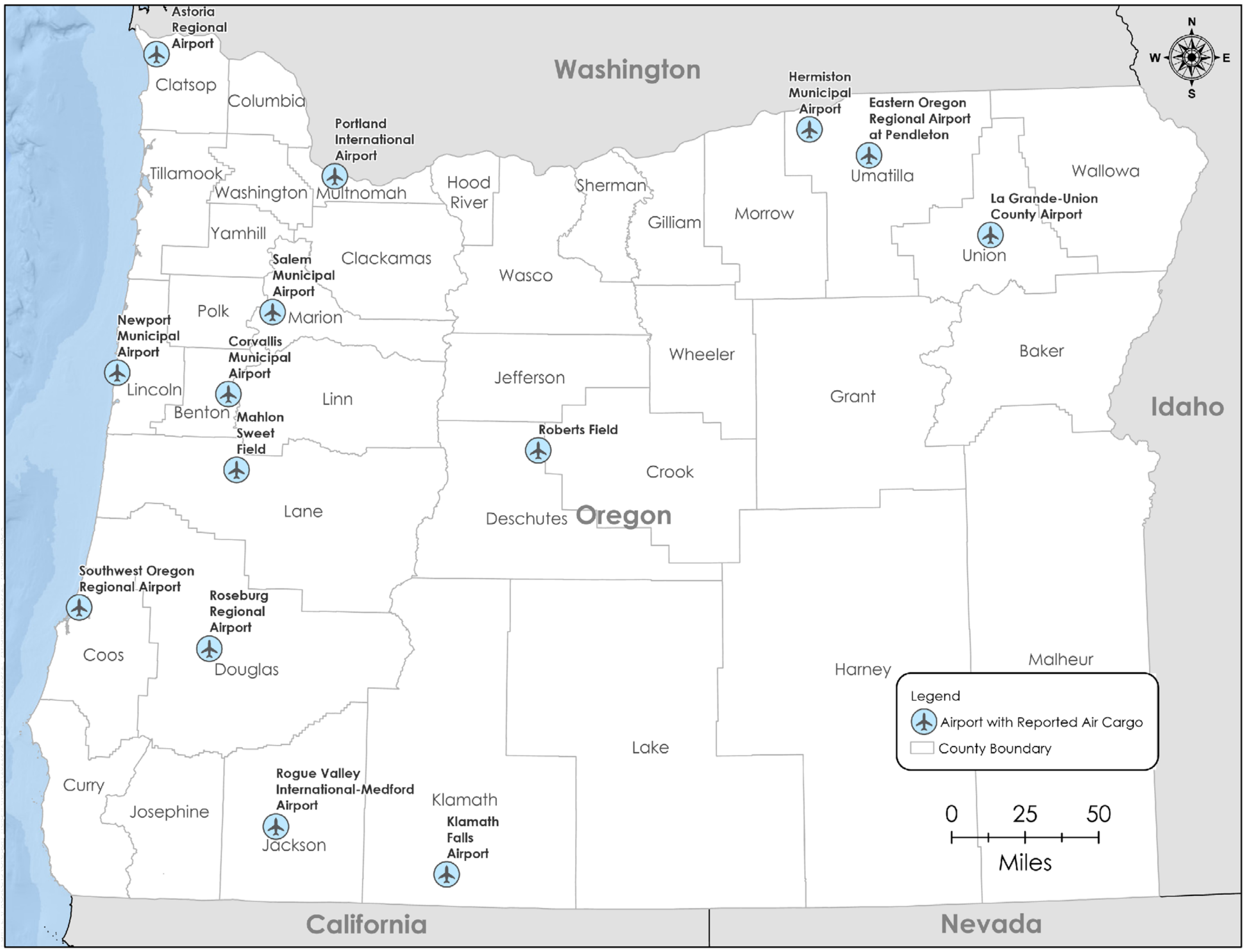
CLASSIFICATION	AIRPORT (LOCATION)*
Category I: Commercial Service Airports	▪ Eastern Oregon Regional Airport (Pendleton)[1, 2] ▪ Eugene Airport – Mahlon Sweet Field[2] ▪ Klamath Falls International Airport[2] ▪ Portland International Airport[2] ▪ Redmond Municipal Airport – Roberts Field[2] ▪ Rogue Valley International Airport (Medford)[1, 2] ▪ Southwest Oregon Regional Airport (North Bend)[1, 2]
Category II: Urban General Aviation Airports	▪ Astoria Regional Airport[2] ▪ Aurora State Airport ▪ Bend Municipal Airport ▪ Corvallis Municipal Airport[2] ▪ McMinnville Municipal Airport ▪ Newport Municipal Airport[2] ▪ Portland Downtown Heliport ▪ Portland – Hillsboro Airport ▪ Portland – Troutdale Airport ▪ Salem Municipal Airport - McNary Field (Salem)[1, 2] ▪ Scappoose Industrial Airpark
Category III: Regional General Aviation Airports	▪ Ashland Municipal Airport – Sumner Park Field ▪ Baker City Municipal Airport ▪ Bandon State Airport ▪ Burns Municipal Airport ▪ Columbia Gorge Regional (The Dalles)[1] ▪ Grant County Regional Airport - Ogilvie Field (John Day)[1] ▪ Grants Pass Airport ▪ Hermiston Municipal Airport[2] ▪ LaGrande /Union County Airport[2] ▪ Lake County Airport (Lakeview)[1] ▪ Ontario Municipal Airport ▪ Roseburg Regional Airport[2] ▪ Tillamook Airport

Source: Oregon Department of Aviation. 2018. Oregon Aviation Plan v6.0. https://www.oregon.gov/aviation/plans-and-programs/Pages/oap.aspx

[1] Location is shown in parentheses when the airport name does not clearly identify its location.

[2] Denotes the airports that move air cargo.

Figure 4.4 Oregon Airports that Carry Air Cargo



Source: WSP, based on information from Oregon Department of Aviation. 2018. Oregon Aviation Plan v6.0. Figure 6.6, Oregon Markets with Sufficient Air Cargo Service. https://www.oregon.gov/aviation/plans-and-programs/Pages/oap.aspx.

4.2.6 Pipeline System

Pipelines are privately owned but are an important part of the multimodal freight network, responsible for delivering petroleum and related products throughout Oregon. The largest pipelines in the state tend to parallel major freight corridors, such as I-5, I-84, and U.S. 97. Private companies own the pipeline system in Oregon completely, which limits the amount of public information available regarding system capacity and planning.

Pipelines in Oregon carry two primary commodities:

- **Natural Gas.** There are more than 18,000 miles of natural gas pipeline in Oregon.[61] These lines supply three gas utilities that provide power to households, businesses and industrial users.[62] Oregon does not have any gas reserves, so natural gas must be imported to the state.
- **Refined Petroleum Products.** Over 300 miles of petroleum product pipelines in Oregon supply the state with gasoline, diesel, jet fuel, and other refined petroleum products.[63] Oregon has no petroleum refineries, so like natural gas, all of its petroleum must be imported. Oregon relies especially on the Olympic Pipeline, which connects Puget Sound refineries to distribution terminals in Portland.

Although the pipeline system is privately owned and operated, it does interact with the rest of the state's transportation network. Petroleum product pipelines, for instance, create demand for truck transportation at their termini since fuel products must be shipped from the terminal to their final destination. If Oregon's pipeline systems reach capacity in the future and no new ones are built, these shipments would have to be made by truck, with potential negative impacts such as infrastructure wear and tear and increased roadway congestion.[64]

4.3 STRATEGIC FREIGHT NETWORK SELECTION METHODOLOGY AND DESCRIPTION

Chapters 2 and 3 summarize the importance of freight-dependent industries to Oregon. These chapters provide background information on factors that drive freight transportation demand in Oregon: the economy, critical freight-dependent industries, and their supply chains. The importance of freight-dependent industries to the Oregon economy is highlighted by their contribution to total Oregon GSP as described in Chapter 2.

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61 American Gas Association website: www.aga.org/policy/state/natural-gas-state-profiles/OR/

62 Oregon Department of Energy website: www.oregon.gov/energy/energy-oregon/Pages/Oregon-Utilities.aspx

63 ODOT, Oregon Transportation Plan: Transportation Needs Analysis Summary Report 2005 -2030, July 14, 2005.

64 According to the *Oregon Transportation Plan: Needs Analysis Summary Report 2005*, current and near-term capacity of petroleum pipeline is adequate. However, capacity issues are expected, which may require barges and trucks to transport petroleum. The report also states that natural gas pipelines will require additional improvements to meet future demand, which the natural gas industry should be able to handle over the next 20 years.

To ensure a long-term competitive advantage for Oregon freight-dependent industries, it is necessary to define the elements of the transportation system used by these industries. This analysis highlights the strategic routes for each freight-dependent industry.

The approach to defining the strategic freight network included the following steps:

1. A set of eight freight-dependent industries was identified by using information contained in Chapters 2 and 3. The Oregon Statewide Integrated Model (SWIM)[65] was used to estimate regional commodity production and consumption for each industry.
2. SWIM was used to assign daily truck freight commodity flows for Oregon's state highways system. Facilities carrying the largest proportion of freight flows by tonnage and values are reported.
3. For each industry, the highways carrying the largest value and tonnage of truck freight were considered to be strategic for those industries.
4. Once these strategic highways were defined based on industry use, corridors and networks were identified that connect them to centers of industry activity and infrastructure serving other freight modes.

The following sections present more detail on how this industry-level view of freight flows in the state was used to define the strategic freight network. Information on Oregon commodity flows can be found in Chapter 2.

4.3.1 Freight Industries Strategic Network Methodology

Based on the data summarized in Chapters 2 and 3, the following freight-dependent industries were analyzed to determine which corridors they use to transport goods to markets and receive supplies:

- Agriculture, Forestry and Fishing
- Computer and Electronics Manufacturing
- Food Manufacturing
- Machinery Manufacturing and Metals Manufacturing
- Wholesale Trade
- Wood and Paper Manufacturing

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65 The Oregon SWIM model uses detailed relationships between the economy, businesses, and infrastructure to disaggregate the Freight Analysis Framework data and assign flows to major highway corridors in the state. Modeling relationships capture the production and consumption of commodities throughout the state by businesses in different sectors. https://www.oregon.gov/odot/Planning/Pages/Technical-Tools.aspx#SWIM

- Retail Trade
- Services and All Other

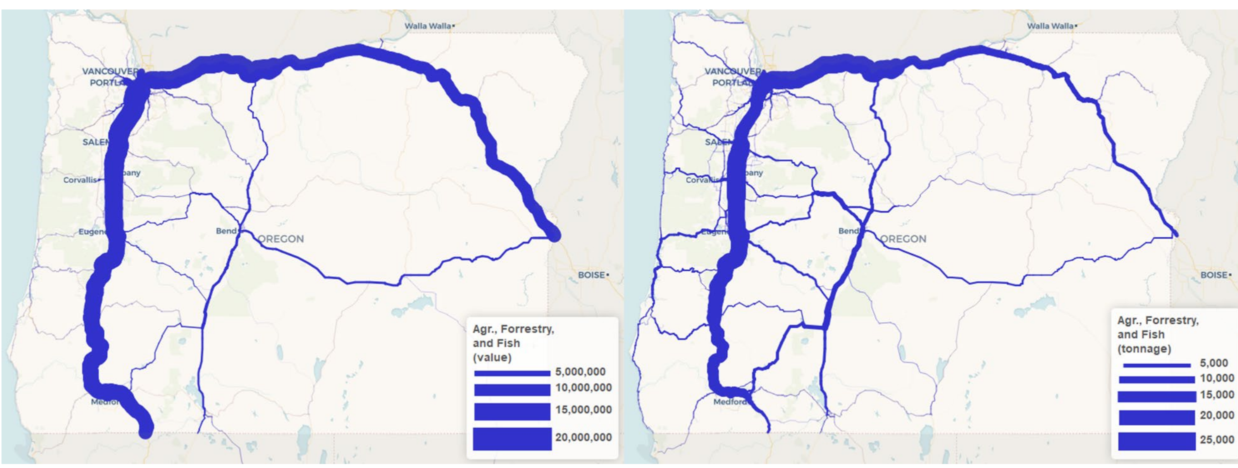
Each industry was analyzed and represented in terms of the value of freight moved and tonnage.[66]

Figure 4.5 through Figure 4.12 show estimated average daily statewide commodity flows by value and tonnage for 2019 for each of the eight freight-dependent industry groups based on their commodity production and consumption. The maps are designed to illustrate the highway corridors over which industry moves a majority of its goods.

4.3.1.1 Agriculture, Forestry, and Fishing

Figure 4.5 depicts value and tonnage flows for the Agriculture, Forestry and Fishing industry sector. Commodity flows by value for this industry group occur primarily on the I-5 and I-84 corridors, with value most heavily concentrated around Portland. Tonnage flows are more dispersed across the Oregon highway system. The heaviest tonnage flows occur on the I-5 corridor, providing access to agriculture production and markets in California and Washington, and on I-84 east of U.S. 97. Additional high tonnage flows are seen on U.S. 97 south of Bend and north of Chemult. I-5 exhibits an interesting flow behavior where value flows are relatively consistent throughout the state but with diminishing tonnage flows toward the southern border with California.

Figure 4.5 Estimated Agriculture, Forestry and Fishing Industry Commodity Flows by Value (left) and Tonnage (right), 2019



Source: WSP analysis of ODOT SWIM output data for year 2019

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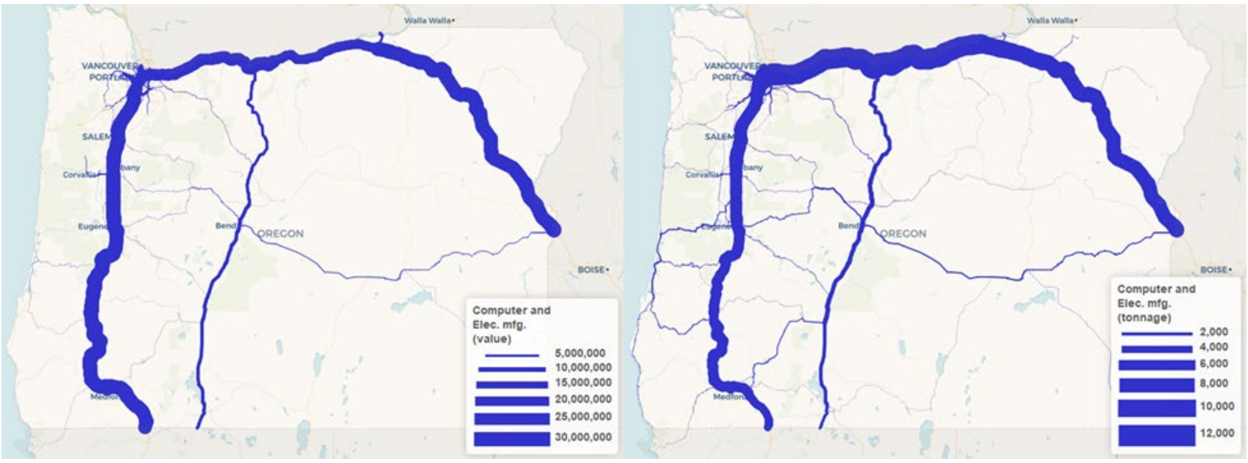
66 Information produced by SWIM based on FAF 5.2 was used to estimate flows by industry.

4.3.1.2 Computer and Electronics Manufacturing

Figure 4.6 depicts value and tonnage flows for the Computer and Electronics Manufacturing industry group. High-value computer and electronic products are seen to travel across I-5 and I-84. The largest tonnage flows in the state occur along the northern I-84 corridor, concentrating west of U.S. 197. U.S. 97 is also utilized to transport computer and electronic goods albeit at much lesser extent than I-84 and I-5.

Figure 4.6 Estimated Computer and Electronics Manufacturing Industry Commodity Flows by Value (left) and Tonnage (right), 2019

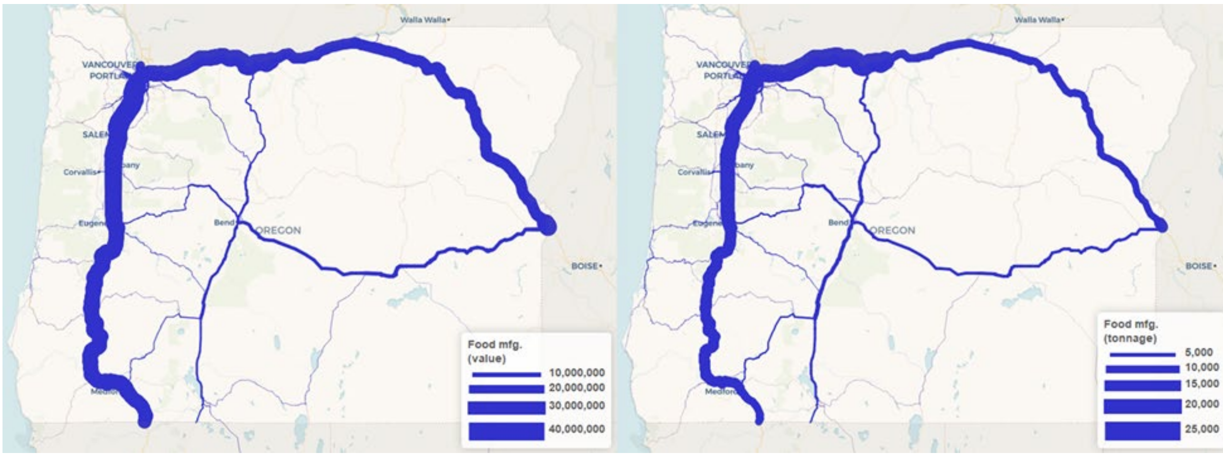


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.1.3 Food Manufacturing

Figure 4.7 depicts value and tonnage flows for the Food Manufacturing industry group. The largest flows by value for food manufacturing products are transported along the I-5 and the I-84 corridors. Tonnage flows are highest around Portland, again with a drop-off at Biggs Junction and around Eugene. Unlike other industry groups, Food Manufacturing flows by both tonnage and value are relatively large for the state highways east of the Cascades, especially along U.S. 20 between Santiam Junction and Ontario.

Figure 4.7 Estimated Food Manufacturing Industry Commodity Flows by Value (left) and Tonnage (right), 2019

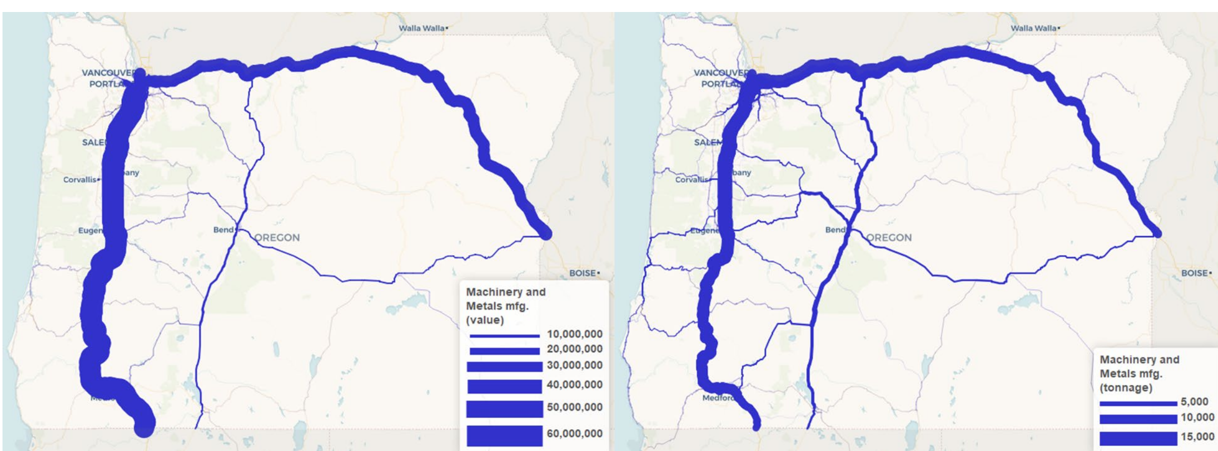


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.1.4 Machinery Manufacturing and Metals Manufacturing

Figure 4.8 depicts value and tonnage flows for the Machinery Manufacturing and Metals Manufacturing industry group. Value attributed to machinery and metals manufacturing is highest along the entire I-5 corridor, reflecting the concentration of industry and city centers in the western part of the state. Tonnage flows are concentrated around Portland and reduce the farther east and south for I-84 and I-5, respectively. Relatively high tonnage flows are also seen on U.S. 97 south around Bend and north of Chemult.

Figure 4.8 Estimated Machinery and Metals Industry Commodity Flows by Value (left) and Tonnage (right), 2019

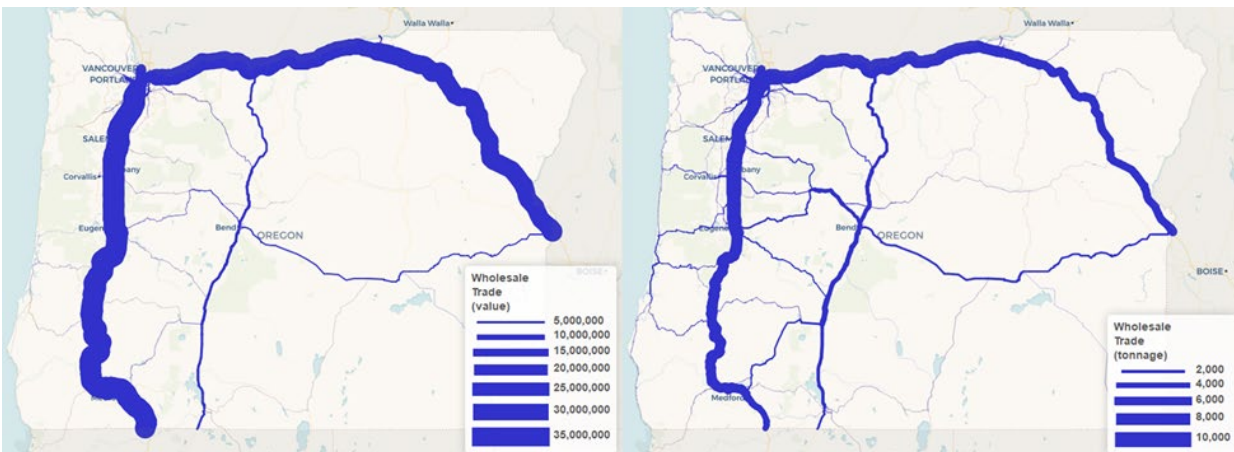


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.1.5 Wholesale Trade

Figure 4.9 depicts value and tonnage flows for the Wholesale Trade industry group, which shows a strong disparity between value and tonnage flows for this industry group. The I-5 and I-84 corridors seem to experience similar wholesale trade flows by tonnage, but I-5 appears to contain higher-value flows, indicating the goods along this corridor have a larger value/tonnage ratio than along I-84. Higher-value flows are mainly restricted to the I-5 and I-84 corridors whereas tonnage is spread across several additional freight corridors such as U.S. 97, U.S. 20, and U.S. 197. Freight on these additional corridors must have lower-value/tonnage ratios.

Figure 4.9 Estimated Wholesale Trade Industry Commodity Flows by Value (left) and Tonnage (right), 2019

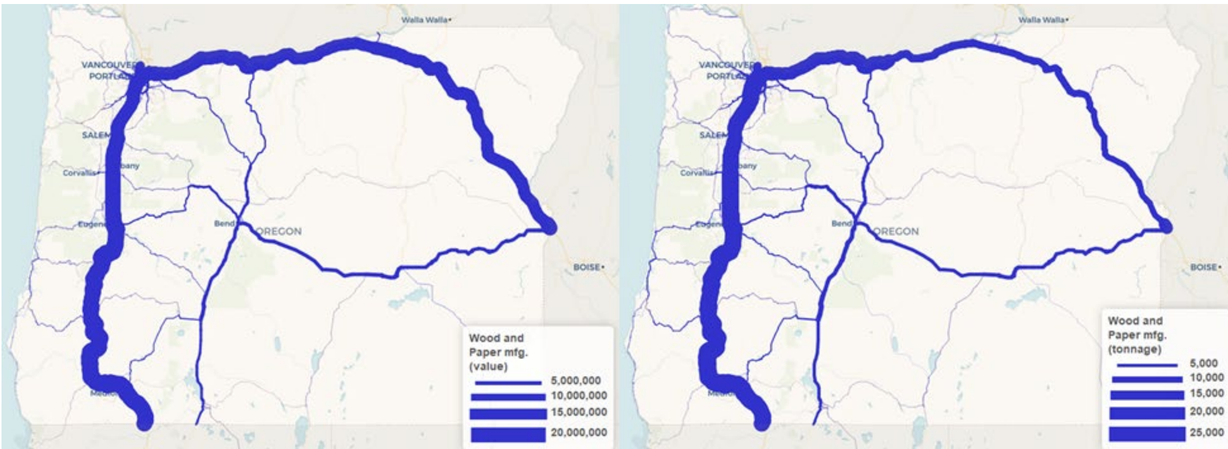


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.1.6 Wood and Paper Manufacturing

Figure 4.10 depicts value and tonnage flows for the Wood and Paper Manufacturing industry group. The I-5 corridor and I-84 corridor west of Biggs Junction experience substantial wood and paper products tonnage flows; there is a noticeable drop in tonnage east of Biggs Junction. Relatively large tonnage flows are seen along the central U.S. 97 corridor and on U.S. 20 east of Santiam Junction (U.S. 20 and OR 22). Value flows are comparable to tonnage flows across the state.

Figure 4.10 Estimated Wood and Paper Manufacturing Industry Commodity Flows by Value (left) and Tonnage (right), 2019

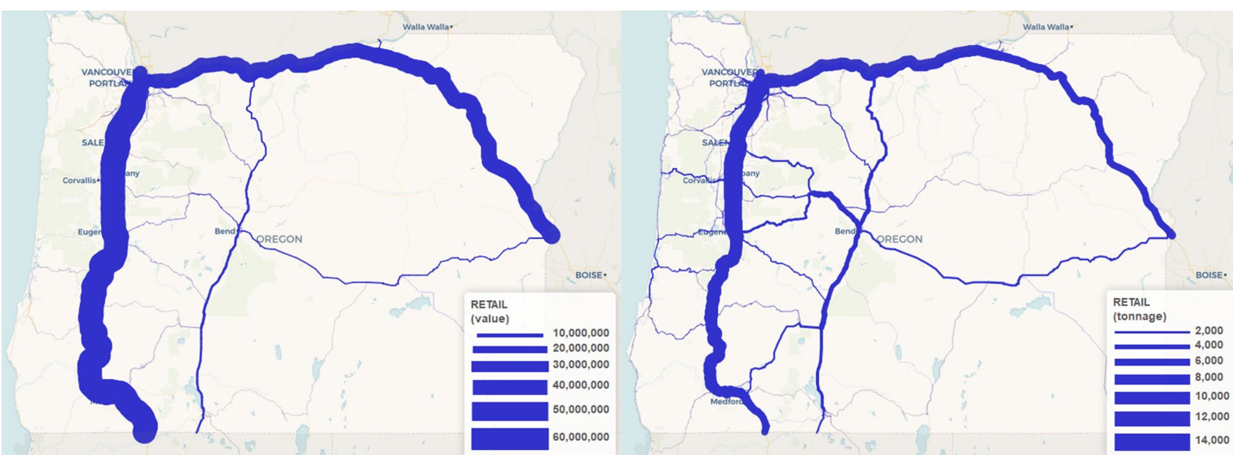


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.1.7 Retail Trade

Figure 4.11 depicts value and tonnage flows for the Retail Trade industry group. Like wholesale products, retail trade products value and tonnage vary noticeably along Oregon freight corridors. Most of the retail value is exclusively on the I-5 and I-84 corridors, with little value flowing through central Oregon. This is contrasted by tonnage flows being fairly spread out across the Oregon network. This is likely due to higher-value goods being exported out of or through the state. Tonnage is largest on I-5 between Eugene and Portland. On U.S. 97, the heaviest concentrations of retail tonnage occur between Chemult and Madras, and on U.S. 20 between Santiam Junction and U.S. 97.

Figure 4.11 Estimated Retail Trade Industry Commodity Flows by Value (left) and Tonnage (right), 2019

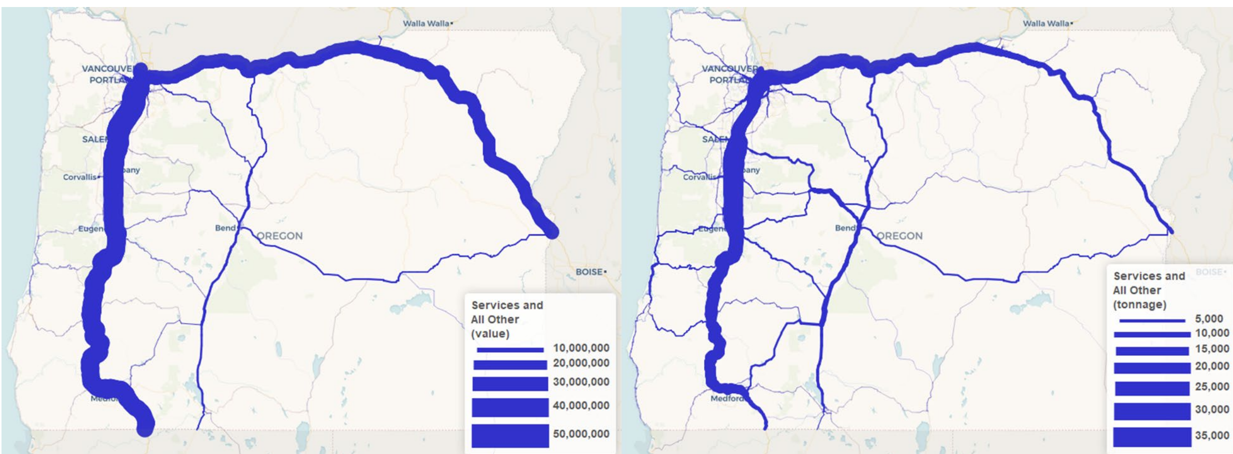


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.1.8 Services and All Other

Figure 4.12 depicts value and tonnage flows for the Services and All Other industry group. The figure depicts tonnage and value flows along Oregon roadways for the Services and All Other products industry sector. The largest tonnage flows for this industry group occur along the I-5 and I-84 corridors with a large concentration located between Eugene and Salem and around Portland Industry tonnage flows appear to be inconsistent as tonnage decreases south of Eugene along the I-5 corridor and along the entire I-84 corridor further in the East toward Idaho. In contrast, the value flows along I-5 and I-84 remain relatively consistent, indicating changes in value/tonnage for goods transported across these facilities in the southern and eastern portions of the state. There are additional corridors with smaller but still substantial tonnage flows all along U.S. 97 and on U.S. 20 between I-5 and US9.

Figure 4.12 Estimated Services and All Other Industry Commodity Flows by Value (left) and Tonnage (right), 2019

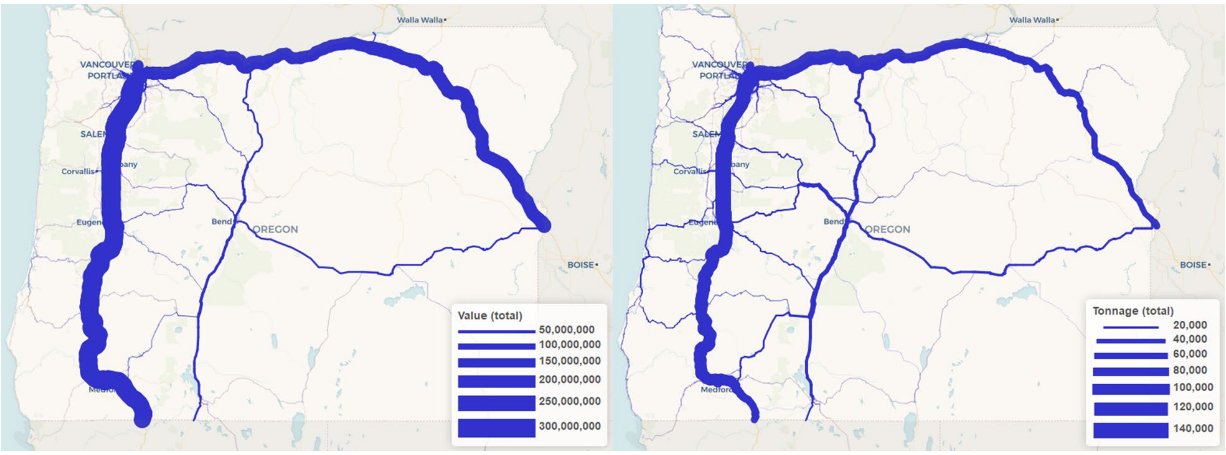


Source: WSP analysis of ODOT SWIM output data for year 2019

4.3.2 Summarizing Freight-Industry Freight Flows and Defining the Strategic System

Figure 4.13 depicts total value and tonnage flows for products transported on the Oregon highway system. For Oregon, the largest flow by value travel mainly along I-5 and I-84, with flows on I-5 being significantly higher than I-84. Tonnage flows are largest around Portland and north of Eugene and begin to fall in the east on I-84 and in the south for I-5, reflecting the location of major urban areas in the northern and western parts of the state.

Figure 4.13 Total Statewide Industry Commodity Flows by Value (left) and Tonnage (tonnage), 2019



Source: WSP analysis of ODOT SWIM output data for year 2019

Table 4.3 and Table 4.4 highlight how each industry utilizes the major corridors. This information is important in defining the strategic freight network, as the corridors that carry high levels of goods for each industry are critical to the state's economic health and to businesses utilizing these corridors. Table 4.3 shows of total value of shipments by each industry in each corridor and Table 4.4 shows the percentage of ton-miles of products shipped by each industry in each major corridor.

From the data in these tables and figures, it becomes apparent that the I-5 corridor moves more freight than any other corridor named in these tables both by freight value and total tonnage. It represents the dominant south-north route in the state. I-84 comes in second carrying about half of the tonnage and value as I-5. It represents the main east-west corridor serving the state. The other corridors carry far less by both tonnage and volume.

Despite the dominance of the I-5 and I-84 corridors, the other named corridors play key roles in moving freight throughout the state. U.S. 97 is a critical route that adds redundancy to north-south freight travel, connects California to the Washington border, and contains several critical junctions with east-west routes U.S. 20, OR 138, OR 58, and U.S. 26. The junction with U.S. 20 is particularly important due to that corridor's important east-west function through the center of the state from the Oregon coast to the Idaho border. And as mentioned previously, OR 138, OR 58, and U.S. 26 also play important roles in adding east-west redundancy through Cascades.

Based on this analysis, the following four corridors are strategic in terms of their significance to major freight-dependent industries:

- Western Corridor (I-5)
- Columbia River Corridor (I-84)
- U.S. 20 Corridor[67]
- Central Oregon Corridor (U.S. 97)

The next section describes how these and other corridors provide critical connections to centers of freight-dependent economic activity in the state.

67 U.S. 26 is also significant to Oregon industries from Portland to Idaho. However, U.S. 20 carries more freight by industry (see Table 4.2 and Table 4.3), and it also acts as an important highway for remote areas in southeastern and south central Oregon with little other east-west highway access. Selecting both would not be warranted, as they run parallel to each other for much of eastern and central Oregon.

Table 4.3 Industry Commodity Flows by Percentage of Value, per Corridor

CORRIDOR	TOTAL	AGRICULTURE FORESTRY & FISHING	COMPUTER & ELECTRONICS	FOOD MFG.	MACHINERY AND METALS	RETAIL TRADE	SERVICES & OTHER	WHOLESALE TRADE	WOOD & PAPER
I-5	45	39	41	41	49	55	44	48	36
I-84	24	26	26	24	23	22	23	25	24
All Other Facilities	19	24	19	21	19	13	22	16	24
I-97	6	5	9	5	5	5	5	6	6
US 20	3	3	2	5	2	2	2	2	5
OR 26	3	3	3	3	3	2	3	2	4

Source: WSP analysis of ODOT SWIM output data for year 2019

Table 4.4 Industry Commodity Flows by Percentage of Total Tonnage, per Corridor

CORRIDOR	TOTAL	AGRICULTURE FORESTRY & FISHING	COMPUTER & ELECTRONICS	FOOD MFG.	MACHINERY AND METALS	RETAIL TRADE	SERVICES & OTHER	WHOLESALE TRADE	WOOD & PAPER
I-5	33	30	30	35	33	33	31	32	35
All Other Facilities	33	38	28	29	31	33	38	32	30
I-84	17	15	26	20	19	16	15	18	17
I-97	8	8	10	7	8	8	7	9	8
US 20	5	5	3	5	4	6	4	5	6
OR 26	4	4	4	4	4	4	4	4	4

Source: WSP analysis of ODOT SWIM output data for year 2019

4.4 STRATEGIC FREIGHT CORRIDORS AND CONNECTIVITY

Connectivity in this section refers to the ability of the freight network to move goods safely and efficiently between important components of the Oregon freight network. This includes connectivity between major highways and intermodal facilities such as airports or marine ports, between all regions of the state, and between key industries and the freight network. Connectivity is critical because it allows businesses and industries to move their goods throughout Oregon and beyond in a cost-effective manner. Four multimodal corridors were selected as major corridors whose connectivity is vital to the state economy.

4.4.1 Western Corridor

The Western Corridor is a split corridor with several components:

- Marine Highway 5 (M-5)
- North-south I-5
- All parallel truck/rail facilities that connect Oregon with the rest of the nation

M-5 is a designated marine highway in the Pacific Ocean that connects Oregon with other West Coast ports from Canada to Mexico. I-5 truck and rail facilities connect the three largest population centers of Portland, Eugene, and Salem and are the state's primary arteries for truck and rail freight shipments. They connect Oregon's primary population and production centers to California and Washington and beyond to Mexico and Canada. Together, this Western Corridor connects Oregon with the national freight transportation system via the following:

- Several truck, rail, seaport, and airport facilities, including I-84, U.S. 30, U.S. 20, and U.S. 199
- Class I and short-line railroads
- Marine facilities at Astoria, Coos Bay, Port of Columbia County, and the Port of Portland
- Air facilities at Portland International Airport

These connections are critical for the movement of the majority of goods produced throughout Oregon and on the I-5 corridor.

The Western Corridor contains some of the major intermodal facilities in the state, which move both heavy and valuable goods to markets around the world. Important intermodal infrastructure on the I-5 corridor includes the following features listed in Table 4.5:

- Portland International Airport
- Port of Portland
- Port of Astoria
- Port of Coos Bay
- Port of Columbia County
- Teevin Terminal

Table 4.5 Western Corridor Freight Facilities, by ACT

ACTS	FACILITIES PROVIDING CONNECTIVITY*	OTHER FREIGHT FACILITIES
Portland Metro Region and ODOT Region 1	▪ I-84, I-205, I-405 ▪ U.S. 30, U.S. 26, OR 99W ▪ OR 6	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** Oregon Pacific Railroad, Portland & Western Railroad, Portland Terminal, Peninsula Terminal ▪ **Major Commercial Ports:** Port of Portland ▪ **Categories I, II and III Airports:** Portland International Airport, Portland – Hillsboro Airport, Portland –Troutdale Airport
Northwest Oregon ACT	▪ U.S. 101, U.S. 30, U.S. 26, OR. 99W ▪ OR 6	▪ **Short-line rail:** Portland & Western Railroad ▪ **Major Commercial Ports:** Port of Astoria, Port of Columbia County ▪ **Categories I, II and III Airports:** Astoria Regional Airport, Tillamook Airport
Mid-Willamette Valley ACT	▪ U.S. 101 ▪ OR 22, OR 99W, OR 18	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** Hampton Railway, Willamette Pacific Railroad, Portland Western Railroad, Willamette Valley Railway, Albany Eastern Railroad ▪ **Categories I, II and III Airports:** Aurora State Airport, Salem McNary Field Airport, McMinnville Municipal Airport
Cascades West ACT and Lane County	▪ U.S. 20, U.S. 101 ▪ OR 99W, OR 58, OR 126	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** Willamette Pacific Railroad, Albany and Eastern Railroad, Central Oregon & Pacific Railroad, Coos Bay Rail Link, Albany Eastern Railroad ▪ **Categories I, II and III Airports:** Corvallis Municipal Airport, Eugene Airport/Mahlon Sweet Field, Newport Municipal Airport
South West ACT	▪ U.S. 101 ▪ OR 126, OR 42, OR 38	▪ **Short-line rail:** Central Oregon & Pacific Railroad, Coos Bay Rail Link, Longview, Portland & Northern Railway ▪ **Major Commercial Ports:** Port of Coos Bay ▪ **Categories I, II and III Airports:** Bandon State Airport, Roseburg Regional Airport, Southwest Oregon Regional Airport
Rogue Valley ACT	▪ U.S. 199 ▪ OR 227, OR 140	▪ **Short-line rail:** Central Oregon & Pacific Railroad, WCTU Railway ▪ **Categories I, II and III Airports:** Ashland Municipal Airport, Grants Pass Airport, Rogue Valley International-Medford Airport

* Connector facilities in this context do not include National Highway System intermodal connectors or other critical local roads mentioned in earlier chapters.

4.4.2 Columbia River Corridor

The Columbia River Corridor, including I-84 and Marine Highway 84 (M-84), is the primary link between western Oregon (including Portland) and the east and is one of the few transportation corridors in North America where truck, barge, and rail transportation run parallel to one another. Eventually, I-84 links with I-80 in Utah, which connects to the large freight hub of Chicago. For most goods originating in the Portland and Willamette Valley region, I-84 is the route used to move goods to the Midwest and beyond. As a result, this is a heavily used freight corridor that is essential to the Oregon economy. Within Oregon, this corridor connects with Portland, the I-5 corridor, Portland International Airport, and the Port of Portland and other ports on the Columbia River. The western portion of I-84 connects Portland to central Oregon via U.S. 97 as well as providing a kay connector for freight between the Portland metropolitan area and southeastern Washington via Hood River for several select industry flows. In addition to the interstate, Oregon's major rail corridor that connects Portland and other West Coast cities with the Midwest runs along the Columbia River. Both Union Pacific and BNSF operate service that connects Portland with destinations in states to the east of Oregon. Noteworthy is the dependence of the computers and electronics manufacturing industry on the I-84 corridor; this is a high-growth industry that makes up a large part of Oregon's expected future growth.

Table 4.6 Columbia River Corridor Freight Facilities, by ACT

ACTS	FACILITIES PROVIDING CONNECTIVITY	OTHER FREIGHT FACILITIES
Portland Metropolitan Region and ODOT Region 1	See Information in Table 4.4	
Lower John Day ACT	▪ U.S. 26, U.S. 97, U.S. 197	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** Mount Hood Railroad, Palouse River Coulee City Railroad ▪ **Categories I, II and III Airports:** Columbia River Gorge Regional Airport
North East ACT	▪ I-82 ▪ U.S. 26 ▪ OR 204, OR 82, OR 11	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** Palouse River Coulee City Railroad, Wallowa Union Railroad, Idaho Northern Pacific Railroad ▪ **Major Commercial Port:** Port of Umatilla, Port of Morrow ▪ **Categories I, II and III Airports:** Baker City Municipal Airport, Eastern Oregon Regional Airport, Hermiston Municipal Airport and La Grande/Union County Airport

4.4.3 Central Oregon Corridor

This corridor is a major north-south corridor connecting central Oregon with markets in Washington and California. The largest city in central Oregon is Bend, a metropolitan area with just over 100,000 residents, which is connected by U.S. 97 to I-84. U.S. 97 is the only major north-south freight route east of the Cascades and acts as a relief highway to support I-5 in case of incidents on that interstate.

- In addition to the highway, a major BNSF and Union Pacific rail corridor runs parallel to U.S. 97; it is the major rail line that connects Oregon with California. The U.S. 97 corridor, similar to U.S. 20, connects a large portion of central Oregon that would have insufficient connectivity to major markets such as Portland and the interstate network without its existence. Businesses located in the South Central Oregon ACT and the Central Oregon ACT benefit from the connections to I-84 and California that this route provides. It also provides efficient access to U.S. 20, which allows businesses to move goods to I-5 and to the east.
- The Central Corridor contains two junctions that connect east-west and north-south freight movements. The larger of the two junctions is located in Bend and connects U.S. 20 and U.S. 97 and the smaller of two junctions connects U.S. 97 and OR138. These two junctions work to redirect freight flows within central Oregon. U.S. 97 between Bend and OR 138 plays an important role linking freight through the Idaho border to southwestern Washington and visa-versa. In addition, like I-5 in the Western Corridor, over the past 10 years U.S. 97 has seen increased and more consistent freight flows along its entire length, indicating more of a reliance on U.S. 97 by freight as a complete link between California and Washington and for industries located in central Oregon its neighboring states.

Table 4.7 Central Oregon Corridor Freight Facilities, by ACT

ACTS	FACILITIES PROVIDING CONNECTIVITY	OTHER FREIGHT FACILITIES
Lower John Day ACT	See Information in Table 4.5	
Central Oregon ACT	▪ U.S. 20, U.S. 26, U.S. 197	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** City of Prineville Railway ▪ **Categories I, II and III Airports:** Redmond Municipal Airport, Bend Municipal Airport
South Central Oregon ACT	▪ U.S. 20 ▪ OR 58, OR 140	▪ **Class I rail:** BNSF and Union Pacific ▪ **Short-line rail:** The Klamath Northern Railway, Lake Railway ▪ **Major Commercial Port:** Port of Umatilla, Port of Morrow ▪ **Categories I, II and III Airports:** Klamath Falls Airport, Lake County Airport

4.4.4 U.S. 20 Corridor

This is a major east-west connector corridor that runs through the middle of the state, from the Idaho border to Newport on the Oregon coast. The route ties together several important cities from Boise, Idaho, to Bend. In essence, U.S. 20 acts as the major east-west highway for central and eastern Oregon; interstates exist only in the northern and western sections of the state. No major rail corridors run parallel to U.S. 20. However, at the Idaho border, a Class I railroad intersects with U.S. 20; Class I railroads also intersect U.S. 20 in Bend and near Corvallis.

Within eastern Oregon, U.S. 20 connects the north-south corridors of U.S. 97, U.S. 395. In Western Oregon, U.S. 20 connects U.S. 97 to I-5 and the Oregon Coast. It connects the freight-dependent industries in Bend with cities to the east and the I-5 corridor to the west. Without this facility, businesses located near U.S. 20 in the South East Oregon ACT or Central Oregon ACT might struggle to compete because of high travel times and transportation costs to get goods to market.

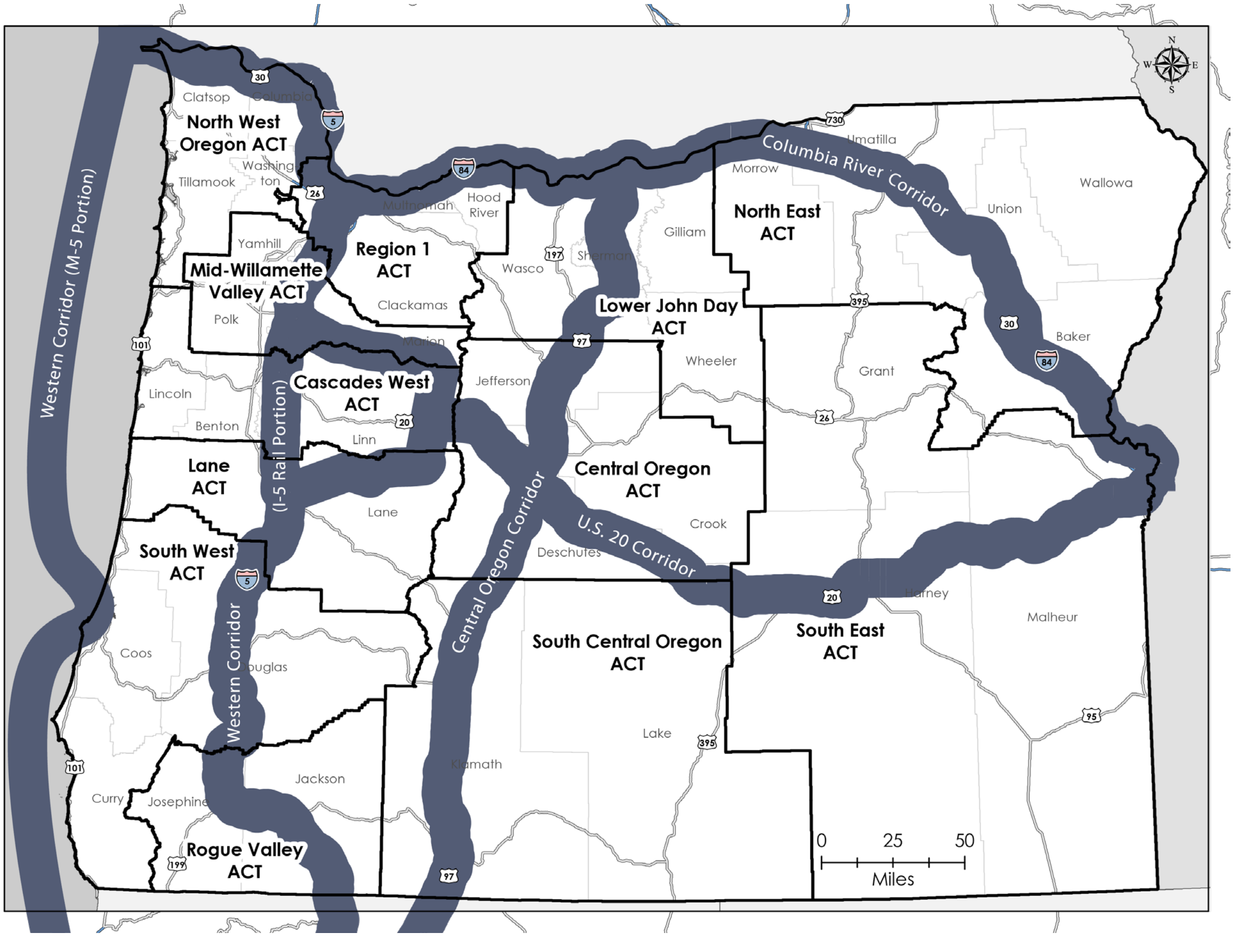
One issue to consider with this route is that 53-foot trailers are not allowed between the U.S. 20/OR 22 junction and Sweet Home. Trucks traveling between Redman/Bend and I-5 must take alternate, parallel routes via OR 22 or OR 126 to circumvent this restriction. As mentioned in Section 4.3, these links are important connectors for companies that produce agricultural, forest/wood, and clay/mineral/stone products between the Western and Central Oregon freight corridors.

Table 4.8 U.S. 20 Corridor Freight Facilities, by ACT

ACTS	FACILITIES PROVIDING CONNECTIVITY	OTHER FREIGHT FACILITIES
South East ACT	▪ I-84 ▪ U.S. 95, U.S. 26, U.S. 395	▪ **Class I rail:** Union Pacific ▪ **Short-line rail:** The Wyoming Colorado Railroad ▪ **Categories I, II and III Airports:** Ontario Municipal Airport, Burns Municipal Airport, Grant County Regional Airport
Central Oregon ACT	See information in Table 4.6	
Cascades West ACT	See information in Table 4.4	

In summary, these corridors, when viewed as a system, provide cross-state or cross-regional access to most of the state. All of the roadways in Figure 4.14 also have parallel Class I railroads except U.S. 20. Since the majority of the population in the state lives along the I-5 corridor, a significant amount of inbound freight needs to be moved there. U.S. 20 and U.S. 97 connect remote, rural places with routes that connect with Portland; this allows goods to be moved to major markets. For further detail on important intermodal connectors in these corridors, a list of the official National Highway System (NHS) intermodal connectors is available from the Federal Highway Administration.[68]

Figure 4.14 Freight Industries Strategic Corridors in Oregon



Source: Prepared by ODOT for the Oregon Freight Plan

68 FHWA Website: https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/

5 Freight and Climate Change

The transportation sector is one of the largest contributors to anthropogenic greenhouse gas (GHG) emissions. According to the U.S. Environmental Protection Agency (U.S. EPA), the transportation sector accounted for the largest portion (27%) of total U.S. GHG emissions in 2020.[69] In Oregon, accounted for an average of 36% of total GHG emissions between 2010 and 2019, of which more than half came from light-duty (i.e., passenger) vehicles.[70] Research and policy have tended to focus on reducing GHG emissions from passenger vehicles and as a result the share of GHG emissions from light-duty vehicles is expected to drop significantly over time. Meanwhile, GHG emissions from freight are likely to exceed those from light-duty vehicles in the coming decades. The Transportation Research Board has found that the conveyance of freight—via rail, commercial trucks, ships, boats and pipelines—accounts for 38% of all transportation-related carbon dioxide emissions[71] or 12% of all human-generated sources in the United States. Thus, addressing freight emissions and efficiency has the potential for significant benefits to overall GHG emissions reduction.

The freight sector can take a number of actions to reduce the GHG emissions it produces, and many of these have begun to be implemented in recent years. Low-cost, high-payoff actions that offer benefits for the freight sector are particularly attractive.

This chapter analyzes trends, actions, and current policy as they relate to freight-sector GHG emissions in the following sections:

- The Oregon policy context, summarizing relevant policies recently adopted in Oregon for climate change mitigation and adaptation
- Technological and regulatory trends affecting freight GHG emissions and infrastructure
- Potential actions to reduce GHG emissions from freight
- Impacts of climate change on freight

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69 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020. (Note: 2020 was an unusual year with reduced transportation activity. Typically, transportation sources account for a higher percentage of total U.S. emissions. In 2019 the figure was 33%).

70 2021 Biennial Zero Emission Vehicle Report, Oregon Department of Energy

71 "Potential Impacts of Climate Change on U.S. Transportation" (TRB 290), Table B-2

5.1 THE OREGON POLICY CONTEXT

The State of Oregon is actively combating climate change through a variety of legislative and regulatory means, as well as collaboration with local governments and other western states. Many of these policies are related to freight and can be grouped into several areas:

5.1.1 Legislative Initiatives

Oregon's Senate Bill 1044, passed in 2019, establishes goals to promote zero-emission vehicle (ZEV) use. The bill requires the Oregon Department of Energy to develop recommended strategies to the legislature to spur EV adoption and report biennially to the legislature. The first Biennial Zero Emission Vehicle Report was submitted in 2021.[72]

In 2020, the Oregon Legislature tried and failed to pass a comprehensive cap and trade bill to combat climate change. As a result, the Governor issued Executive Order 20-04, which established GHG reduction goals for the State of Oregon of at least 45% below 1990 emissions by 2035 and at least 80% below 1990 emissions by 2050. The executive order also directed state agencies to take actions to achieve the reduction targets, with specific directives for key agencies such as the Department of Environmental Quality, Department of Energy, Department of Transportation, and others.

These laws follow earlier legislative efforts to reduce GHG emissions in Oregon, including the Climate Change Integration Act in 2007, which established more modest GHG reduction goals, and a 2010 law directing ODOT in partnership with other state agencies, the private sector, and a variety of other stakeholders to develop a state-level strategy to reduce greenhouse gas emissions from transportation. Developed in 2013, the Statewide Transportation Strategy (STS) continues to provide a roadmap for transportation sector GHG reduction in the state. In 2018, the OTC adopted an amendment to incorporate the STS as part of the OTP. The STS includes a section on freight, with specific strategies for emissions reduction identified in 5-year increments out to 2050.

5.1.2 State Agency Programs and Administrative Rule Changes

- **ODOT Climate Office.** Formed in 2020, the Climate Office is responsible for integrating climate considerations into ODOT business and transportation systems. The office works across ODOT Divisions, with other state agencies, local jurisdictions, and the public to implement policies in three program areas: mitigation, sustainability, and adaptation. Mitigation work focuses on reducing GHG emissions from transportation, including

72 State of Oregon: Energy in Oregon - Biennial Zero Emission Vehicle Report. https://www.oregon.gov/energy/energy-oregon/Pages/BIZEV.aspx

transportation electrification and implementing State of Oregon's directives. Adaptation work focuses on preparing for and responding to the impacts of climate change to transportation infrastructure. The office's Sustainability Program conserves resources, such as materials and fuels used in ODOT business and operations and includes efforts like the Oregon Solar Highways Program. The Climate Office also supports legislative and Governor's Office directives on climate change mitigation, adaptation or sustainability.

- **Department of Environmental Quality (DEQ) Clean Fuels Program.** Initiated in 2016, the goal of the Clean Fuels Program is to reduce GHG emissions by promoting the production of lower-carbon fuels and substitution of alternative fuels for traditional fossil fuels. The program has had success in transitioning Oregon to cleaner and more renewable forms of biofuels, diesel, natural gas, propane, and electricity, reducing tailpipe emissions, and fostering a $100-million-a-year-plus market where investments are being made to increase the production of lower-carbon fuels, spark new innovations in technology, and invest in infrastructure to deliver these fuels across the state. DEQ plans to expand the program through rulemaking, which may include the expansion of the annual average carbon intensity reduction targets beyond 10% and beyond 2025, and other changes to support achievement of the new standards and improve the effectiveness of the program.
- **DEQ Advanced Clean Trucks (ACT) Rule.** Enacted in November 2021, this rule requires medium- and heavy-duty[73] vehicle manufacturers to sell ZEVs as a certain percentage of sales, beginning with the 2025 model year, with percentage increases each year through 2035, reaching 55% for Classes 2b-3; 75% for Classes 4-8; and 40% for Class 7-8 Tractors. As a result of this new rule, the trucking sector is likely to be increasingly interested in policies and initiatives that ensure the availability of the charging and hydrogen fueling infrastructure necessary for compliance.
- **Department of Land Conservation and Development (DLCD) Climate Friendly and Equitable Communities Rulemaking.** To support Oregon's GHG emissions reduction goals, DLCD has made changes to the State of Oregon's rules guiding transportation and housing planning, particularly in the eight areas with populations over 50,000 people (Albany, Bend, Corvallis, Eugene /Springfield, Grants Pass, Medford/Ashland, Portland Metro, and Salem/Keizer). The rules' changes are intended to improve walking, biking, and transit opportunities, increase housing choice and supply, and promote more equitable and inclusive development in Oregon's communities, thereby decreasing greenhouse emissions. While freight movement is not a key focus of the rulemaking, reduction in GHG emissions

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73 Medium-duty trucks are divided into three classes and range from 14,001 pounds (Class 4) to 26,000 pounds (Class 6). Heavy-duty trucks are also divided into three classes and range from 26,001 pounds (Class 7) to 60,000 pounds (Class 9).

from delivery vehicles within these specific urban areas will contribute toward the rules' overall goals. Additionally, providing increased travel options for other types of trips can help to reduce congestion and keep freight trips moving efficiently to reduce fuel consumption and emissions.

5.1.3 Funding Programs

The Connect Oregon program is a competitive grant program funded by the privilege tax that provides funding for non-highway freight projects including aviation, marine, and rail transportation projects. As such, the program improves or preserves modal alternatives that may reduce GHG emissions, as compared to trucking.

ODOT has committed to investing $100 million in federal and state sources between 2022 and 2027 to bolster Oregon's EV charging infrastructure. The funding will focus on charging infrastructure for light-duty EVs like cars and SUVs; however, some benefits for electric freight vehicles may be seen as well.

The state's four-year STIP go through a climate impacts analysis that is factored into funding awards and project selection.

In 2022, DEQ received $15 million to administer a one-time grant to develop medium- and heavy-duty charging infrastructure. Through this bill, the Legislature also directed DEQ and ODOT to develop a report for the Joint Committee on Transportation on existing vehicle and infrastructure incentives available to support the transition to medium- and heavy-duty ZEV fleets. The report includes a summary of incentives offered in other states, stakeholder feedback on program design and costs, and provide recommendations on expanding or creating incentives to support businesses in the transition to medium- and heavy-duty ZEVs in Oregon.

- Congestion Mitigation and Air Quality (CMAQ): The purpose of the CMAQ program is to improve air quality by reducing transportation emissions. The Federal Highway Administration awards CMAQ funds to Oregon through ODOT. In 2007, the Oregon Legislature directed $250,000 per year of Oregon's CMAQ funding allotment to DEQ to reduce diesel emissions. Between 2021 and 2023, DEQ will have awarded CMAQ grants to organizations focused on reducing diesel emissions through the adoption of zero-emission technologies.
- Oregon DEQ's Diesel Emissions Mitigation grant program: This grant program provides incentive funding from Oregon's share of the Volkswagen settlement—a $72.9 million settlement dedicated to projects that reduce diesel emissions. DEQ will provide approximately $40 million (~$8 million per year) between 2021 and 2025 to support

businesses, governments, and equipment owners in retrofitting, repowering, or replacing older, more polluting diesel engines with new, cleaner alternative technologies.

- U.S. EPA Diesel Emissions Reduction Act grant program: Since passage of the federal Diesel Emissions Reduction Act (DERA) in 2005, the U.S. EPA has funded diesel emissions reduction projects through national competitive grants, direct state allocations, school bus rebates, and direct tribal allocations. DEQ administers the DERA state allocation funds for Oregon. The focus of DERA state allocation funds has been on vehicle and equipment replacement, funding advanced exhaust control retrofits, or replacing older diesel engines with newer, cleaner-burning engines.

  In recent years, Oregon has focused its DERA state allocation resources on retrofitting or replacing older school buses.

5.2 TRENDS AFFECTING FREIGHT GREENHOUSE GAS EMISSIONS

Driven in part by recent policy changes, a number of transportation-related technological innovations and regulatory actions are affecting, or have the potential to affect, freight-sector GHG emissions. Foremost among these may be electrification of vehicles, particularly automobiles and trucks. In addition to the increasing commercialization of battery-electric vehicles, other low-emission alternatives emerging or already available include hydrogen fuel-cell vehicles, plug-in hybrid electric vehicles, natural gas vehicles, and liquefied gas petroleum vehicles. This section highlights progress made on adoption of ZEVs as well as other technological trends that have the potential to reduce GHG emissions from traditional gas and diesel-powered vehicles. Regulatory actions that could affect trends in GHG emissions from the freight sector are also addressed.

5.2.1 New Technologies

The following technological trends by mode can affect GHG emissions from freight sources:

- **Trucks**
  - Electric. Electrification of medium- and heavy-duty vehicles has accelerated in recent years but is still in the beginning stages of adoption. Medium-duty battery-electric vehicles are available (though still significantly more expensive than conventional trucks) and in use in some freight applications. Heavy-duty electric vehicles, including electric semi-trucks, have been deployed in test scenarios and will soon be commercially available. (Models from Daimler and Tesla are scheduled to be released in 2022 and 2023, respectively, although it may take significantly longer for orders to be fulfilled.) In addition to battery-electric vehicles, hydrogen fuel-cell electric vehicles are being tested for use in freight applications and are expected to become commercially viable sometime

around 2027.[74] Both battery and hydrogen fuel-cell electric vehicles are considered ZEVs[75] and are at the forefront of technological solutions for reducing GHG emissions from vehicle sources.

Despite these advances, battery-electric technology poses significant challenges for some freight applications. For example, long-haul semis have range and uptime needs that can be challenging to meet with batteries. There are also concerns that the weight and volume of batteries significantly reduces the cargo capacity for medium- and heavy-duty vehicles. Some of these challenges may be offset by the use of hydrogen fuel cells, which more closely approximate traditional fuel sources in terms of range and weight. It is therefore likely that the medium- and heavy-duty electric fleet will be a mix of full battery-electric vehicles and hydrogen fuel-cell electric vehicles in the future.[76]

– Diesel. Although signs point to increasing adoption of electric and hydrogen technology in the medium- and heavy-duty truck sector, forecasts indicate diesel-fueled trucks could still account for a large portion of heavy-duty vehicles sold in 2040.[77] Traditional diesel-fueled truck efficiency can be improved through a variety of options, including aerodynamic improvements, low rolling resistance tires, weight reduction, and engine improvements such as electrified accessory systems. Other diesel options that can decrease GHG emissions include diesel hybrid vehicles (trucks that have hybrid diesel-electric engines similar to the gas-electric engines seen in cars like the Toyota Prius) and renewable diesel (fuel that is chemically similar to petroleum diesel but is derived from renewable resources such as vegetable oils and other agricultural products). Diesel hybrid engines can reduce GHG emissions and other pollutants by 20% compared to petroleum diesel engines, while engines running on renewable diesel have up to 70% fewer GHG emissions and emit no particulate matter.[78]
– Natural Gas. Trucks powered with natural gas emit fewer GHGs and other air pollutants compared to traditional diesel engines. A variety of medium- and heavy-duty trucks that run on natural gas are available commercially and in use for both long-haul and short-trip applications. Using renewable natural gas can reduce GHG emissions by

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74 2020 Biennial Energy Report, Oregon Department of Energy

75 Both emit zero tailpipe emissions; however, in each case the initial energy source used to create electricity or hydrogen determines the ultimate climate impact. Using renewable electricity sources has the potential to make both technologies truly zero emission.

76 2021 Biennial Zero Emission Vehicle Report, Oregon Department of Energy

77 2020 Biennial Energy Report, Oregon Department of Energy

78 Comparison of Medium-and Heavy-Duty Technologies in California, 2019, California Electric Transportation Coalition and Natural Resources Defense Council.

up to 60% compared to diesel; however, the supply of renewable natural gas may be limited.[79]

Table 5.1 Comparison of Greenhouse Gas Emissions by Technology/Fuel Source for Medium- and Heavy-Duty Trucks

TECHNOLOGY/FUEL SOURCE	ESTIMATE GHG EMISSION REDUCTIONS (RELATIVE TO DIESEL FUEL)
Diesel Hybrid	-20%
Renewable Diesel	-50 to -70%
Natural Gas	-20%
Renewable Natural Gas	-60%
Electricity	-80 to -100%
Hydrogen	-50%

Sources: *Comparison of Medium- and Heavy-Duty Technologies in California.* 2019. Prepared by ICF International for California Electric Transportation Coalition and Natural Resources Defense Council

- **Rail.** Rail locomotives have demonstrated improved fuel economy over the past few decades mostly because the development of larger, more powerful line-haul locomotives results in fewer locomotives required per train. Other railroad technological and operational improvements also contributed to this trend. The combination of best available new locomotives and lightweight aluminum railcars could lead to a significant reduction in freight rail GHGs per ton-mile over the existing fleet. However, locomotives typically remain in service for 30 to 40 years, so it will likely take many decades before these new technologies penetrate the market completely.

  There are no commercially available long-haul electric locomotives (although electric switching engines are in use), however research is being done on battery-electric and fuel-cell electric engines for trains. Wabtec, a global developer of freight and passenger train equipment, developed and delivered an experimental battery-electric locomotive to the Port of Los Angeles. In summer 2021, a 2,400 horsepower engine along with two diesel locomotives pulled a freight train from Barstow to Stockton, CA. Not only did the battery-electric locomotive reduce total diesel fuel consumption by 11%, but it also reduced its air pollutant emissions by a similar amount.[80]

- **Marine.** Various technologies have the potential to reduce GHG emissions from marine sources, including battery-electric, hydrogen fuel-cell, and hybrid diesel-electric engines, propeller designs to increase efficiency, and shore power systems. Electrification of marine

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79 Comparison of Medium-and Heavy-Duty Technologies in California, 2019, California Electric Transportation Coalition and Natural Resources Defense Council.

80 July 5, 2021. Battery-powered trains could be a climate game changer. Is everyone all aboard? Los Angeles Times.

vessels is still in its infancy, but the number of hybrid and electric marine vessels in operation, or on order, has increased steadily over the last decade. Although the majority of these vehicles are for transporting passengers, electrified tugboats and offshore supply vessels are also beginning to be used. In 2022, Japan began operating the world's first battery-electric tanker for ship refueling.[81] Hydrogen fuel-cell marine vehicles are also under development, although progress has been somewhat slowed in the United States by the lack of U.S. Coast Guard regulations for maritime safety of hydrogen fuel-cell marine vehicles.[82]

- **Aircraft.** GHG emissions from aircraft continue to improve because air carriers have strong incentives to cut operating costs and increase payload capacity with fuel-efficient aircraft. Using sustainable aviation fuels such as renewable diesel can also generate significant savings and reduced emissions. However, like locomotives, commercial and cargo aircraft have very long service lives (up to 40 years or so), so it will take a long time before the best new technologies completely penetrate the fleet.

  Aviation, like rail, is behind other modes in terms of commercialization of electrified or hydrogen fuel-cell models. The battery technology required to power massive aircraft like a large passenger jet is likely many years away, but smaller electric planes that could be used for regional travel or cargo deliveries are under development. Global logistics firm DHL, for example, has placed orders for an electric plane manufactured by Eviation, due to be delivered in 2024. The Alice eCargo plane is capable of hauling up to 2,600 pounds of cargo for 500 miles and can be fully charged in 30 minutes. Small electric planes like the Alice could be an attractive near-term option for firms seeking to lower emissions from regional deliveries.

5.2.2 GHG Emissions Regulations by Mode

5.2.2.1 Trucks

In 2011, the U.S. EPA and National Highway Traffic Safety Administration issued a joint rulemaking that set GHG emissions and fuel economy standards for medium- and heavy-duty trucks manufactured in model years 2014 through 2018. This was followed in 2016 by a new set of Phase 2 standards for medium- and heavy-duty vehicles through model year 2027. On August 5, 2021, U.S. EPA announced plans to reduce GHG emissions and other harmful air pollutants from heavy-duty trucks through a series of rulemakings over the following three

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81 April 4, 2022. Japan's Asahi Tanker to start ship fuelling with world's first electric tanker. Reuters

82 2021 Biennial Zero Emission Vehicle Report, 2021, Oregon Department of Energy

years. The first rulemaking focuses on reducing criteria pollutant emissions and would apply to heavy-duty vehicles beginning in 2027.

U.S. EPA is also developing two other commercial-vehicle actions. The first will focus on light- and medium-duty vehicles and will address multipollutant emissions, including GHG emissions, for model year 2027 and later commercial pickup trucks and vans. The second will focus on GHG emissions for model year 2030 and later heavy-duty engines and vehicles. According to the U.S. EPA, "these two upcoming commercial-vehicle rulemakings will provide an opportunity for EPA to fully consider how ZEV technologies should be incorporated into the regulatory framework over the long term."[83]

As noted earlier, Oregon DEQ's Advanced Clean Trucks Rule requires manufacturers to sell ZEVs as a certain percentage of sales beginning with the 2025 model year. Oregon is also one of about a dozen states that follows California's motor vehicle emission standards under the waiver authorized by the U.S. EPA. California has adopted GHG standards that largely align with the U.S. EPA and National Highway Traffic Safety Administration standards for new medium- and heavy-duty vehicles.

5.2.2.2 Rail and Marine

New locomotives and remanufactured line-haul locomotive and heavy-duty engines, including those used in marine vessels have been subject to U.S. EPA emissions requirements since 2008 to reduce nitrogen oxides and particulate matter.[84] However, no federal regulations are in place aimed at reducing carbon dioxide emissions from diesel locomotives and marine vessels.

5.2.2.3 Aircraft

In 2021, the U.S. EPA finalized rulemaking setting GHG emission standards for certain new commercial airplanes, including all large passenger jets. These standards match the international airplane carbon dioxide standards adopted by the International Civil Aviation Organization in 2017.[85]

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83 EPA Website: https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-commercial-trucks

84 EPA Website: https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-locomotives

85 EPA Website: https://www.epa.gov/regulations-emissions-vehicles-and-engines/control-air-pollution-airplanes-and-airplane-engines-ghg

5.3 POTENTIAL ACTIONS TO REDUCE FREIGHT-RELATED GREENHOUSE GAS EMISSIONS

A number of potential actions could be taken to reduce transportation-related GHG emissions from freight movements in Oregon, many of which have been identified in plans and technical reports produced in recent years. In general, reduction of GHG emissions from freight activities can be achieved through one or more of the following methods:

- Technology: adoption of low- and zero-emission vehicles, alternative fuels, and other innovative technologies
- Operations: adjusting operations to improve how efficiently vehicles consume fuel
- Mode shift: changing modes of transportation

This section discusses actions that could be, or in some cases have already begun to be implemented, in order to make progress in the above areas.

5.3.1 Technology

5.3.1.1 Alternative Fuels

Oregon has had success in increasing the availability and reducing the cost of alternative fuels such as renewable diesel through its Clean Fuels Program. Encouraging the use of renewable diesel and natural gas in trucks and other vehicles could significantly decrease overall GHG emissions (as well as other pollutants) from freight sources.

5.3.1.2 Zero-Emission Vehicles

The previous section discussed the trend toward increasing use of ZEVs for medium- and heavy-duty trucks, despite technological and logistical challenges. Other modes are further behind, but trending toward eventual adoption. The State of Oregon can take a number of actions to accelerate the transition from gas- and diesel-powered vehicles to ZEVs.

Trucks

Perhaps first and foremost is the need for a charging network to serve medium- and heavy-duty electric vehicles along key freight corridors and in urban areas. In 2021, ODOT finalized the Transportation Electrification Infrastructure Needs Analysis report, which set the stage to achieve "rapid growth in public charging…essential to achieve mainstream adoption of EVs." The report addresses EV charging needs for medium- and heavy-duty vehicles, estimating, for example, that the state will need 39 long-haul heavy-duty truck chargers by 2025 and nearly 700 by 2035. The report recommends a number of policy actions beyond direct funding of EV infrastructure that could help meet the needs of freight, including the following:

- Developing EV charging standards in collaboration with national, regional, and multistate organizations to create a consistent EV charging experience.
- Providing incentives that drive infrastructure development. For example, tax breaks to incentivize private companies to install charging infrastructure at workplaces and distribution centers.
- Considering available grid capacity and supporting utility grid management needs.
- Ensuring that technical and educational resources are available to support stakeholder groups seeking to pursue EV charging.

Oregon could also consider funding hydrogen fueling stations to support adoption of hydrogen-powered fuel-cell electric vehicles. California, for example, has invested more than $242 million since 2008 to support hydrogen research, development, and deployment projects, including $30 million to construct five medium- and heavy-duty hydrogen fueling stations as of 2021.[86]

Other Modes (Rail, Marine, Aircraft)

Oregon could research and consider ways to encourage electrification of vehicles for non-truck modes. Development of electric vehicles and needed infrastructure for these modes is progressing much more slowly in comparison. This could include funding (for example, for electrification infrastructure at ports), additional regulations or incentives for private businesses, and public-private partnerships.

5.3.2 Idling Reduction Technologies

Long-duration idling of trucks in the United States consumes more than 1 billion gallons of diesel fuel annually and produces 11 million tons of carbon dioxide, along with other harmful emissions.[87] This estimate does not consider short-term idling or train and marine vessel idling, which also contribute to freight GHG emissions. Idling reduction technology (IRT) devices allow vehicle operators to reduce long-duration idling of the main propulsion engine by using an alternative technology. An IRT device generally has the following three main characteristics:

- Is installed on a vehicle (e.g., bus, truck, locomotive, automobile, marine vessel, equipment, etc.) or at a location;
- Reduces unnecessary main engine idling of the vehicle or equipment; and/or

86 www.energy.ca.gov/sites/default/files/2021-06/CEC_Hydrogen_Fact_Sheet_June_2021_ADA.pdf
87 https://www.epa.gov/verified-diesel-tech/learn-about-idling-reduction-technologies-irts-trucks-and-school-buses

- Provides services (e.g., heat, air conditioning, and/or electricity) to the vehicle or equipment that would otherwise require the operation of the main drive engine while the vehicle or equipment is temporarily parked or remains stationary.

U.S. EPA has found five types of verified IRTs to reduce emissions on long-haul, Class 8 trucks when compared to the truck's baseline emissions while idling:

- Auxiliary power units and generator sets
- Small fuel operated cab heaters
- Battery operated heating and/or cooling systems
- Thermal storage systems
- Electrified truck parking spaces

Pilot efforts to electrify trucks stops are underway in Oregon but could be expanded. Some or all of these technologies could be used for locomotives and marine vessels as well. For example, shore power systems that provide electricity to ships while docking could be used to reduce emissions from idling ships at port.

5.3.3 Emerging Technologies

The internet and wireless communications have made possible innovative technologies that are transforming how we live and can play an important role in efficiently operating the transportation system, which can translate to reduced GHG emissions. Examples include connected and autonomous vehicles that drive more efficiently, Active Traffic Management systems to reduce congestion, weigh-in-motion systems, and automated tolling. When it comes to freight, truck platooning (trucks traveling together connected by a computer system), automated freight vehicles, and advanced logistics are likely to improve the safety, reliability, and efficiency of freight movement.[88] For example, logistics companies have begun using routing algorithms to improve driving efficiency by reducing left turns, and artificial intelligence is being explored to optimize shipping routes and save on fuel costs. Supporting the development of emerging technologies could have numerous benefits in addition to GHG reduction.

5.3.4 Operations

Many states, including Oregon, have realized environmental and economic benefits through the implementation of promising new freight operations and education ideas. These include three possible methods to reduce GHG emissions from freight:

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[88] Emerging Technology Impact Assessment Final Report, 2019, ODOT

- **Port Operations and Equipment Improvements.** Ports and intermodal terminals are major freight nodes. The presence of numerous mobile and stationary emissions sources at these facilities can often turn them into hot spots for emissions of GHG and other pollutants. This is particularly true because port equipment (e.g., drayage trucks and shunting locomotives) tends to be older and more polluting.[89] A number of operational strategies can reduce emissions at ports. These include various strategies using computerized information systems to help spread port truck traffic into off-peak periods (reducing congestion and associated fuel usage), making more efficient use of trucking equipment to reduce empty trips, using electric and alternative fuel powered equipment within the marine terminals to reduce emissions from fossil fuels, and using electronic tracking systems to more efficiently manage port-related trucking fleets to reduce trips and operations in congested conditions.
- **Idling Reduction Operations Strategies.** In addition to the technologies to reduce idling discussed above, behavioral strategies can help to reduce unnecessary GHG emissions from idling.
  - *Driver/Operator Training*: Educate drivers and operators about the impacts and adverse effects of long-duration idling can help change their behavior.
  - *Financial Incentives*: Fleet owners can offer financial incentives to drivers to reduce idling. Many large trucking companies already offer these incentives and have reported success in reducing idling times below national averages.
- **Improved driving and routing efficiency**. Vehicle driving and routing efficiency improvements are important to reducing GHGs from the freight sector. Methods to improve operations efficiency include the following:
  - *Virtual weigh stations.* These utilize technology, such as weigh-in-motion devices, to detect truck weight without requiring that the driver stop at an actual weigh station. This reduces idling and fuel consumption that would occur in the weigh station. Oregon uses weigh-in-motion devices throughout the state.
  - *Speed reduction.* Freight operators will generally go as fast as the speed limits allow. While this may make sense from a time perspective, fuel economy usually decreases rapidly at speeds above 60 miles per hour.[90] The current maximum truck speed limit in Oregon varies; on most rural highways and interstates it is 55 miles per hour, but on some sections it is 60 or 65 miles per hour.

[89] Oregon DEQ assessed activity and emissions of nonroad diesel equipment in the state in 2017 in other (non-marine) industry sectors (https://www.oregon.gov/deq/aq/Documents/orNonroadDieselRep.pdf).
[90] U.S. EPA Fuel Economy Guide: http://www.fueleconomy.gov/feg/driveHabits.shtml.

- *Driver training efforts.* Driver training programs can be used to educate truck drivers on "eco-driving" techniques to reduce emissions and save fuel, such as pre-planning a trip, using cruise control, avoiding rapid acceleration and deceleration, and up shifting as soon as practicable. freight carriers themselves often implement this strategy because they result in fuel cost savings and cost reduction for carriers.
- *Signal optimization and signage.* Adjusting signal timing to optimize traffic flow on busy truck routes and improving signage near marine and intermodal facilities can improve emissions by freight. These are effective strategies to reduce freight emissions by reducing idling at signals and subsequent acceleration after the stop.
- *Congestion relief and bottleneck mitigation.* Congestion on roadways requires trucks to accelerate and idle more frequently, increasing truck emissions. Past studies have shown that fluctuations in speed during congestion on freight routes in the Portland metropolitan area correlated to increased emissions from trucks compared to free-flow conditions.[91] Thus, addressing congestion has the potential to reduce GHG emissions and improve air quality. However, it is important to consider the impacts of latent and induced travel demand from passenger vehicles when considering an increase in capacity or improving traffic flow.[92] Transportation system and demand management strategies,[93] such as traffic controls, traveler information, adequate public transportation, and tolling, can also help reduce congestion on major truck routes, thereby potentially contributing to reduced truck emissions.

5.3.5 Mode Shift

Moving cargo by air has the highest GHG emissions per ton-mile of freight moved on average—more than five times that of trucks. Trucking, in turn, emits GHGs at more than five times the rate of marine or rail modes on average (Figure 5.1).

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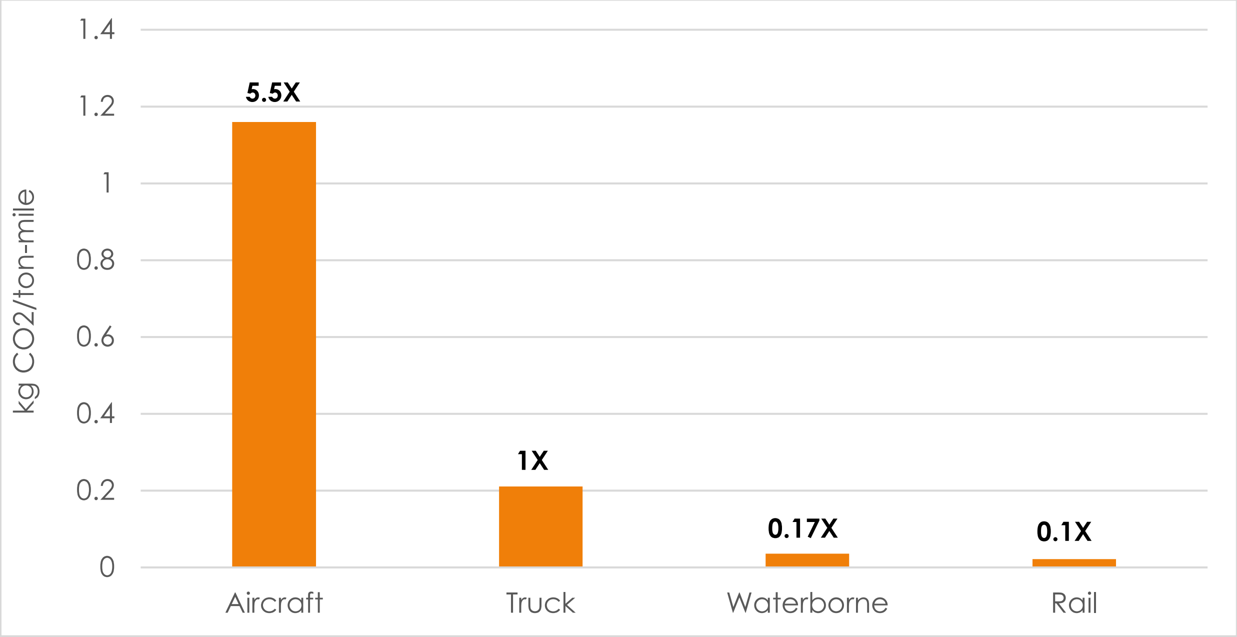
91 Wheeler and Figliozzi, Portland State University, Multi-Criteria Trucking—Freeway Performance Measures in Congested Corridors, August 2010

92 Induced travel demand refers to the concept that increasing roadway capacity and reducing congestion will result in additional vehicle traffic as a result of mode choice decisions. For example, a commuter who might have selected transit with congested roadways may instead select to drive, therefore increasing emissions. This generally does not apply to trucks. However, when implementing congestion mitigation measures, it is important to consider all system users.

93 https://www.oregon.gov/ODOT/Planning/Documents/APMv2_App18A.pdf

Figure 5.1 Metric Tons of Greenhouse Gas (per million ton-miles), 2019



Source: WSP based on EPA emissions factors per ton-mile[94]
Note: Oregon trucks will be cleaner given Oregon-specific vehicle/fuel regulations

It follows, then, that shifting freight to modes with lower emission rates can reduce GHG emissions. The major mode shifts that could result in reduced energy usage and GHG emissions reductions include the following:

- Truck to rail
- Truck to short-sea shipping and/or inland waterway
- Air cargo to truck

These mode shifts are not easy to implement. Trucks offer flexibility and time savings that make it difficult for other modes to compete. In addition, the limited locations of rail infrastructure and remote locations of certain industries make many goods dependent on truck movements. However, some commodities in certain locations may see benefits from mode shifts to more energy efficient modes. To make sure a project is economically viable, an economic analysis should be completed prior to public-sector investments that are intended to cause a mode shift.

The following are examples of potential mode-shift opportunities from truck to rail or marine:

- **Shipments arriving via water to the Port of Portland.** The port has on-dock rail and easy access to inland barges, so drayage emissions for transfers from ocean-going ships to rail or

[94] See Table 8, https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf

barge at Portland would be minimal, preserving the GHG benefits of rail and barge movements even within Oregon. However, there may still be a relatively high financial cost to the transfer that could discourage shippers. In addition, not all commodities are amenable to on-dock rail.

- **Shipments moving between locations directly on the rail or waterway network.** Where drayage moves are very short at both ends, it may be beneficial from both a financial and a GHG emissions point of view to shift to rail or water.

The following are examples of potential mode shifts from truck to short-sea or inland waterway shipping in Oregon:

- **Container feeder service to Puget Sound.** About one-half of the containers that arrive or depart the Columbia/Snake Rivers region by sea do so through Portland's Terminal 6,[95] but the remainder are sent by truck or rail to the Puget Sound's Ports of Seattle and Tacoma. Short-sea service has been suggested as a way to take some of those containers off the highways; however, the water route is almost double the distance of the overland route. Moreover, containers traveling down the Columbia River by barge would need to be transshipped to an ocean-going barge to make the trip, adding significantly to the costs of such a move.[96]
- **Coastal service to California.** Coastal service to Southern California could preserve some of the cost advantages of water transport due to the length of the haul. It could be most appropriate for movement of bulk agricultural and forest products from the Columbia River or southern Oregon. However, a suitable backhaul would also need to be found to make barge movement economically viable.
- **Solid waste shipments.** A large portion of Portland area waste is trucked annually to the Columbia Ridge Landfill 140 miles east of Portland. Using barge or rail service to transport this waste instead could reduce GHG emissions, although recent proposals to do this have not been successful.[97] In Washington state, Union Pacific ships more than 2 million tons of waste from the greater Puget Sound area to Columbia Ridge by train each year, "the

95 Based on container service at Portland's Terminal 6 in 2011. In 2016, all container service was discontinued. Weekly container service returned in 2020.

96 Center for Economic Development Education and Research, 2005, *Columbia Snake River System and Oregon Coastal Cargo Ports Marine Transportation System Study*, prepared by Pacific Northwest Waterways Association, June 2005.

97 In 2018, Metro received bids from both Union Pacific and Tidewater Barge Lines to transport waste from the Portland area to landfills by train and barge; however, the contract was ultimately awarded to a trucking company.

equivalent of removing 75,000 trucks from the roadways and reducing greenhouse gas emissions by 11,000 tons," according to the railroad.[98]

The public sector can play a role in encouraging the shifting of freight to less energy-intensive modes of transport. Possible strategies include investing in the rail and marine transportation systems, pricing, and other incentives.

5.4 IMPACTS OF CLIMATE CHANGE ON FREIGHT

Climate change may have an impact on the freight sector in the following ways:

- **Extreme temperatures.** Climate change is expected to lead to an increase in the frequency of very hot days. As the number of very hot days rises, stress will increase on infrastructure. Infrastructure design changes may be required, pavement may wear out faster, and railroad tracks may be negatively affected as a result of hotter weather.
- **Wildfires.** The wildfire season in Oregon is expected to become longer, and fires will be more frequent, more intense, and cover larger areas. Impacts to freight are likely to include more frequent short- and long-term road closures, destruction of transportation and logistics infrastructure, increased landslide hazard, and general disruption of freight activities during the fire season.[99]
- **Changes in stream flow.** The Northwest will experience major changes in stream flow patterns due primarily to changes in the timing of spring snowmelt in the mountains and an increase in winter precipitation falling as rain instead of snow. In addition to earlier stream flow peaks, this will result in considerably lower summertime flows. The marine freight system will be affected by both higher and lower levels of stream flow; barge travel can be restricted as a result of either condition. During periods of low water levels, tonnage carried per barge may be limited.
- **Increase in heavy precipitation.** The number and intensity of heavy precipitation events, particularly in winter, is projected to increase throughout the 21st century.[100] Increased winter rainfall instead of snowfall is expected to lead to more winter flooding on the west side of the Cascades and is likely to increase the risk of landslides. More heavy rainfall events may require redesign of stormwater management facilities for all transportation

98 Union Pacific Website: www.up.com/customers/track-record/tr090721-can-transportation-solve-the-landfill-problem-waste-management.htm

99 https://www.oregon.gov/odot/climate/Documents/Wildfire.pdf

100 Oregon Climate Change Research Institute, *Fifth Oregon Climate Assessment*, 2021.

facilities. Severe weather is also correlated with increases in accidents and delays, affecting both freight safety and mobility.

- **Sea level rise and coastal erosion.** By the year 2050, relative sea level at Newport, Oregon, is very likely to rise between 0.6 and 1.8 feet, and at least one flood is likely to exceed 4 feet above mean high tide. Accounting for plausible, yet uncertain, estimates of Antarctic ice sheet melt suggests that sea level could rise 2.9 feet by the year 2050, with regular nuisance flooding occurring earlier.[101] More southwesterly winter wind patterns, combined with higher sea levels, could accelerate erosion along the Pacific coast. Coastal port facilities and the roads and railways that serve them may be affected by rising sea levels. Coastal areas may also become more vulnerable to surges from strong coastal storms, because these surges will now be overlaid onto higher water levels.
- **Impacts to agriculture and forestry.** Climate change also will affect demand for freight services by affecting agriculture and forestry production in Oregon. In the short run, growth rates of high-elevation forests on the west side of the Cascades could increase due to milder conditions, but in the long run all forests are projected to see decreased growth due to summertime soil moisture deficits. Agricultural production is likely to be negatively affected by decreasing irrigation supplies during the summer growing season as well as increasing pests and weeds.

The likely impacts of climate change can be addressed in part through improved planning. The planning process should incorporate an understanding of expected future changes. For instance, future infrastructure might not be planned for locations such as floodplains and tsunami hazard zones. When designing new infrastructure, project managers will need to switch from designing with standards developed for historical climate trends to designing for future and uncertain climate projections. Operations are more easily adapted to a changing climate, but conditions should be monitored to plan for future operations in an effective manner rather than relying on past information.

101 Ibid.

6 Funding

6.1 INTRODUCTION

Federal, state and local governments provide much of the funding for freight transportation system improvements including highways, airports and certain marine port facilities. The private sector provides funding for those elements of the transportation system that are privately owned and operated, including marine terminals, pipelines and rail lines. Governments and the private sector sometimes work together in public-private partnerships to fund freight transportation improvements. In order to ensure that freight transportation system needs are adequately funded, states are actively seeking new methods and sources of project funding and finance. These include a wide variety of federal grant and loan programs, expanded user-pay programs and further development of partnering arrangements between the public- and private-sector investors.

The following topics are covered in this chapter:

- Public-sector funding for transportation in Oregon, along with how this funding is distributed to meet transportation needs;
- Summary of transportation funding needs as forecasted in the 2006 OTP; and
- Review of selected existing and potential initiatives for helping to fill the gap between funding needs and anticipated revenues.[102]

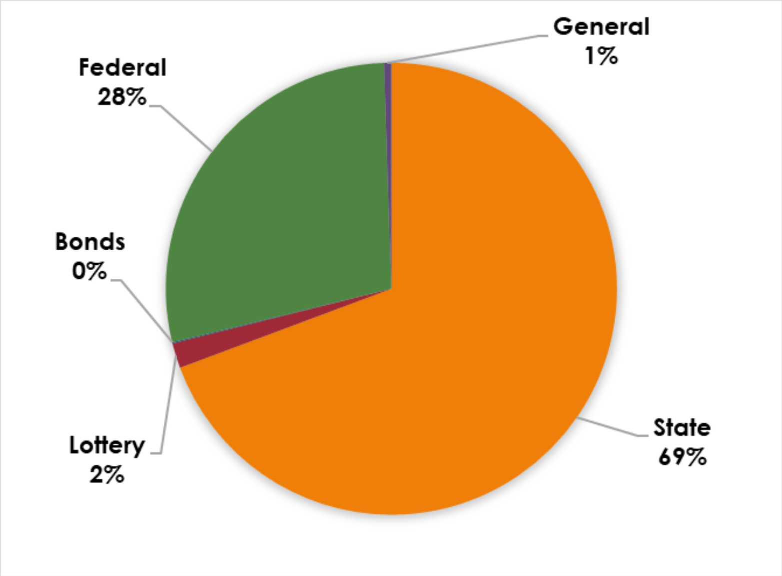
6.2 ODOT'S TRANSPORTATION FUNDS

For the 2021 to 2023 biennium, the legislatively adopted ODOT budget includes $6.8 billion in total available revenue.[103] Roughly 28 percent of this funding ($1.92 billion) is from federal government sources, as shown in Figure 6.1. The other 72 percent ($4.71 billion) is from state sources. These include a tax on motor fuels (21 percent), weight-mile tax (13 percent), driver and vehicle licenses and fees (15 percent) and other state and local sources (23 percent).

[102] Chapter 9, Section 9.6 includes updated information regarding funding related to the FAST Act as well as Freight Investment Plan.

[103] Oregon Department of Transportation Legislatively Adopted Budget 2021-23: https://www.oregon.gov/odot/About/Budget/ODOT%202021-23%20Legislatively%20Adopted%20Budget.pdf

Figure 6.1 ODOT's Revenue Sources (2021 to 2023)



Source: ODOT Legislatively Adopted Budget 2021-23.

Bond sales, which had in previous decades accounted for nearly 1/5 of funding now only account for $6 million. Bonds sold through previous programs are repaid from revenues generated by various sources such as lottery revenues, weight-mile taxes, fuel taxes and vehicle license, registration and title fees.

Oregon has a constitutionally dedicated Highway Fund that requires all taxes levied on motor vehicle fuel and ownership, operation or use to be used exclusively for construction, reconstruction, improvement, repair, maintenance, operation and use of public highways, roads, streets and roadside rest areas. Oregon's constitution also requires that the legislature ensure that cars and trucks pay their fair and proportionate share of state motor vehicle taxes described above. This latter provision is unique among states and is accomplished by completion of a comprehensive cost allocation study every two years that includes a report to the legislature for appropriate action.

The share of funding from various sources, as shown in Figure 6.1, is likely to change in the future. Federal, state and local sources, including bond proceeds and vehicle taxes and fees, are all subject to fluctuation. The next 20 years are anticipated to see dramatic improvements in the fuel efficiency of vehicles and fleet electrification. As these new vehicles replace the current vehicle fleet, large reductions in fuel consumption are expected. This will translate into a decrease in the amount of revenue derived from fuel taxes, even as vehicle-miles traveled are projected to increase unless the OReGO Road Usage Charge program significantly expands.[104]

About 16 percent of ODOT's total revenue is "passed through" to Oregon cities, counties and other agencies, as shown in Table 6.1. Per biennium, cities receive roughly $529 million and counties, roughly $712 million. These funds are derived from the state fuel tax, weight-mile tax and licensing fees. Other state agencies, such as Oregon Parks and Recreation Department, Oregon Department of Aviation, and the Oregon State Marine Board, receive roughly $102 million. ODOT acts as a tax collector for these other agencies. ODOT itself is receiving approximately $5.15 billion for its 2021 to 2023 operating budget, from a total of $6.81 billion in revenue for the state.

Table 6.1 ODOT's Pass-Through Revenue (2021 to 2023)

RECIPIENT	PASS-THROUGH REVENUE
Cities	$529 million
Counties	$712 million
Other State Agencies	$102 million
TOTAL 2021-2023 BIENNIUM	**$1,343 million**

Source: ODOT, 2022

6.3 ODOT'S TRANSPORTATION BUDGET

Incoming revenues are used to support a wide variety of state and local transportation system needs. For the years 2021 to 2023, the Delivery & Operations uses the largest portion ($3.24 billion or 63 percent), as shown in Figure 6.2, for programs such as the bridge program ($494 million), the highway maintenance and preservation programs ($1,203 million combined) and the highway modernization program ($174 million). The remaining 37 percent of expenses include debt servicing ($561 million or 11 percent) and the rail program ($72 million or 1.3 percent) and other smaller programs.

Table 6.3 summarizes 2030 transportation need forecasts from the 2006 OTP. By most estimates, trends such as a growing statewide population, industry activity and employment mean that the needs for the transportation system will likely grow in the future.

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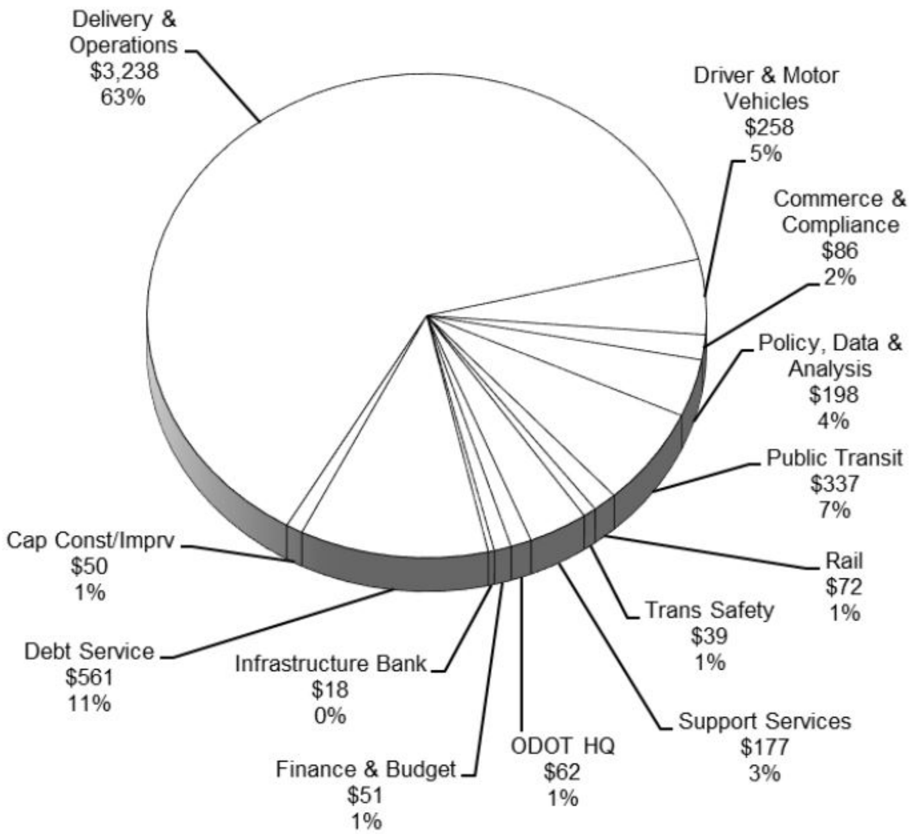
104 The transition away from fuel taxes is anticipated to take 10 to 25 years (https://www.oregon.gov/odot/Programs/RUF/RUFTF_REPORT_2021.pdf)

Figure 6.2 ODOT's Expenses (2021 to 2023)



Source: ODOT 2021 to 2023 Legislatively Adopted Budget.

6.4 FREIGHT-SPECIFIC FUNDING OPPORTUNITIES

A variety of sources are necessary to fund Oregon freight projects, beyond those that are not freight specific that nonetheless benefit the freight system. These diverse funding sources, which include federal, state, local, and private sector, are able to improve and maintain the freight system in many ways.

This section discusses funding needs and the impact of not meeting the state's freight funding needs. The OFP does not develop specific freight funding needs forecasts. Instead, the plan relies on work completed for the OTP, the OHP, and existing modal plans to develop a picture of future needs for selected components of the freight transportation system and funding gaps associated with these needs.

6.4.1 Funding Needs as Identified in the Oregon Transportation Plan

The 2006 OTP identified feasible transportation needs of publicly and privately owned components of state, regional and local transportation systems from 2005 to 2030. These are summarized in Table 6.2. Though these are not freight-specific needs, they refer to components of the transportation system that are important for the movement of freight—the highways, intermodal connectors and other infrastructure that support efficient freight movement.

Table 6.2 Oregon Transportation Plan Investment Needs for Freight-Related Components of the Transportation System (2005 to 2030)

INVESTMENT NEEDS	CURRENT ANNUAL EXPENDITURES (In $Millions)	AVERAGE ANNUAL REALISTIC NEEDS* (In $Millions)	ANNUAL GAP (In $Millions)	FORECASTED ANNUAL GROWTH RATE (Percentage)
State highway-related needs	787	1,278	491	1.4 (freight highway travel)
Intermodal connectors	Not applicable	11.3	Not applicable	1.35 (total highway travel)
Air freight and passenger				
Portland International	44.4	115.3	70.9	2.62 (freight tons)
Major modernization**	13.9	15.1	1.2	
Other airports	10.7	47.4	36.7	
Ports and waterways	51.3	56.2	4.9	0.97 (deep-draft freight) 0.29 (shallow draft freight)
Natural gas and petroleum pipelines	Not applicable	Not applicable	Not applicable	Not applicable
Private rail facilities	More than 6.7	18.8	Not applicable	1.83 (freight tons)

Source: Oregon Transportation Plan, p. 83.
Note: Chapter 9, Federal Compliance, describes freight transportation needs and revenues further.
* "Realistic needs"—referring to the amount of funding that would maintain the transportation system at a slightly more optimal level than 2005 levels—would replace infrastructure and equipment on a sensible and logical life cycle, and would bring facilities up to standard or add capacity in a prudent and practical way. The OFP references "realistic needs" in place of the Oregon Transportation Plan's "feasible needs."
** Needs identified for eight airports other than Portland International Airport where growth is expected to exceed capacity.

This assessment documents gaps in many of the investment categories. For example, state highway-related needs (including maintenance and capital improvements) are forecasted to face an annual shortfall of $491 million every year between 2005 and 2030. These figures are anticipated to be updated as part of the major update to the OTP, which is scheduled for adoption in 2023.[105]

[105] Project Schedule – Oregon Transportation Plan Development (https://www.oregon.gov/odot/Planning/Pages/Oregon-Transportation-Plan-Update.aspx)

6.4.2 Potential Impacts of Not Meeting State Needs

With these modal needs and gaps in mind, the OTP also provides an investment scenario analysis. The goal of this analysis was to gauge the response of Oregon's transportation infrastructure to three hypothetical scenarios. The scenarios reflected the needs of publicly-supported transportation infrastructure and services, though they did include limited information on funding for freight rail. Briefly, the three scenarios were defined as follows:

- Level 1 – The impacts of "flat funding" on the state's transportation system, where inflation causes a 40 to 50 percent loss in purchasing power by 2030
- Level 2 – A situation where transportation funding, while not providing for major capacity enhancements, keeps up with inflation and results in maintaining current performance levels on existing facilities and services
- Level 3 – Funding that:
  - Expands facilities and services including making major investments in new infrastructure
  - Maintains the system at a slightly more optimal level than current levels
  - Replaces infrastructure and equipment on a reasonable life cycle
  - Brings facilities up to standard or adds capacity in a reasonable way

Analysis of these different levels of funding in the OTP, which are assumed to be applicable for the OFP, suggested the results listed in Table 6.3, including possible freight-related impacts.

Following the results of this scenario analysis, the OTP recommended Oregon use traditional and new revenue sources to move toward funding at Level 3, using incremental steps over time.

Table 6.3 Oregon Transportation Plan Funding Levels and Impacts

LEVEL	RESULTS OF FUNDING	FREIGHT-RELATED IMPACTS
Level 1	This level of funding could be devastating to Oregon's economy.	▪ The ability to get to places by all forms of transportation would decline because of declining infrastructure conditions and services and lack of funding for projects that relieve congestion. ▪ Deterioration of the state and local road and bridge system could not be avoided and would increase user costs. If bridges deteriorated to the point of load limits, then commerce would be interrupted. ▪ Traffic congestion would hurt the local, state, regional and national economy because of longer travel times, reduced market areas, the need for duplicate inventories at more locations and the need for additional delivery fleet and drivers. ▪ Reduction of intercity bus, rail freight, aviation and ports all would leave rural communities at an economic disadvantage. ▪ Failure of the jetties at the mouth of the Columbia could leave Columbia River ports, including the Port of Portland, without access to ocean shipping. This would be devastating to industries dependent on ocean shipping and to Oregon's transportation and warehousing industry.
Level 2	This level of funding would preserve existing facilities and services and keep up with inflation, at an estimated rate of 3.2 percent annually. Investments that kept up with inflation would keep existing facilities and services at their current performance levels to the extent possible. Funding at this level thus would avoid economic disaster but would not result in a competitive advantage for Oregon businesses.	▪ Rail freight shipping costs would be reduced by elimination of some bottlenecks. Preservation of rail services would assist job retention in rural areas and outside the Willamette Valley. ▪ Funding would prevent further cutbacks of short-line rail service and maintain rural air service, maintaining rural access to freight and passenger services. ▪ Ports would have the opportunity to deepen channels, protect jetties, and address truck and rail congestion around marine terminals. But the economy would not grow to full potential because congestion at truck, rail and port facilities would prevent expansion and efficient handling of growing amounts of cargo. ▪ Some congestion would be addressed through improvements to bottlenecks and through more aggressive implementation of operational improvements, such as Intelligent Transportation Systems. ▪ Major capacity needs for roads and highways would still go unaddressed. Road users would continue to experience rising costs from increased travel delay due to congestion. Freight accessibility would be lessened by lack of capacity-adding projects. The inability of local areas to expand arterial roads would hurt their development opportunities.

LEVEL	RESULTS OF FUNDING	FREIGHT-RELATED IMPACTS
Level 3	This level of funding would mean that major investments would enable feasible needs to be met over the Oregon Transportation Plan planning period, resulting in positive impacts on Oregon's economy.	▪ Statewide mobility would be enhanced by systemwide improvements. ▪ Development of expanded road, transit, intercity passenger service, rail freight and airports would occur throughout the state. ▪ Rural areas would be better able to retain air and rail services and related jobs. ▪ Improved rail freight, marine port facilities and airports would enhance the economy in urban and rural areas. ▪ Truck congestion would not be eliminated, but it would no longer be a threat to the economy.

6.4.3 Why Oregon Needs to Look for a Way to Close the Funding Gap

The OTP Investment Scenarios illustrate some of the potential dangers of continuing to under-invest in the state's freight transportation system. In addition, other looming challenges will impact the performance of the state's freight transportation system and create a strong case for finding additional funding sources. Among these challenges are the following:

- Increasing wear and tear on the transportation infrastructure as Oregon's population and the economy grow;
- More congestion and crashes with growth in traffic volumes;
- Greater global competition, rising fuel prices and the need to have efficient, reliable and affordable freight transportation options so Oregon businesses can compete favorably with businesses in other states and nations;
- Global warming, greenhouse gas reduction and various other environmental issues and concerns;
- Community livability and land use issues and concerns; and
- Security issues and concerns.

These and other challenges suggest a compelling need to expand existing programs for financing freight transportation improvements, and to identify and implement new funding and finance sources, where feasible.

6.5 OPPORTUNITIES FOR ADDRESSING THE FUNDING GAP

Additional private- and public-sector funding is needed to address freight financing issues. Private-sector companies will continue to make transportation investments based on a variety of considerations to help maintain and improve their competitiveness regionally, nationally, and internationally. Market conditions are a primary factor in private-sector decision-making, so efforts to strengthen economies at all geographic levels are critical to private-sector investments in the freight transportation system.

Private-sector companies will also continue to pay specific fees that governments, port authorities and other entities will use for a variety of purposes including freight infrastructure improvements. Opportunities may exist for enhancing existing fee structures or implementing additional fees to help reduce the funding gap. Federal, state and local governments, including port authorities, may identify ways to broaden or improve existing or establish new, freight financing programs. The following section summarizes private- and public-sector opportunities for addressing the funding gap through user fees and government programs.

6.5.1 User Fees

Freight shippers and carriers currently pay user fees such as federal, state and local fuel taxes. In a few states, including Oregon, trucking companies pay a weight-distance tax based on mileage driven for various weight classifications of truck configurations. Shippers and carriers for other modes pay user fees specific to their type of freight haulage. Any Oregon-specific fees that do not produce transportation system improvements that would offset the costs to businesses that pay the fees could result in reduced competitiveness of Oregon businesses. In the most extreme case, businesses could choose to move to other states where costs are lower.

6.5.2 Airport and Port Fees

Airports and port authorities generate revenues in a variety of ways including grants, loans, tariffs, taxes and user fees. User fees for airports include passenger facility charges, aircraft registration fees, landing fees, terminal and gate lease fees, and parking fees. Most of these fees relate to passenger usage of airport facilities. User fees for port facilities include berthing fees, security fees, fees related to servicing vessels and fees for loading and unloading cargo. Fees may be dedicated to specific projects whereby the fees are used to repay the project costs.

6.5.3 Container Fees

Container fees on import and export container movements at U.S. ports represent a potentially significant source of revenue. Although the use of container fees or other direct user fees presents opportunities to address the freight transportation funding gap, several institutional and operational challenges must be addressed to implement these strategies effectively. There may be significant institutional resistance to levying new containers or user fees or diverting existing user fees to fund freight transportation improvements. The private-sector freight community, for instance, will want assurances that efficiency and reliability gains are proportional to the user fees that will be collected.

The regional, national, and international natures of freight shipments also present challenges. Freight movements often affect the transportation systems of multiple states and metropolitan planning organizations. It is critical to ensure that costs and benefits of container fees or other direct user fees are allocated appropriately across jurisdictional boundaries. Container fees rely on non-discretionary traffic levels that may not be generated through one state’s infrastructure. A regional or national approach may be necessary.

6.5.4 Infrastructure Surcharges

Infrastructure surcharges are special assessments that governments or businesses impose on taxpayers or customers to help pay for infrastructure improvements. Numerous utilities have assessed surcharges on their customers to recoup the costs of infrastructure investments such as pipelines and related equipment and facilities.

Similar types of surcharges may be used to pay for transportation improvements. An example would be a surcharge placed on the number of employees at businesses in a taxing district such as a county or city (see Section 6.5.5, Special Districts, below). Revenues generated from the surcharge would be used to help pay for transportation improvements within the taxing district. Another type of surcharge might be a fee on tonnage of cargo shipped through a terminal or other freight facility. Surcharges could be targeted to pay for transportation improvements that benefit the payers of the surcharge.

6.5.5 Special Districts

According to the U.S. Census of Governments, special district governments are "Organized local entities other than county, municipal, township or school district governments. Special districts are authorized by state law to provide only one or a limited number of designated functions, and with sufficient administrative and fiscal autonomy to qualify as separate governments; includes a variety of titles; such as, districts, authorities, boards, commissions, etc., as specified in the enabling state legislation."[106] A freight special district would focus on freight-related functions such as the provision of infrastructure to support freight movement. Special districts are typically financed through taxes on district properties, other taxes, special assessments, grants or loans from governmental entities, or fees for services imposed on property owners or service users within the district's boundaries. However, getting voters to approve increased taxes or fees associated with special districts can be a challenge, because higher taxes are rarely popular.

Oregon statutes authorize 28 types of special districts, including several that finance activities that may support freight improvements.[107] These include port districts,[108] road assessment districts and special road districts. Some states authorize local transportation improvement districts to identify planning, funding and other resources for local transportation projects, usually associated with roadway improvements. In Oregon, local improvement districts serve this purpose.

6.5.6 Tolls

Tolling is a form of financing where transportation system users pay for using specific roads, bridges, tunnels or other facilities. The only tolled facilities in Oregon are two locally owned

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106 https://www.census.gov/programs-surveys/gus/about/glossary.html#par_textimage_455878023
107 http://landru.leg.state.or.us/ors/198.html.
108 Legally in Oregon port districts are municipal corporations, like cities and counties.

and operated toll bridges that together contribute 0.2 percent of the state's transportation revenue:

- Bridge of the Gods, operated by the Port of Cascade Locks, that connects Cascade Locks, Oregon, to Stevenson, Washington
- Hood River Bridge, operated by the Port of Hood River and connecting Hood River, Oregon, to White Salmon, Washington

Oregon could consider other types of toll facilities including turnpikes and priced lanes. Many other states have instituted tolled facilities that are under either state or private operation.[109] ODOT is currently developing a tolling program for I-5 and I-205 with the aims of congestion management and funding an addition of a third lane and seismic improvements to bridges on I-205 from Stafford Road to OR 213[110] Tolling is also being considered as a funding mechanism for the I-5 Bridge Replacement project, which would replace the Interstate Bridge between Oregon and Washington.[111] Tolls do however increase costs to freight providers and have an impact on the economy as a result of increased transportation costs. More policy details on the implications of pricing and tolling with respect to freight is explored in a 2022 amendment to the OHP.

6.5.7 Congestion Pricing

Congestion pricing, a form of tolling, involves charging fees to use a transportation facility when demand is highest to encourage some vehicles to shift travel times to off-peak hours. Prices can vary based on a fixed schedule, or they can be dynamic, meaning that rates change depending on the level of congestion that exists at a particular time. A congestion pricing strategy is currently being used to mitigate congestion and improve air quality as part of the Ports of Los Angeles and Long Beach PierPASS program. Use of congestion pricing strategies at freight facilities or corridors could represent a potential source of revenue to offset freight infrastructure investments. Though most commonly used as a congestion mitigation tool, surplus revenue from congestion pricing programs could be used to support other freight improvements. However, freight logistics prevent substantial travel-time shifting, making this option unlikely to be successful because it would be for more flexible passenger-vehicle travel.

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109 For more information on toll facility ownership in other states see http://www.financingtransportation.org/funding_financing/funding/state_fundi ng/tolls.aspx

110 For more on the Oregon Toll Program see https://www.oregon.gov/odot/tolling/Pages/default.aspx

111 The Interstate Bridge Replacement Program is a joint effort of the Oregon and Washington Departments of Transportation (https://www.interstatebridge.org/)

6.6 SELECTED FEDERAL OPPORTUNITIES

A number of financing mechanisms at the federal level represent existing and potential opportunities for funding freight transportation system improvements in Oregon. Several such mechanisms are summarized briefly below. It is important to note that while the programs presented below create opportunities for financing of critical transportation programs in Oregon, these options do come at a cost in the form of debt service. As a result, when these options are considered for funding transportation projects, it is necessary to weigh the implications and future costs of these alternatives.

6.6.1 Section 129 Loans

Section 129 of the Code of Federal Regulations Title 23 allows federal-aid highway apportionments to fund direct loans to projects with dedicated revenue streams. Dedicated revenues may include tolls, excise taxes, sales taxes, property taxes, motor vehicle taxes and other beneficiary fees. Proceeds from Section 129 loans can fund the costs of engineering, right-of-way acquisition and physical construction.

Any federal-aid highway project is a potential candidate for a Section 129 loan provided that the recipients pledge revenues from a dedicated source to repayment of the loan. Loans can be in any amount of up to 80 percent of the project cost, provided that a state has sufficient obligation authority to fund the loan.

Use of Section 129 loans for project financing has been very limited. One reason for this is that the Transportation Infrastructure Finance and Innovation Act program (described below) is generally available for the same type of projects that would likely use Section 129 loans. However, for projects that do not fit the profile of Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) projects, Section 129 loans remain a good alternative.

6.6.2 Transportation Infrastructure Finance and Innovation Act of 1998

TIFIA is a federal program through which the U.S. DOT provides credit assistance in the form of direct loans, loan guarantees and credit assistance to major surface transportation projects with dedicated revenue streams. In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) opened the TIFIA program to freight projects. Several states have received TIFIA credits for projects that could be significant to freight, such as the Maryland Intercounty Connector and the Reno Rail Corridor in Nevada.

TIFIA has provided credit assistance to state DOTs, transit operators, special authorities, local governments and private entities undertaking highway, transit, rail and intermodal improvements. Rather than providing grant funding, TIFIA provides projects with supplemental or subordinate debt in order to leverage available federal resources. Since 1998, the TIFIA program has provided $32 billion to 74 projects with a total cost of nearly $117 billion (in fiscal year [FY] 2018 inflation-adjusted dollars). The average TIFIA-supported project cost is $1.5 billion, and the average TIFIA loan is $430 million (both in FY 2018 dollars). About two-thirds of TIFIA loans have gone to highway and highway bridge projects, with a quarter going toward public transportation. TIFIA has supported at least one project in 21 states, the District of Columbia, and Puerto Rico. The top 10 states account for about 80 percent of all projects supported.[112]

Oregon has not yet taken advantage of the TIFIA program. This may be a consideration for ODOT in coming years, in particular, to fund those projects occurring on the Strategic Freight System.

6.6.3 Grant Anticipation Revenue Vehicles Bonds

Grant Anticipation Revenue Vehicles (GARVEE) is the name given to the process where states utilize bond or other debt instrument financing mechanisms involving the payment of future federal-aid highway funds to retire debt. Therefore, GARVEE bonds are backed by a pledge of future federal aid from the U.S. DOT. GARVEEs generate upfront funding for major capital projects that a state would likely be unable to construct in the near term using traditional funding approaches. Bond-related costs eligible for federal-aid reimbursement include interest payments, retirement of principal and any other cost incidental to the sale of an eligible bond issue. States, political subdivisions and public authorities have issued GARVEE debt, including Oregon neighbors California and Idaho.

6.6.4 Infrastructure Investment and Jobs Act (IIJA) and Surface Transportation Reauthorization[113]

The passing of the IIJA in 2021 is expected to inject roughly $3.4 billion for federal-aid highway apportioned programs and $268 million for bridge replacement and repairs over the next five years through formula funding.[114] The IIJA is also expected to support $52 million in expansion of the state's EV charging network over the same period. The bill also provides funding to the state's weatherization efforts as climate change exacerbates extreme weather events, which directly impact strategies for future freight movement.

The National Highway Freight Program, established through the FAST Act in 2015, provided a new framework of funding to improve the efficient movement of freight on the National Highway Freight Network while investing in infrastructure and operational improvements that

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112 The Transportation Infrastructure Finance and Innovation Act (TIFIA) Program (fas.org)

113 Chapter 9, Section 9.6, includes updated information regarding funding related to the IIJA as well as a Freight Investment Plan.

114 OREGON_Infrastructure-Investment-and-Jobs-Act-State-Fact-Sheet.pdf (whitehouse.gov)

strengthen economic competitiveness, reduce congestion, reduce the cost of freight transportation, improve reliability, and increase productivity and safety.

Under the FAST Act, the Federal Highway Administration (FHWA) to provide formula funds over federal FY 2016 to 2020 for states to invest in freight projects on the National Highway Freight Network. This program has been renewed through IIJA, providing formula funds over federal FY 2022 to 2026 totaling over $7.1 billion in dedicated funding to be apportioned to all states including Oregon. Oregon is expected to receive around $17.3 million in National Highway Freight Program funding for FY 2022.[115]

The IIJA guarantees states a 2 percent increase in their FHWA formula program apportionment over FY 2021 levels, with a 1 percent increase in each of the subsequent years.[116]

The IIJA includes a provision that increases the eligibility on the amount of National Highway Freight Program funding that a state may use on non-highway freight projects from 10 percent under the FAST Act to 30 percent, including freight intermodal or freight rail projects. Additionally, the update increases the number of miles designated as critical rural and critical urban freight corridors. Eligibility for modernization/rehab of a lock and dam or a marine highway corridor, connector, or crossing are also included. This will further increase eligibility for federal dollars from the National Highway Freight Program on freight improvement projects across a state.

The National Highway Performance Program, authorized under MAP-21 and first renewed under the FAST Act, has been reauthorized under IIJA. The program provides aid for the condition and performance of the NHS, to construct new facilities on the NHS, and to ensure that investments of federal funds in highway construction are directed to support achievement of performance targets established in a state's asset management plan for the NHS. Total program funding for FY 2016 through 2020 was roughly $116 billion, with specific apportionment allotted to each state.[117]

The IIJA has increased total funding for FY 2022 through 2026 to $148 billion while modifying program goals to include climate change and resiliency-focused provisions for activities to increase the resiliency of the NHS to mitigate the cost of damages from sea level rise, extreme weather events, flooding, wildfires, or other natural disasters. Section 11105 of the IIJA expands eligibility for states to use National Highway Performance Program funds for resiliency,

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115 https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf

116 58 U.S.C. 11104: Apportionment

117 23 U.S. Code Section 104: Apportionment

cybersecurity, and undergrounding utility infrastructure, and allows a state to use up to 15 percent of its National Highway Performance Program funding for protective features on a federal-aid highway or bridge that is off the NHS if the protective feature is designed to mitigate the risk of recurring damage or the cost of future repairs from extreme weather events, flooding, or other natural disasters.

The National Highway Performance Program also requires consideration of extreme weather and resilience in lifecycle cost and risk management analyses, indicating the heightened focus on environmental measures and mitigation plans for freight-specific projects across the country and in Oregon.

Oregon will also be eligible for additional federal funding that will support freight improvements and advancement through existing/renewed and newly initiated grant programs made available through the IIJA as further described below.

Existing programs renewed through the IIJA include:

- Rebuilding American Infrastructure with Sustainability and Equity grants—previously known as Better Utilizing Investments to Leverage Development and Transportation Investing Generating Economic Recovery grants—provide an opportunity for U.S. DOT support for port and freight rail projects of local and/or regional significance. Projects may seek funding through an annual competitive, merit-based application process, with nearly $10 billion dedicated since inception in 2009. The program has been expanded under IIJA to include a total of $15 billion in eligible funds.[118]
- Infrastructure for Rebuilding America (INFRA) grants are competitive grants for multimodal freight and highway projects of national or regional significance to improve the safety, efficiency, and reliability of the movement of freight and people in and across rural and urban areas. Most competitive projects are those that will directly eliminate freight bottlenecks and improve critical freight movements. INFRA will offer needed aid to freight infrastructure by providing funding to state and local government for projects of regional or national significance. INFRA was expanded under IIJA to $14 billion in eligible funds, with a raised cap on multimodal projects to 30 percent of program funds.[119]
- Port Infrastructure Development Program is a discretionary grant program administered by the U.S. Maritime Administration with funds awarded through a competitive application

118 https://www.transportation.gov/RAISEgrants/about
119 https://www.transportation.gov/grants/infra-grants-program#:~:text=INFRA%20(known%20statutorily%20as%20the,and%20across%20rural%20and%20urban

process to projects that improve the safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port. IIJA has expanded this program to increase investment in America's coastal ports and inland waterways, with the goal of improving the supply chain and enhancing the resilience of the shipping industry within the United States. IIJA doubles the level of investment in port infrastructure and waterways to $2.3 billion.[120]

- Consolidated Rail Infrastructure and Safety Improvements Program is a discretionary grant program first authorized under the FAST Act. Higher funding levels were made available under the IIJA. In addition to projects that improve and expand freight and passenger rail infrastructure, Consolidated Rail Infrastructure and Safety Improvements Program grants under the IIJA will focus on safety projects such as grade-crossing enhancements and rail line relocations and improvements as well as other priorities, including workforce development and training, regional rail and corridor planning, environmental analyses, and research and deployment of railroad safety technology. New project eligibilities also include measures to prevent trespassing and to rehabilitate, remanufacture, procure, or overhaul locomotives for emissions reduction projects. Over $1.4 billion in funding was available in FY 2022.[121]

New programs initiated through IIJA include the following:

- Mega Program: This new National Infrastructure Project Assistance grant program will support multimodal, multijurisdictional projects of national or regional significance. Projects considered include large projects that are likely to generate national or regional economic, mobility, or safety benefit. Eligible projects include National Multimodal Freight Network, National Highway Freight Network, and NHS highways or bridges as well as freight intermodal or freight rail projects providing public benefit, as well as railway-highway grade separation or elimination projects. Total program funds allotted under the IIJA consists of $5 billion.[122]
- FHWA Bridge Formula Program: This program will guarantee Oregon (and all states) with dedicated funding to replace, rehabilitate, preserve, protect, and construct highway bridges. IIJA includes an incentive for states to direct the new FHWA Bridge Formula Program funds to off-system bridges owned by a county, city, town, or other local agency, matching 100

120 https://www.maritime.dot.gov/PIDPgrants
121 https://railroads.dot.gov/grants-loans/competitive-discretionary-grant-programs/consolidated-rail-infrastructure-and-safety-2
122 https://www.maritime.dot.gov/PIDPgrants

percent of project costs. Total expected 5-year FHWA Bridge Formula Program Funding for Oregon is $268 million.[123]

- National Electric Vehicle Infrastructure Program: A new program under the IIJA will make FHWA formula funds totaling $5 billion over five years available to states to deploy EV charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. The network of EV charging stations will be focused along designated Alternative Fuel Corridors, prioritizing the interstate highway system. Each state must submit an Electric Vehicle Infrastructure Deployment Plan before funding is accessible.[124]
- Bridge Investment Program: This new competitive grant program will assist state, local, federal, and tribal entities in rehabilitating or replacing bridges to improve safety, efficiency, and reliability of people and freight movement. Large projects and bundling of smaller bridge projects will be eligible for funding, with nearly $16 billion in total program funding.[125]
- Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Program: PROTECT will provide $7.3 billion in formula funding to states and $1.4 billion in competitive grants to eligible entities to increase the resilience of the transportation system. Eligible projects include highway projects, public transportation facilities, intercity rail facilities or service, or port facilities. PROTECT includes funding for evacuation routes, coastal resilience, making existing infrastructure more resilient, or efforts to move infrastructure to nearby locations not continuously impacted by extreme weather and natural disasters.[126]
- Rural Surface Transportation Grant Program: This new competitive grant program, with $2 billion in available funds, will improve and expand surface transportation infrastructure in rural areas, increase connectivity, improve safety and reliability of the movement of people and freight, and generate regional economic growth. Relevant projects may include highway, bridge, or tunnel projects eligible under the National Highway Performance Program, Surface Transportation Block Grant Program, or the Tribal Transportation Program; highway freight projects eligible under the National Highway Performance

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123 https://highways.dot.gov/newsroom/dot-announces-historic-bridge-investment-under-bipartisan-infrastructure-law

124 https://www.fhwa.dot.gov/environment/nevi/

125 https://www.fhwa.dot.gov/bipartisan-infrastructure-law/bip_factsheet.cfm

126 https://highways.dot.gov/newsroom/biden-administration-announces-new-protect-formula-program-73-billion-bipartisan#:~:text=The%20new%20Promoting%20Resilient%20Operations,by%20focusing%20on%20resilience%20planning%2C

Program; highway safety improvement projects; and projects on a publicly owned highway or bridge improving access to certain facilities that support the economy of a rural area.[127]

- Charging and Fueling Infrastructure Grant Program: This discretionary grant program will provide up to $2.5 billion in funding to provide EV charging and hydrogen/propane/natural gas fueling infrastructure along designated Alternative Fuel Corridors and in communities.[128]
- Strengthening Mobility and Revolutionizing Transportation Grant Program: This new program under the IIJA will be a programmed competition that will deliver $100 million annually in competitive grants to states, local governments, and tribes for projects that improve transportation safety and efficiency, including smart-city projects ranging from building out autonomous and connected vehicles infrastructure, smart traffic sensors, smart grids, and commerce delivery and logistics.[129]
- Railroad Crossing Elimination Program: This new competitive discretionary grant program was created under the IIJA and will be administered by the Federal Railroad Administration. The Railroad Crossing Elimination Program will fund projects that create grade separations—such as overpasses and underpasses—as well as closures, track relocations, and improvement or installation of warning devices at crossings if related to a separation or relocation project. Planning, environmental review, and other preliminary design elements are also eligible for grant funding. More than $570 million was made available in FY 2022.[130]

Individual states can help influence federal policy by making freight funding and financing top priorities in their discussions with their respective congressional representatives. Ongoing state agency coordination with Oregon's congressional delegation is critical in showing support for maintaining and expanding current programs for funding freight projects, as well as identifying potential new sources of freight funding in federal transportation and other legislation.

6.7 STATE AND MULTIMODAL OPPORTUNITIES

At the state level, state gas taxes and a variety of fees have been used to support freight infrastructure and other improvements. In recent years, these taxes and fees have been extended by other programs, such as Keep Oregon Moving (HB 2017), which has been instrumental in

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127 https://www.transportation.gov/grants/rural-surface-transportation-grant

128 https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-funding-and-financing/federal-funding-programs

129 https://www.transportation.gov/grants/SMART

130 https://railroads.dot.gov/grants-loans/competitive-discretionary-grant-programs/railroad-crossing-elimination-grant-program

providing funding to address key Portland area bottlenecks that are critical to truck freight movements.

Recognizing the need for multimodal investments, the State of Oregon created the Connect Oregon program, which established a funding source for non-highway aviation, marine, and rail freight projects. The following discussion summarizes the Connect Oregon Fund.

The Connect Oregon Fund is a privilege-tax-funded program that invests in air, marine, and rail infrastructure. Public road and highway projects that are eligible for funding through the State Highway Trust Fund are not eligible for funding through the Connect Oregon Fund. Connect Oregon Fund requirements include that $50 million must accrue prior to launching a competitive program, with the most recent awards occurring in 2022. While the funding is dedicated, it comes from a source that is expected to vary widely, which will result in the necessary $50 million being available every approximately 2 to 4 years.

The challenge of the dedicated funding source used is that it represents a significant drop in investment compared to earlier iterations. The first three competitive cycles—which launched in 2005, 2007, and 2009—made $100 million available, whereas the four subsequent cycles had less than $50 million. This represents half of what was previously available, which was exacerbated by inflationary pressures from labor shortages, rising input material costs, and aging infrastructure. Supplementing the privilege tax funding with lottery bonds as was the previous funding source or other means could bring investment back to historic levels and result in more impactful projects.

6.7.1 Keep Oregon Moving Act[131]

The Keep Oregon Moving Act (HB 2017), enacted by the 2017 Oregon Legislature, represents an important source of new financing for investments in Oregon's transportation infrastructure. The legislation makes a significant investment in transportation to help further the outcomes Oregonians value, such as a vibrant economy with good jobs, choices in transportation, a healthy environment, and safe communities. Further, the HB 2017 established the newly created privilege tax as a dedicated source of Connect Oregon funding with the program no longer relying on lottery bonds. Key major highway projects, such as the I-205 Abernethy Bridge replacement and I-5 Rose Quarter project, are to receive funding for addressing bottlenecks or improving safety; many of these projects are on major freight routes. Roadway improvements are financed through revenues generated by increases in various fees and in gasoline and diesel taxes, and ODOT is now considering tolling as a potential revenue source.

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[131] https://www.oregon.gov/odot/pages/hb2017.aspx

6.7.2 Public-Private Partnerships

Public-private partnerships (PPP) help accelerate development of critical transportation infrastructure, thereby, realizing benefits before the public or private sectors could do so on their own. From a goods movement perspective, rail PPP arrangements have thus far been the focus of many transportation PPP projects, possibly because of the frequent interaction between private railroads and government agencies. However, other types of projects also make potential PPPs, such as the development of intermodal centers or tolled/priced facilities.

ODOT's Office of Innovation offers a unique support system to plan, fund and implement PPPs. In the past, the office has played a role in projects, which brought together public and private partners, including the Road User Fee Pilot Program and Oregon's Solar Highway project. This office may be able to facilitate the development of freight-related projects using a combination of public and private sources of funding.

6.8 IMPLICATIONS FOR FUTURE FREIGHT FUNDING

While assumed values such as growth rates, rate of inflation, and materials costs have changed since estimates and forecasts were made for the OTP, the general trends have not changed significantly. Passage of Keep Oregon Moving (HB 2017) resulted in significant new state revenues to improve freight and passenger transportation facilities, but a major funding gap remains. Continuation of existing funding sources such as Connect Oregon and the creation of new state funding sources will help reduce the gap and support Oregon's economy. A similar effect will occur due to IIJA's reauthorization of federal surface transportation funding legislation as well as other freight-related federal legislation and grant programs, resulting in extension of existing, and new, freight funding programs. Ongoing comparisons of freight funding needs to available revenues in relation to Oregon's economy and the demand for goods movement will be important to decision-makers when developing legislative proposals.

7 Freight Issues and Strategies

7.1 PURPOSE OF ISSUES AND STRATEGIES

Analysis and outreach efforts supporting the development of the OFP have identified a number of issues that need to be addressed in order to ensure that Oregon has an efficient and sustainable freight transportation system that continues to support economic growth and livability of Oregon communities. This chapter presents these issues and formulates strategies that ODOT, tribal governments and other governmental agencies and jurisdictions can implement in order to realize the state's freight transportation goals.

These strategies would do the following:

- Define a Strategic Freight System and establish a process for updating the definition of the system.
- Describe how the strategic system should be preserved.
- Periodically revisit existing processes and criteria for determining critical investment needs for the freight system.[132]
- Describe how ODOT can work with partner agencies and other states, local agencies and the private sector to ensure a coordinated approach to freight transportation system planning.
- Establish procedures to ensure the system operates safely and efficiently.
- Identify actions that can be taken to coordinate land use and freight transportation planning decisions.
- Describe how regulatory programs can be coordinated with freight transportation needs.
- Describe approaches to addressing long-term funding needs for the freight transportation system.

Most of these strategies and actions were developed as part of the 2011 plan and continue to be relevant today. A few strategies and actions were developed or updated in order to address new requirements. Strategies and actions that are new or updated since the 2011 plan are indicated as such in parenthesis at the end.

[132] Chapter 8, Section 8.5, evaluates freight mobility issues and includes strategies to address those issues as required by the FAST Act.

7.2 CONSISTENCY WITH OREGON TRANSPORTATION PLAN

As noted in Chapter 1, the OFP as a modal plan is subordinate to the Oregon Transportation Plan (OTP). Thus, any strategies and actions that are identified in response to freight issues in the OFP must be consistent with the goals of the OTP. The following are the OTP goals:

- Mobility and Accessibility
- Management of the System
- Economic Vitality
- Sustainability
- Safety and Security
- Funding the Transportation System
- Coordination, Communication and Cooperation

Appendix C includes a section that maps OFP strategies to OTP policies.

7.3 STRATEGY METHODOLOGY

7.3.1 Methodology to Create the Oregon Freight Plan Issues and Strategies

The issues and strategies presented in this chapter were developed with input from two primary sources:

- **Analysis described in a series of technical memoranda on freight transportation topics.** Experts within the stakeholder community who participated in a series of Working Groups and the OFP Steering Committee reviewed these technical memoranda. The technical memoranda also provided extensive data that were used in subsequent analyses included in the preceding chapters of this plan. The technical memoranda prepared to support the OFP can be found in Freight Plan Publications on the ODOT website.[133]
- **Discussions with the OFP Steering Committee.** As described in Chapter 1, the OFP Steering Committee included executive-level freight-industry, community, and transportation professionals from around the state. The OFP Steering Committee received all of the technical memoranda and then spent a number of meetings discussing issues and formulating strategies based on the technical information and their own expertise.

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[133] Contact the ODOT Freight Planning Unit to obtain copies of the technical memos.

7.4 OREGON FREIGHT PLAN ISSUES AND STRATEGIES

Freight Issue #1

A clearly defined, multimodal "Strategic Freight System" is essential to focus freight system improvements, maintenance, and protection on the freight corridors that play the most critical role in supporting the state's economy. Currently, this does not exist.

Strategy 1.1—Establish a Strategic Freight System building on the system defined by the commodity flows of Oregon's major industries. This system should include those elements of the transportation infrastructure that best support the state's key industries. This system should be multimodal, when viable, and exist in both urban and rural areas as appropriate.

- *Action 1.1.1.* Monitor and maintain freight systems identified in modal plans. Update modal plans to meet identified strategic needs and incorporate analysis of current economy and economic forecasts periodically.
- *Action 1.1.2.* Use the methodology resulting from this plan to update the definition of the strategic freight infrastructure system. The methodology includes both quantifiable and qualitative data elements.
- *Action 1.1.3.* Develop performance measures and gather necessary data on an ongoing basis to support continued updating of identified freight routes as Oregon's economy evolves and the state reacts to changing economic conditions.[134]

Strategy 1.2—Support freight access to the Strategic Freight System. This includes proactively protecting and preserving corridors designated as strategic.

- *Action 1.2.1.* Preserve freight facilities included as part of the Strategic Freight System from changes that would significantly reduce the ability of these facilities to operate as efficient components of the freight system unless alternate facilities are identified or a safety-related need arises.
- *Action 1.2.2.* When a change of use or classification of any facility on the Strategic Freight System is considered, seek to ensure that continuity of the Strategic Freight System is maintained.

Strategy 1.3—Improve understanding of the economic benefits of freight improvement projects or programs to Oregon's residents and businesses. This means understanding both the direct benefits and secondary benefits such as induced job growth.

[134] Refer to Chapter 8, Section 8.3, for updated performance measures required by the FAST Act.

- *Action 1.3.1.* Develop mechanisms to measure the potential benefits of freight projects or programs. Measures should include quantifiable economic benefit as well as non-quantifiable benefits such as improvements to public health, safety and quality of life.
- *Action 1.3.2.* Establish mechanisms to measure appropriate comparative economic returns of different freight projects or programs. When multiple projects are reviewed, provide decision-makers with information regarding return on investments.
- *Action 1.3.3.* Use relevant freight benefit and freight mobility measures during project prioritization and selection. Use the economic benefit and economic return information to support freight projects to achieve project funding during the selection process.

Freight Issue #2
Capacity constraints, congestion, unreliability and geometric deficiencies in key highway, rail, air and marine freight corridors cause inefficiencies in statewide freight movement.

Strategy 2.1—Define and establish criteria to identify freight constraints and deficiencies.

- *Action 2.1.1.* Create quantitative definitions for the types of constraints existing on the Oregon transportation system: capacity-related congestion points, operational chokepoints, deficient infrastructure conditions or geometry and weather-related closures. Define these constraints and deficiencies at a corridor level. Base performance and prioritization criteria on multiple factors, including delay, value of cargo and industries affected, degree of weather-related impacts, availability of alternate routes and OHP mobility standards.[135]

Strategy 2.2—Develop a process for identifying, measuring and monitoring system constraints and deficiencies.

- *Action 2.2.1.* Develop and use performance measures/factors to identify corridor performance constraints, system deficiencies and affected industries. Apply the criteria to identify system constraints on an ongoing basis. Base performance measures on research conducted by ODOT and reported in "Freight Performance Measures: Approach Analysis."[136, 137]

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135 Chapter 8, Section 8.5, summarized the Freight Highway Bottlenecks Project that identified and prioritized truck delay areas in response to this strategy and FAST Act requirements.

136 Starr McMullen and Christopher Monsere, "Freight Performance Measures: Approach Analysis," prepared for the Oregon Department of Transportation and the Oregon Transportation Research and Education Consortium (OTREC), May 2010. http://www.oregon.gov/ODOT/Programs/ResearchDocuments/Freight_Performance_Measures.pdf

137 Chapter 8, Section 8.3, implements required performance measures and monitoring.

Strategy 2.3—Identify and rank freight bottlenecks, corridor constraints or chokepoints, in particular those located on the strategic system. Update the ranked list periodically.[138]

- *Action 2.3.1.* Create a set of freight planning guidelines to use for developing transportation system plans. Recommend the adoption of ranking and prioritization procedures for evaluating freight system performance as part of TSPs. In the guidelines, recommend that the TSPs detail how plans will eliminate or significantly reduce bottlenecks and constraints.
- *Action 2.3.2.* Prioritize freight system needs on a regular basis. This list should include all modes and be flexible enough to be adaptable to different funding sources.

Strategy 2.4—Coordinate freight improvements and system management plans on corridors comprising the Strategic Freight System with the intent to improve supply chain performance.

- *Action 2.4.1.* Define freight improvement projects specifically as those projects that support goods movement efficiency, using quantitative criteria as defined in Action 2.1.1.[139]

Strategy 2.5—Enhance Intelligent Transportation Systems (ITS) applications (such as traveler information programs and transportation demand management systems) that are effective and useful to freight. Prioritize strategic locations for ITS applications. This should include intermodal connector facilities.

- *Action 2.5.1.* Evaluate the effectiveness of existing programs and explore opportunities to expand the programs to new facilities, in particular those that are part of the Strategic Freight System.
- *Action 2.5.2.* Target key intermodal connectors as well as possible alternate routes to those intermodal connectors that tend to be congested.
- *Action 2.5.3.* Interview freight users (motor carriers, private fleets and shippers) to determine types of travel information most useful to them and identify best methods of delivery. Conduct demonstrations of public-private information sharing partnerships

138 Chapter 8, Section 8.5, summarizes the Freight Highway Bottlenecks Project that identified and prioritized bottlenecks in response to this strategy and the FAST Act.

139 Refer to Chapter 8 for the freight investment plan required by the FAST Act.

linking public Traffic Management Centers (TMC)/Trip Check systems to private dispatch and scheduling systems.

- *Action 2.5.4.* Coordinate with local Transportation Demand Management programs on or near congested freight corridors to reduce discretionary auto trips.

Strategy 2.6—In order to increase modal alternatives on key freight corridors in the strategic system, encourage development of carload transload/consolidation facilities where there is market support for such facilities.

- *Action 2.6.1.* Since railroad business models have evolved to emphasize efficiency through unit train and expedited service models (for intermodal trains) that benefit shippers who can consolidate loads, consider developing programs to help shippers develop transload/consolidation facilities where there is market support for such facilities. Build this strategy on a compelling public benefits analysis and demonstration of potential market feasibility.

Freight Issue #3
Congestion and unreliable travel time on roads to access major intermodal facilities can cause disruptions to freight movement and industry supply chains.

Strategy 3.1—Establish a procedure for monitoring the mobility, infrastructure conditions, and performance of intermodal connector roads on the NHS and other last-mile connections to important freight generation sites.

- *Action 3.1.1.* Develop and maintain measures monitoring intermodal connection performance at key intermodal facilities in terms of traffic volumes, delays and infrastructure conditions.

Strategy 3.2—Partner with local government agencies and tribal governments to identify intermodal connectors that provide “last-mile” connectivity to freight-generating businesses or locations and are not currently classified as NHS Connectors. Use this information to update the NHS connector list, when requested by the federal government, and to establish an additional list of secondary connector routes as appropriate. Highlight the importance to local governments of the role they have in making the freight system function effectively for businesses across the state.[140]

[140] Chapter 8, Section 8.5, summarizes the Oregon Freight Intermodal Connector System Study that identified intermodal connectors in response to this strategy and the FAST Act.

- *Action 3.2.1.* Working with local and regional jurisdictions, develop guidance documents for local agencies that identify how to define and designate local freight connectors.
- *Action 3.2.2.* Compile a list of local freight connectors once they have been identified by local and regional jurisdictions and tribal governments.
- *Action 3.2.3.* Request local governments to document how they have addressed last-mile local freight connector needs in their TSPs.

Strategy 3.3—Encourage inclusion of connector roads in local transportation system plans.

- *Action 3.3.1.* Review TSP guidelines and make recommendations about identifying connector roads including any NHS and non-NHS, local freight connectors or secondary freight routes in the local TSP process. Place special emphasis on those facilities that serve as important links to businesses, industrial lands and freight generators of statewide economic importance.

Freight Issue #4
Improvements to the efficiency, reliability and safety of long-haul freight corridors require collaboration between Oregon and neighboring states.

Strategy 4.1—Prioritize efforts to create and maintain strategic relationships with multistate coalitions and freight groups in neighboring states to identify freight transportation issues, concerns and needs of mutual interest. Continue to advocate for multistate planning opportunities. Work with trading partners and freight destinations and origins on identifying supply chain issues that affect whole industries.

- *Action 4.1.1.* Take a strong role in supporting the activities of established multistate coalitions as well as coordinating freight initiatives with transportation agencies in California, Idaho, Nevada and Washington. Build strong ties with Washington State and seek opportunities to work on cross-border planning initiatives, rail issues and capacity issues in the Columbia River Gorge and on the Columbia River bridges.
- *Action* 4.1.2 Promote greater uniformity in size and weight standards for trucks in Oregon as a member of the Multistate Highway Transportation agreement.
- *Action 4.1.3.* Build relationships with major trading partners to identify freight supply chain issues.
- *Action 4.1.4.* Coordinate with neighboring states to reduce discretionary auto trips in congested interstate corridors at peak hours.

Freight Issue #5
Changes to the physical dimensions of a highway may either accommodate or restrict permitted loads throughout the entire state and can cause connectivity issues to key businesses and freight generating activities.

Strategy 5.1—Monitor, preserve and improve highway freight facilities that accommodate truckloads requiring a permit.

- *Action 5.1.1.* Preserve the ability of highway facilities and locations that are utilized by heavy and over-dimensional trucks to accommodate these loads. Identify freight mobility needs and avoid loss of physical capacity for these trips unless an existing feasible route is identified. If a conflicting policy limits the application of this action, seek to balance the transportation needs of all highway users while managing the statewide transportation system.[141]
- *Action 5.1.2.* Target highway facilities and locations that are utilized by heavy and over-dimensional loads for improvements through a systematic process that identifies centers of economic activity for industries generating these loads and the corridors in which they operate. Create connections between the motor carrier permitted load routes and project selection processes.
- *Action 5.1.3.* When applying Actions 5.1.1 and 5.1.2, engage in early public outreach to the affected communities, local governments, shippers of over-size and over-weight loads and motor carriers.

Strategy 5.2—Identify routes that have length, weight, or height restrictions and include these routes, as appropriate, in the state's assessment of needed highway improvements.[142]

- *Action 5.2.1.* Use a data-driven process to identify highway improvement needs and to conduct an economic analysis of over-size, over-weight truck corridor improvement needs. Some criteria that could be considered as part of this identification and assessment process include:

  1. The number of requests for permits on the route.

141 Oregon Revised Statutes 366.215 stipulates that the Oregon Transportation Commission may not permanently reduce the vehicle-carrying capacity of an identified freight route when altering, relocating, changing, or realigning a state highway unless safety or access considerations require the reduction. Local governments may apply to the OTC for an exemption to prohibitions to reductions in capacity.

142 Chapter 8, Section 8.5, summarizes the needs related to highway over-dimensional load pinch points in response to this strategy and the FAST Act.

2. Input from stakeholders and periodic shipper surveys to identify latent demand for commodity shipments requiring over-size, over-weight truck configurations.
3. Analysis of corridor-level data and forecasts to determine where demand for over-size, over-weight loads is likely to increase.
4. Analysis of emergency preparedness plans as certain events will require viable routes to deploy larger and heavier trucks that require a permit.

Strategy 5.3—Consider targeting financial support to strategic non-highway modal infrastructure such as short-line rail and barge for shipment of nondivisible loads.

- *Action 5.3.1.* Identify other transportation modal options, including short-line rail service or barge, in each of the key corridors that need to be protected for over-size and over-weight commodity movements, as well as the "last-mile" connections to industrial and freight-generating land uses. If rail or barge infrastructure is available, consider targeting financial support into upgrading or maintaining the infrastructure as an alternative to truck transportation.

  In all cases, the state's participation in supporting infrastructure owned by private entities should only be contemplated if there is significant public interest or economic incentive to do so. Subsidies to the private sector should be provided only where there is an acceptable business plan for ongoing operation and maintenance of facilities and where a public benefit is clearly documented. Identified matching funds should also be considered as a necessary condition for state investment in private modal services.

Freight Issue #6

Freight needs to be able to move throughout the state in a manner that is as safe as possible. Its movement may impact safety in Oregon communities and risk to the environment.

Strategy 6.1—Partner with local, statewide, tribal and federal partners to monitor and manage the safety performance of the statewide freight system.

- *Action 6.1.1.* Work with the ODOT Commerce & Compliance Division, Rail & Public Transit Division and other programs within state agencies to advance freight issues for consideration in safety plans. This should include continued monitoring of locations on state highways for high incidence of truck-involved crashes to identify any emerging safety issues and continued evaluation of rail grade-crossing safety through the Oregon Operation Lifesaver program.
- *Action 6.1.2.* Continue leveraging the knowledge and support on safety matters offered by federal public agencies as well as private-sector freight partners.

- *Action 6.1.3.* Review programs and manuals offered by the state to include the most recent technological and operational freight and logistics developments.
- *Action 6.1.4.* Review existing hazardous transportation routes to determine whether their location is optimal to provide mobility while minimizing potential impacts to the environment and communities.

Strategy 6.2—Use state-of-the-art crash statistics and data tracking methods to monitor the safety performance of the system and to track system performance over time.

- *Action 6.2.1.* The state will develop and use up-to-date local and national freight-related crash data. Adjust the data types if necessary to respond to changes in logistics supply chains or transportation modes.

Strategy 6.3—Build freight safety considerations into the system monitoring, project selection and prioritization processes.

Freight Issue #7

Industrial land supply for freight-dependent land uses may be insufficient to meet future demand. Lack of necessary land use protections may threaten the viability of freight transportation systems.

Strategy 7.1—Work to better integrate freight into the land use planning process and to protect the existing supply of industrial (freight-dependent) land uses and freight terminals.

- *Action 7.1.1.* Support better integration of freight into the regional and local land use planning processes. Encourage local governments to integrate industrial land use planning into comprehensive plans and all other plans and actions relating to land use controls.
- *Action 7.1.2.* Work with regional and local land use planning agencies to protect existing industrial land from encroachment from incompatible land uses. This could be accomplished by including industrial-zoned lands adjacent to freight facilities (including such facilities as intermodal yards, freight terminals, marine and others) for future freight expansion. Encourage the development of buffers between freight facilities and incompatible uses. Transportation infrastructure connecting to terminals, ports, airports, and other freight-generating land uses should be included in these discussions.
- *Action 7.1.3.* Work with local and regional governments to encourage that properties designated as industrial lands in a comprehensive plan are reasonably developable. Land selected for industrial uses should not have significant constraints that would make it unduly difficult or costly to develop.

- *Action 7.1.4.* Encourage the development of freight transportation facilities and other industrial land uses at brownfield locations.

Strategy 7.2—Work with local and regional agencies and tribal governments to develop best practices for integrating freight-generating land uses into the urban fabric in a manner that minimizes the impact on surrounding communities and the environment.

- *Action 7.2.1.* Support local and regional land use agency efforts to create a set of freight-generating land use design standards including information to educate private-sector developers and public-sector planners. Distribute the standards to potential developers of freight-dependent businesses and local land use planners. Support adoption of strategies such as Cargo-Oriented Development[143] and Smart Industrial Growth in local and regional plans.

Freight Issue #8
Freight emissions include pollutants such as greenhouse gases and particulate matter that contribute to climate change and health risk concerns.

Strategy 8.1—Implement strategies and methods noted in the Climate Action Plan to reduce pollutants and greenhouse gas emissions from freight sources within Oregon. Focus on existing efforts and strategies that have been identified in statewide plans and policy documents. (Updated)

- *Action 8.1.1.* Ensure that new publicly funded transportation electrification infrastructure addresses freight needs, such as charging stations for medium and heavy-duty vehicles.
- *Action 8.1.2.* Incentivize and support the conversion of commercial fleets from gas and diesel-powered vehicles to near-zero and zero-emission vehicles. (New)
- *Action 8.1.3.* Support congestion relief and idling reduction activities such as weigh-in-motion technology and the provision of electricity at truck stops for parked trucks.

Strategy 8.2—Consider climate change and environmental impacts such as flooding, stormwater runoff, and wildlife habitat loss, in freight transportation planning activities. (Updated)

- *Action 8.2.1.* Incorporate methods of considering greenhouse gas impacts in freight transportation planning and decision-making processes. Consider emissions reduction

[143] See Appendix E – Glossary for definition of Cargo-Oriented Development.

benefits and local air pollution improvement when awarding funds to freight projects. (Updated)

- *Action 8.2.2.* Work with private-sector freight stakeholders to identify the most cost-effective approaches to address climate change impacts from freight, in particular those strategies that also support and benefit shippers.
- *Action 8.2.3*. Ensure that freight transportation planning activities are consistent with OHP Policy 5A for highway-related projects, and best practices for non-highway modes, in order to minimize freight impacts on flooding, storm water runoff, and wildlife habitat loss. (New)
- *Action 8.2.4*. Support integration of strategies to in climate change and adaptation planning policies to decrease the severity of impacts of extreme weather and natural disasters on freight mobility. (New)

Freight Issue #9

National Environmental Policy Act (NEPA) review procedures and permitting requirements for freight projects involve complexities that, if overlooked, can result in negative impacts to project development and implementation cycles.

Strategy 9.1—Reduce inefficiencies in the National Environmental Policy Act (NEPA) process and environmental permitting processes, and improve environmental outcomes, by considering actions that encourage early consultation with federal, state, and local agencies.[144]

- *Action 9.1.1.* Review the state's natural resource and environmental permitting program for highway projects and assess its potential applicability for freight transportation projects for other modes. For all environmental review and NEPA projects, engage the necessary internal and external stakeholders early in the planning process in order to secure the required permits, speed project delivery and understand and address environmental concerns. Work with resource agencies to arrange for concurrent reviews wherever possible.
- *Action 9.1.2.* Consider using FHWA's Planning and Environmental Linkages (PEL) framework to facilitate early collaboration with environmental stakeholders and streamline the NEPA process.

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[144] At the project level, Planning and Environmental Linkages (PEL) can be used to inform and streamline environmental review by transitioning information, analysis, and products developed during a PEL study into a subsequent NEPA process. ODOT has developed guidance for linking planning and NEPA using the ODOT PEL Questionnaire (https://www.oregon.gov/odot/Planning/Documents/ODOT%20_Guide_to_Linking_Planning_and_NEPA.pdf).

Freight Issue #10

New and emerging safety, security, and environmental regulations, though beneficial, can be confusing to shippers and carriers and be expensive to implement.

Strategy 10.1—Work with shippers, carriers and terminal operators to increase the knowledge of the costs, consequences and requirements of new safety, security and environmental regulations.

Freight Issue #11

The freight system in Oregon lacks system redundancy in several key locations. This leaves it vulnerable to disruptions that threaten freight system continuity, especially during emergencies.

Strategy 11.1—Create a statewide emergency management plan that identifies critical vulnerable points from a freight mobility perspective and places where there is a lack of system redundancy. Create freight movement emergency plans for disruptions at these locations that include information about possible alternatives routes.

- *Action 11.1.1.* Create an emergency transportation system map that includes alternative route identification as well as transportation modal alternative information. The map should be flexible enough to be used when single transportation components are compromised or when entire portions of the system have suffered a disruption.
- *Action 11.1.2.* Identify and track those places where disruptions would be most acutely felt. This includes those places where there are no, or few, parallel route options, so a disruption means a lack of connectivity. This also means places that tend to be subject to natural or weather-related disruptions including mountain passes, single-lane infrastructure, rail tracks that tend to be affected by heavy rains and snows, and inland waterway passages that are heavily influenced by water levels and drought.
- *Action 11.1.3.* Create plans that facilitate the movement of goods on alternative routes.

Strategy 11.2—Develop and maintain transportation models that account for freight logistics and routing behavior in order to evaluate effects of disruptions on freight movement at the state, regional and urban levels.

Strategy 11.3—Retain critical existing redundancy elements (for example, rail lines currently not in use, but parallel to a highway facility). Infrastructure that is currently under-utilized may become the primary link in the case of serious disruption on the primary facility.

Strategy 11.4—Develop a statewide emergency management plan, or add element to an existing plan, that accounts for the ability of the state to rapidly restore access and reliability to freight transportation in the event of a disruption.

Freight Issue #12
Lack of a sustained source of statewide freight funding decreases the ability of the public sector to plan for long- and medium-term freight needs in a comprehensive manner.

Strategy 12.1—Work with elected officials, carriers, shippers and other stakeholders to study the potential for, and implications of, a statewide freight fund. The fund would have a selective, criteria-driven process to prioritize and fund projects in all modes of freight transportation. The process would be needs-based and focus on projects located on the Strategic Freight System.

Strategy 12.2—On a regular basis, create a package of statewide freight improvements that best support efficient statewide freight movement. Share this statewide package with local and regional governments and agencies to assist them in selecting projects to forward through the multimodal transportation improvement selection processes.

Strategy 12.3—Advocate establishing sources of funding for improvements on intermodal connectors.

- *Action 12.3.1.* Explore establishing mechanisms to maintain and improve intermodal connectors, focusing on publicly owned infrastructure such as the roads and railways that connect private intermodal warehouse/industrial facilities. This could include options for those problem intermodal connectors that are not NHS designees or for supplementing the funds available through the NHS program. Funding could be provided through an existing or new state funding source.

Freight Issue #13
Limited availability of state transportation funds means that use of existing sources of funding must be effectively optimized.

Strategy 13.1—Before embarking on capital improvement projects, explore lower-cost solutions, including operational upgrades or institutional changes, consistent with least cost planning principles.

- *Action 13.1.1.* Investigate freight operational upgrades or institutional changes prior to engaging in a capital improvement project, particularly during times of significant economic hardship.

Strategy 13.2—When a public benefit can be achieved, work together with private-sector multimodal freight stakeholders to pool resources and optimize funding efficiencies. This may include investing in transportation improvements that are multimodal and privately owned, and includes improvements to all freight modal infrastructures.

- *Action 13.2.1.* Develop the tools necessary to incorporate the breadth of transportation modes into the state transportation planning process. Develop an understanding of criteria such as multimodal transportation performance measures, costs and benefits for all transportation modes if they are to be considered as part of the transportation planning process.

Strategy 13.3—Seek projects to advance as potential PPPs through the planning and programming process.

- *Action 13.3.1.* Actively pursue PPP, where appropriate, and use capabilities already developed to help manage them, such as the Office of Innovative Partnerships Program.

Freight Issue #14

The lack of a continuous federal freight funding source makes it very challenging for Oregon to implement the ongoing planning and programming of freight projects. Those projects that are of regional or national significance should be eligible for federal participation and funding.

Strategy 14.1—Work through Oregon's congressional delegation to urge the federal government to develop a coherent national freight strategy.[145]

- *Action 14.1.1.* Work toward influencing national policy by stressing the urgency of freight funding and financing in discussions with congressional representatives.

Strategy 14.2—Work with partner states to identify projects that are of national significance to elevate to the federal level for funding consideration.[146]

- *Action 14.2.1.* Continue to work with partner agencies and other states to identify projects that are important to regional and statewide economies and also important at the national scale. State or local contributions may also be needed for these projects to the extent that they benefit the state or local communities.

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145 Chapter 8 describes the steps taken in the FAST Act and with the National Highway Freight Program to develop a national freight strategy and funding source.

146 Chapter 8, Section 8.6, lists projects in an investment plan that describes how formula freight funding will be expended and matched during federal fiscal years 2016-2020.

Freight Issue #15
The economic importance of freight is not always understood or appreciated by the public.

Strategy 15.1—Continue to create opportunities for positive interaction between freight-industry representatives and community stakeholders, including long-range planning or other community planning activities.

- *Action 15.1.1.* Continue to include shippers, carriers and private-sector developers in regional and statewide outreach efforts and on advisory groups such as the one created for this OFP to promote an understanding of the needs of freight-related businesses.
- *Action 15.1.2.* Explore additional opportunities for promoting the understanding of freight issues, such as the participation of ODOT freight staff, carriers and shippers in Area Commission on Transportation meetings.
- *Action 15.1.3.* Educate the public about the importance of statewide freight issues through increased coverage on the ODOT website and through other forums.

7.5 IMPLEMENTATION

Implementation of the OFP strategies and actions will build on the planning framework established in the OTP and other modal and topic plans. This will include working with a variety of public agencies and private-sector stakeholders through existing and new partnerships. Implementation of some of the strategies and actions can be accomplished in the short term while others will require commitments over the longer term. Some may require legislative action or action by other governmental entities. Implementation will occur in phases and will require coordination with efforts to update other plans such as the modal and topic plans as well as regional and local transportation system plans. Additionally, the biennial State of the System report should be referenced to ensure OFP Section 8.3 incorporates Freight Issues, Strategies and Actions that align with broader aims of the OTP. Funding availability will be important to implementing many of the strategies and associated actions.

7.5.1 Oregon Transportation Plan Key Initiatives

The OTP implementation identifies a set of key initiatives that provide implementation guidance for the OTP and the modal and topic plans. These key initiatives include directions related to system optimization, integration of transportation modes, integration of transportation, land use, the environment and the economy, and the need to make strategic investments using a sustainable funding structure.

The purpose of the key initiatives is to frame plan implementation, along with updating the modal/topic plans, not to override the direction of the goals and policies. Implementation of the OFP will be consistent with all OTP key initiatives and advance several of them. These are the OTP key initiatives:

- Maintain the existing transportation system to maximize the value of the assets. If funds are not available to maintain the system, develop a triage method for investing available funds.
- Optimize system capacity and safety through information technology and other methods.
- Integrate transportation, land use, economic development and the environment.
- Integrate the transportation system across jurisdictions, ownerships and modes.
- Create a sustainable funding plan for Oregon transportation.
- Invest strategically in capacity enhancements.

7.5.2 Implementation Steps

Implementation of the OFP will require coordination between and within governments, agencies, and the private sector, integration of the OFP strategies into subsequent planning efforts and public involvement in discussions of freight needs.

7.5.2.1 Coordination

Implementation will require involvement and coordination among a variety of ODOT business units. This includes the ODOT modal divisions and the Transportation Development Division. The involvement of ODOT Region staff will be critical to the implementation of some strategies and actions. Implementation also will require involvement and coordination with other state agencies such as the Department of Aviation, Business Development Department, DLCD, and various resource and other agencies as well as the FHWA, Federal Aviation Administration, and other federal modal administrations and agencies.

Coordination with transportation and other agencies in neighboring states can further implementation of several strategies and actions.

7.5.2.2 Planning

Oregon's statutes and administrative rules promote planning consistency among state, regional and local governments. The Transportation Planning Rule (TPR) requires state, regional and local governments to address goods movement issues in the development of transportation system plans. The TPR also requires regional and local government transportation system plans to be consistent with the state transportation system plan. Since the OFP is part of the state transportation system plan, its strategies will provide guidance to regional and local freight planning and system management.

The OFP supports several elements of planning and system management including:

- State transportation facility plans such as specific area plans, interchange area management plans, expressway management plans and corridor plans.
- Regional and local transportation system plans developed through MPO, city, or county processes.
- Plans developed by tribal governments.
- Plans developed by ports or special districts.
- System management by ODOT, other state agencies, MPOs, cities and counties that may include management of roadway pavement, bridges, safety, operations, maintenance, congestion and public transportation.

7.5.2.3 Public Involvement

Public involvement and coordination will be critical to OFP implementation. This will include seeking input from a variety of community and freight stakeholders, such as the OFAC as well as other tribal, state, regional and local advisory committees.

Input from various public agencies and freight stakeholders will help guide preparation of a more detailed analysis of the work needed to implement specific OFP strategies and actions. Completion of the analysis is expected to result in a guidance document identifying short-term priorities, medium-term priorities and long-term priorities, similar to the way these are identified in the OTP Implementation Work Program. Implementation of OFP priorities will need to be consistent with implementation of priorities in the OTP work program as well as other planning work programs.

7.5.3 Steps Following Plan Adoption

Some implementation actions can start soon after the OFP is adopted.[147] These include the following:

- Develop an Implementation Plan using the OTP Key Initiatives and Freight Plan purpose statement to provide a framework.

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147 Refer to Chapter 8 for an update on implementation activities related to system needs, performance, network designations, and funding.

- Continue discussions to update Oregon's transportation finance structure with stakeholders and the public.
- Develop performance measures and analytical tools for plan implementation.
- Develop freight stakeholder input on bottlenecks or choke points on the Strategic Freight System.
- Communicate the bottlenecks or choke point locations to infrastructure owners and stewards.

8 Federal Compliance

8.1 BACKGROUND

Moving Ahead for Progress in the 21st Century Act (MAP-21[148]) was signed into law on July 6, 2012. Among other things, it contains provisions related to freight and performance management, specifically requiring the U.S. Department of Transportation (USDOT) to establish a national freight network to help states strategically direct resources toward improved freight system performance. MAP-21 also requires the USDOT to develop a National Freight Strategic Plan. It continues the Projects of National and Regional Significance program and, to encourage investment in freight projects, allows reduced non-federal matching share for freight projects.

MAP-21 encourages each state to develop a comprehensive state freight plan that would:

- Identify significant freight system trends, needs and issues.
- Include freight policies, strategies and performance measures to guide the state's investment decisions.
- Improve the ability of the state to meet national freight goals.
- Consider innovative technologies and operational strategies, including ITS that improve the safety and efficiency of freight movement.
- Describe improvements that may be required to reduce or impede the deterioration, where travel by heavy vehicles is projected to substantially deteriorate the condition of roadways.
- Inventory facilities with freight mobility issues, such as truck bottlenecks, and identify strategies to address those mobility issues.

MAP-21 also encourages each state to establish a freight advisory committee containing a representative cross section of public- and private-sector freight stakeholders.

The original OFP was developed in parallel with MAP-21 and is consistent with much of the impetus behind the law. However, the OFP was adopted in 2011 prior to the finalization of MAP-21. Additionally, on December 4, 2015, then President Barack Obama signed the FAST Act into law.

The FAST Act builds on MAP-21's freight requirements. At a national level, the act clarifies and amends the national freight network and planning requirements. It focuses more on

[148] 2021 Infrastructure Investment and Jobs Act - SEC. 21102. UPDATES TO NATIONAL FREIGHT PLAN.

multimodal freight planning by establishing a National Multimodal Freight Policy (NMFP) and requires the creation of a National Multimodal Freight Network (NMFN). It requires the USDOT to establish both an interim and final network.

The FAST Act established a new funding program—the National Highway Freight Program (NHFP)—and provides formula funds over federal fiscal years 2016 to 2020 for states to invest in freight projects on the National Highway Freight Network (NHFN). This program has been renewed through the IIJA. The IIJA includes a five-year reauthorization of existing federal highway, transit, safety, and rail programs as well as new programs and increased funding related to freight. (See Chapter 6 for information on freight funding related to the IIJA.)

The FAST Act further requires that states develop a freight plan that comprehensively covers short- and long-term freight planning activities and investments. The plan must:

- Be fiscally constrained
- Include a freight investment plan with a list of priority projects
- Describe how the state will invest and match its NHFP funds

The FAST Act continues to encourage states to form freight advisory committees and clarifies their role. The act requires the USDOT to develop new tools to support an outcome-oriented, performance-based approach to evaluate proposed projects and continues the requirement to report on the NHFN's condition and performance.

This chapter has been developed to meet the federal freight provisions under MAP-21, FAST Act, and IIJA. The FAST Act lists 10 required elements that all state freight plans must address.[149] Many of these requirements (including freight trends, needs and issues, policies, strategies, innovative technologies and state of good repair) are addressed in the previous chapters of this OFP, the OTP, and other modal/topic policy plans.

IIJA includes additional elements that have been covered in other portions of this OFP:

- The latest supply chain cargo flows
- An inventory of commercial ports
- Findings and recommendations from any multistate freight compacts
- The impacts of e-commerce on freight infrastructure in the state

149 2021 IIJA - SEC. 21104. IMPROVING STATE FREIGHT PLANS.

- Strategies and goals to decrease the severity of impacts of extreme weather and natural disasters on freight mobility
- Strategies and goals to reduce the impacts of freight movement on local air pollution, flooding and stormwater runoff and wildlife habitat loss
- A requirement that the state enhance reliability or redundancy of freight transportation or incorporate the ability to rapidly restore access and reliability with respect to freight transportation
- A description of the consultation with the OFAC

IIJA has also lengthened the forecast period to eight years and increased the frequency with which a state must update its freight plan from every five years to every four years.[150]

This chapter covers the outstanding requirements that relate to:

- Assessment of truck parking facilities within the state
- Considerations of military freight
- Freight-related performance measures
- Designation of critical rural and urban freight corridors
- A description of how this OFP will improve the State of Oregon's ability to meet the NMFP goals and the NHFP goals, including the use of innovative technologies and operational strategies to improve the safety and efficiency of freight movement
- An inventory of facilities with freight mobility issues and a description of the strategies the State of Oregon is employing to address those issues
- Consideration of any significant congestion or delay caused by freight movements and strategies to mitigate those impacts
- Impact of heavy vehicles to roadway conditions
- A freight investment plan

These requirements and how the plan addresses them are detailed in the sections that follow. Chapter 1 summarizes (and Appendix A details) the extensive consultation used to develop both the original plan and this chapter. Appendix J demonstrates how this plan meets all federal requirements for state freight plans.

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150 58 U.S.C. 21104: Improving State Freight Plans (pg. 4 of Federal Compliance Memo).

8.2 COMPARISON WITH NATIONAL FREIGHT GOALS

The FAST Act established the NMFP, which includes national goals to guide decision-making. The NHFP also includes goals to guide investment in freight. While one is geared to drive decision-making for all modes and the other focused on highway investments, there is a great deal of similarity in their goals.

Appendix F contains a matrix that cross-references the national goals to the specific Oregon state plan policies, strategies, and actions. In general, there is strong correlation and connection between this OFP strategies and the actions and the goals outlined in the NHFP and NMFP. Additionally, this OFP is one of several statewide transportation plans that implement the OTP's goals and define the state's multimodal transportation system.[151] Several of these other statewide plans, including the Oregon State Rail Plan and the OTP, have numerous connections to the federal goals as further set forth below.

In keeping with the national goals, this OFP purpose statement strongly connects the reliability, safety and efficiency of the multimodal freight system with economic competitiveness. This plan and the OTP contain numerous strategies and actions related to increasing economic competitiveness and to addressing reliability and safety. In addition, OFP implementation strategies include the completed inventory of needs for all modes, including the freight highway delay areas and intermodal connectors studies, along with similar inventories for other freight modes. These inventories of mobility issues are further discussed in Section 8.5, Freight Mobility Issues, which outlines specific areas of need that are critical to the Strategic Freight System.

Preserving and maintaining a state of good repair is a foundational element of this OFP. Numerous actions and strategies address this goal, relying on data processes to identify the most critical areas on the Strategic Freight System. This OFP also recognizes the importance of multistate and multi-agency coordination to improve freight system efficiency. Further, this OFP underscores the freight system's impact on the environment and provides many actions to reduce this impact.

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151 The relationship between this OFP, the OTP, and the various statewide modal and topic plans is further explained in Section 1.2.

The National Highway Freight Program goals are—

1. To invest in infrastructure improvements and to implement operational improvements on the highways of the United States that—
    a. strengthen the contribution of the National Highway Freight Network to the economic competitiveness of the United States;
    b. reduce congestion and bottlenecks on the National Highway Freight Network;
    c. reduce the cost of freight transportation;
    d. improve the year-round reliability of freight transportation; and
    e. increase productivity, particularly for domestic industries and businesses that create high-value jobs;
2. To improve the safety, security, efficiency, and resiliency of freight transportation in rural and urban areas;
3. To improve the state of good repair of the National Highway Freight Network;
4. To use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Highway Freight Network;
5. To improve the efficiency and productivity of the National Highway Freight Network;
6. To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address highway freight connectivity; and
7. To reduce the environmental impacts of freight movement on the National Highway Freight Network.

Source: 23 U.S.C. 167: National Highway Freight Program

The National Multimodal Freight Policy goals are:

1. To identify infrastructure improvements, policies, and operational innovations that—
    a. strengthen the contribution of the National Multimodal Freight Network to the economic competitiveness of the United States;
    b. reduce congestion and eliminate bottlenecks on the National Multimodal Freight Network; and
    c. increase productivity, particularly for domestic industries and businesses that create high-value jobs;
2. To improve the safety, security, efficiency, and resiliency of multimodal freight transportation;
3. To achieve and maintain a state of good repair on the National Multimodal Freight Network;
4. To use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Multimodal Freight Network;
5. To improve the economic efficiency and productivity of the National Multimodal Freight Network;
6. To improve the reliability of freight transportation;
7. To improve the short- and long-distance movement of goods that—
    a. travel across rural areas between population centers;
    b. travel between rural areas and population centers; and
    c. travel from the Nation's ports, airports, and gateways to the National Multimodal Freight Network;
8. To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address multimodal freight connectivity;
9. To reduce the adverse environmental impacts of freight movement on the National Multimodal Freight Network; and
10. To pursue the goals described in this subsection in a manner that is not burdensome to State and local governments.

Source: 49 U.S.C. 70101 (b)

Security is a key topic in the OTP. Strategy 5.2.1 addresses the need for security plans for all transportation modes. Strategy 5.2.4 specifically addresses the potential impact of security measures on managing transportation facilities to minimize delays in the movement of people, goods, and services. This OFP also has several actions related to improving connections between urban and rural areas.

While goals directed to using innovation and technology are less abundant in this OFP, technology is a strong theme, consistent with the national freight goals. This OFP outlines several key strategies and actions directed at implementing advanced technology to improve freight system efficiency and safety. This OFP's focus on cost-effectiveness and use of the best opportunities available to maximize system efficiency and safety encourages the use of innovative technologies to achieve these goals. ODOT has completed many Intelligent Transportation System projects that benefit truck freight. The State of Oregon will continue to capitalize on opportunities for using innovation and technology to develop applications such as Oregon's Green Light Preclearance Program (Green Light). Over the last 26 years, Green Light has saved operators of commercial vehicles some 2.7 million hours of travel time and approximately $350 million in operating costs as they cleared Oregon weigh stations without having to slow or stop. In addition, the increase in operational capacity afforded by Green Light has reduced the need to build new weigh station facilities or expand existing ones.[152]

The strategies and actions outlined in this OFP and the OTP formalize Oregon's commitment to multimodal freight system improvement by helping define system needs. Nearly every strategy and action in this OFP supports multiple national freight goals. Extensive implementation efforts have led to the identification of critical areas of need and will provide the State of Oregon with the information necessary to meet to this OFP and national freight goals.

Appendix F provides more detail on how the specific strategies and actions in Oregon plans line up with the federal freight goals.

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152 Oregon Department of Transportation. Green Light Preclearance Program. https://www.oregon.gov/ODOT/MCT/Pages/GreenLightProgram.aspx.

8.3 PERFORMANCE MEASURES

MAP-21 established seven national performance goals and a performance management system. It required the FHWA, in consultation with the states, to establish measures and required each state to establish performance targets in the following areas:

- Pavement condition on the interstate highway system and on the remainder of the NHS
- Performance of the interstate highway system and the remainder of the NHS
- Bridge condition on the NHS
- Fatalities and serious injuries—both number and rate per vehicle-miles traveled—on all public roads
- Traffic congestion
- On-road mobile source emissions
- Freight movement on the interstate highway system

The FAST Act continues MAP-21 with some limited adjustments. If the USDOT Administrator determines that a state has failed to make significant progress toward meeting its freight performance targets within two years after establishing the targets, the state must describe the actions it will take to achieve these targets in its next performance report to USDOT.[153]

USDOT has established national performance measures in response to the requirements of MAP-21 and the FAST Act.[154] The performance measure to assess freight movement on the interstate is "Percentage of the Interstate System Mileage providing for Reliable Truck Travel Times, or Truck Travel Time Reliability Index" (the Freight Reliability measure). This measure is calculated using the National Performance Management Research Data Set, which the FHWA developed to provide a comprehensive picture of travel times throughout the NHS for both passenger vehicles and trucks. The Freight Reliability measure is a ratio of the median to the 95th percentile travel time and is calculated for each segment throughout the state system for five time periods. The worst time period for each segment is selected and then an average is developed for the entire system based on the segment length.

153 FAST Act § 1116; 23 U.S.C. 167(j)
154 23 CFR Part 490 – Subpart F

In addition to this federally required performance measure, the State of Oregon will track and report on the following three safety performance indicators:

- Large truck at-fault crashes: number of large truck at-fault crashes per million vehicle-miles traveled[155]
- Rail crossing incidents: number of highway-railroad at-grade incidents
- Derailment incidents: number of train derailments caused by human error, track, or equipment

All three of these indicators are included as part of the Oregon Transportation Safety Action Plan and are measured and reported through the ODOT Safety Division and the Rail and Public Transit Division. ODOT will continue to work with the OFAC to evaluate and explore other potential freight performance measures and indicators that may help inform future system needs and priorities.

8.4 FREIGHT NETWORK DESIGNATIONS

8.4.1 Existing Federal Networks

The FAST Act requires FHWA to establish an NHFN, which is a network that focuses funding under the NHFP and the FASTLANE Grants program. The NHFN consists of four subsystems:

- The Primary Highway Freight System (PHFS)
- Portions of the interstate highway system that are not part of the PHFS
- Critical Rural Freight Corridors (CRFCs)
- Critical Urban Freight Corridors (CUFCs)[156]

The FAST Act limited the PHFS to 41,518 centerline miles nation-wide. FHWA designated the PHFS in October 2015. Figure 8.1 shows the current NHFN for Oregon, the portions of the interstate highway system that are not part of the PHFS. The State of Oregon is responsible for designating CRFCs. The FAST Act allows states, in consultation with metropolitan planning organizations, to designate CUFCs for urbanized areas with populations more than 50,000 but less than 500,000. In consultation with the State of Oregon, metropolitan planning organizations may designate CUFCs in urbanized areas with populations of 500,000 or more. The FAST Act approved 155 miles as CRFC and 77 miles of CUFC per state, but IIJA increased the mileage of the federal freight network by increasing the maximum highway miles a state may designate as critical rural freight corridors from 150 miles to 300 miles, and as CUFCs from 75 to 150 miles.

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155 Trucks with five or more axles are commonly considered large.
156 23 U.S.C. 167(c)

Once designated, ODOT can ask FHWA to remove or add segments within the total mileage limit. The rules also provide a mechanism for state mileage to increase over time.

Figure 8.1 National Highway Freight Network in Oregon (2022) [157]

Source: PHFS and the Non-PHFS Interstate geometry is based on the U.S. Department of Transportation, Federal Highway Administration, All Roads Network of Linear Referenced Data (ARNOLD) - 2019
Note: Map does not include Critical Rural Freight Corridors (CRFCs) and Critical Urban Freight Corridors (CUFCs) components of the National Highway Freight Network (NHFN)

Adding mileage to the NHFN allows the state to expand the facilities it can strategically direct federal resources toward. ODOT has worked with stakeholders to develop recommended CUFCs and CRFCs, which are discussed later in this section.

The FAST Act also required the USDOT to develop a National Freight Strategic Plan that identifies and assesses the demands on, and the condition and performance of, the nation's multimodal freight system. The plan, released in September 2020, identifies barriers and opportunities as well as best practices for improving multimodal freight network performance. It also contains strategies for mitigating the impacts of freight on communities and for improving multistate and multimodal connectivity.[158] Additionally, IIJA requires that the National Freight Strategic Plan be updated to include the following:

157 https://ops.fhwa.dot.gov/Freight/infrastructure/ismt/state_maps/states/oregon.htm
158 https://www.transportation.gov/freight/NFSP

- Best practices for reducing environmental impacts
- Strategies for increased resilience of the freight system
- Consideration of potential impacts of the freight system on rural and historically disadvantaged communities
- Strategies for decarbonization of the freight movement
- Impacts of e-commerce on the national multimodal freight system

The FAST Act requires the USDOT to establish an NMFN to inform stakeholders where major freight flows occur and where special attention to freight issues may be most warranted. The NMFN will include the following elements:

- The NHFN
- The Class 1 railroads as well as other freight rail systems
- U.S. public ports
- U.S. inland and intracoastal waterways
- The Great Lakes, the St. Lawrence Seaway, and coastal and ocean domestic freight routes
- The 50 largest U.S. airports by landed weight
- Other strategic freight assets, including intermodal facilities

In May 2016, USDOT released an interim NMFN for comment. ODOT provided comments and asked that a number of facilities be added.

Beyond that, the FAST Act allowed the addition of up to 20% of mileage to the NMFN. The IIJA increases this allocation, allowing states to propose the designation of up to 30% of mileage to the NMFN. Designation on the NMFN is not required for freight funding under the act. Therefore, this section does not contain recommended additions to the NMFN, but ODOT will consider additional designations as a part of future processes.

8.4.2 State Networks

Chapter 4 describes the freight networks for all modes in Oregon. The chapter examines commodity flows and identifies a network of highways and other modal facilities that provide critical connections to centers of freight-dependent economic activity in the state. The designated Strategic Freight Corridors comprise four primary (trunk) corridors and multimodal connecting routes:

- Western Corridor (I-5)
- Columbia River Corridor (I-84)
- U.S. 20 Corridor
- Central Oregon corridor (U.S. 97)

Figure 4.14 shows the Strategic Freight Corridors.

8.4.3 Oregon Highway Plan Freight Routes

The OHP contains policies and actions to balance the need for efficient movement of goods and support of the economy with the movement of other modes. In order to facilitate efficient and reliable interstate, intrastate, and regional truck movement, the OHP designated a freight system: the State Highway Freight System.[159] This system comprises interstate highways and certain statewide, regional, and district highways, the majority of which are on the NHS, and includes routes that carry significant tonnage of freight by truck and serve as the primary interstate and intrastate highway freight connection to ports, intermodal terminals, and urban areas. The State Highway Freight System designation does not guarantee additional state investment in these routes. However, the OHP outlines special management strategies that are available.[160]

The 2003 Oregon Legislature adopted changes to Oregon Revised Statutes (ORS) 366.215. In order to protect the routes that are necessary for the movement of freight, the legislation limits the situations in which the state could reduce the carrying capacity (defined as the horizontal or vertical clearance) on these routes. Oregon Administrative Rule (OAR) 731-012-0010 implements ORS 366.215 and details the review of potential reductions of vertical and horizontal clearance and the process for stakeholder involvement. Figure 10c of the OHP depicts the Reduction Review Routes where ODOT will apply the rule.

8.4.4 Critical Urban Freight Corridors

CUFCs must be a public road in an urbanized area (more than 50,000 population) that either:

- Connects an intermodal facility to the PHFS, the Interstate System, or an intermodal freight facility;
- Is located within a corridor on the PHFS and provide an alternative highway option important to goods movement;
- Serves a major freight generator, logistic center or manufacturing and warehouse industrial land; or
- Is important to freight movement within the region as determined by the MPO or the state.

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159 1999 OHP (including amendments November 1999 through May 2015), Figure 10

160 1999 OHP, p. 61

The FHWA encourages the consideration of first- or last-mile connector routes from high-volume freight corridors to freight-intensive land and key freight facilities, including ports, rail terminals, and other industrially zoned land.

Based upon the FAST Act, USDOT allotted 77 miles to Oregon for CUFCs. This allocation was increased to 150 miles under IIJA. As a result of the limited mileage, USDOT encourages states to focus strategically on segments in which improvement projects in need of federal funding are anticipated in the near term.

Appendix G lists the designations that were adopted as part of the 2017 OFP amendment. ODOT is not proposing to revise the CUFC designations as part of this 2023 amendment but may do so at a later date.

8.4.5 Critical Rural Freight Corridors

Based upon the FAST Act, USDOT allocated 155 miles to Oregon for CRFCs. The IIJA increases Oregon's allocation for CRFCs to 600 miles. CRFCs must be a public road that is not within an urbanized area and that meets one or more of the following criteria:

- Is a rural principal arterial roadway with a minimum of 25% of the annual average daily traffic of the road measured in passenger-vehicle equivalent units from trucks
- Provides access to energy exploration, development, installation, or production areas
- Connects the PHFS or the Interstate System to facilities that handle more than:
  - 50,000 20-foot equivalent units per year; or
  - 500,000 tons per year of bulk commodities;
- Provides access to a grain elevator, an agricultural facility, a mining facility, a forestry facility, or an intermodal facility
- Connects to an international port of entry
- Provides access to significant air, rail, water, or other freight facilities
- Is a corridor that is vital to improving the efficient movement of freight that is important to the state's economy

ODOT developed the list of potential segments based on the inventories of need that are further described in Section 8.5, Freight Mobility Issues. Locations outside of urbanized areas and not already on the NHFN were considered from the following inventories:

- Freight Highway Delay Areas
- Freight Intermodal Connectors – Tier 1

- Highway Over-dimension Load Pinch Points – High Priority
- Regional Highway System Needs
- Seismic Bridges – Phase 1 & 2 Unfunded
- Seismic Landslides – Phase 1 Tier 1 Selection

ODOT then considered state designations. Segments that are on the following routes were prioritized as follows:

- OFP Strategic Freight System
- OHP Freight Routes
- Seismic Phase 1 & 2 Routes
- ORS 366.215 Reduction Review Routes

Appendix G lists the CRFC designations that were adopted as part of the 2017 amendment to this plan. ODOT is not updating the CRFC mileage as part of this 2023 amendment but may do so in the future.

8.5 FREIGHT MOBILITY ISSUES AND NEEDS

The OFP identifies "significant freight system trends, needs and issues with respect to the State" as required by the FAST Act. The OFP and the OTP contain numerous strategies and actions to address those needs. In 2011, the OFP incorporated a strategic implementation initiative 2.3, which directs the state to "identify and rank freight bottlenecks…in particular those located on the strategic system. Update the ranked list periodically."[161] The FAST Act also calls for an "inventory of facilities with freight mobility issues, such as bottlenecks, within the State, and for those facilities that are State owned or operated, a description of the strategies the State is employing to address those freight mobility issues."

This section describes the inventories of facilities with freight mobility issues, particularly bottlenecks, and generally outlines the strategies in this OFP and OTP that address the needs identified in those inventories.

8.5.1 Highway Freight Issues and Needs

Freight Highway Delay Areas: Studies of existing freight highway conditions in Oregon identified congestion from bottlenecks as a major issue, affecting Oregon's economy with variations in travel time reliability and rising travel costs. The 2017 Freight Highway Bottlenecks Project (FHBP) was initiated to identify locations on Oregon's highway network that were experiencing significant freight truck delay, unreliability, and increased

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[161] ODOT, 2011 Oregon Freight Plan

transportation costs. The FHBP looked at key measurable indicators to identify locations on the state freight highway network, specifically those routes identified as ORS 366.215 restriction review routes. The FHBP identifies areas that impose higher than usual transportation costs on the freight user and where impacts are felt but does not diagnose the cause of the freight delay area or prescribe the solution.

Indicators were primarily elements such as:

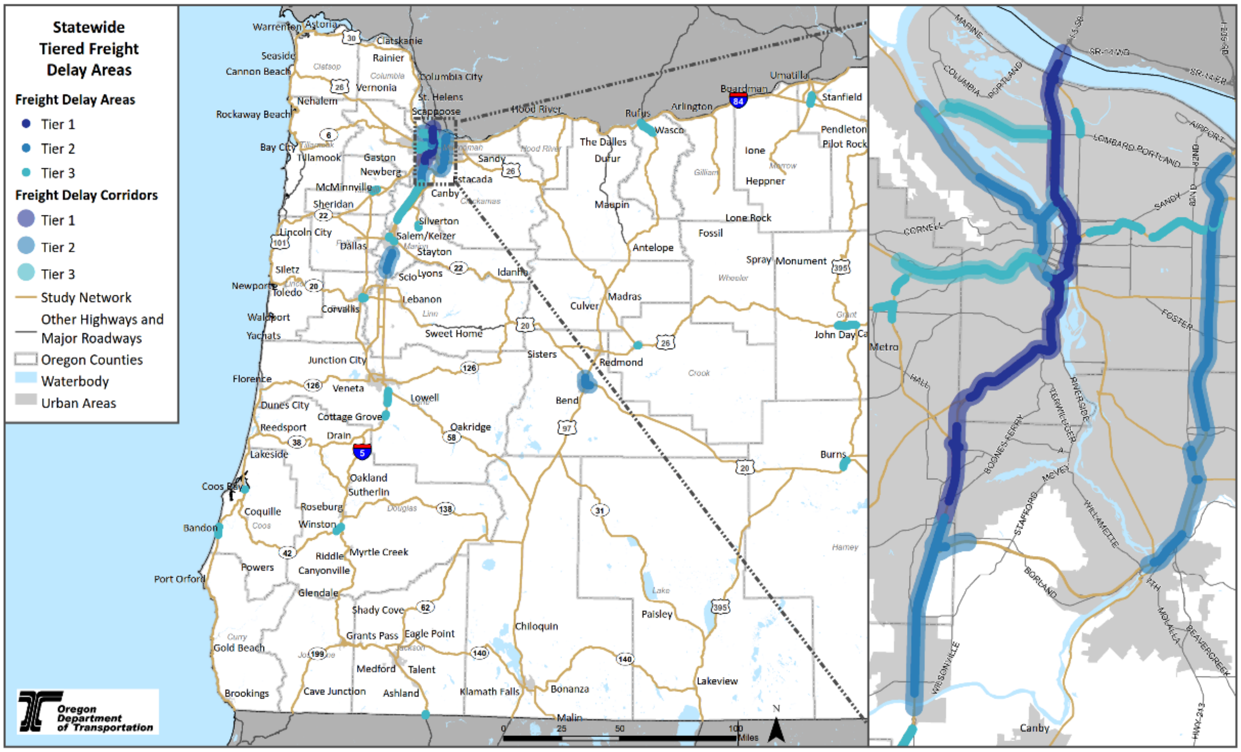
- **Delay** – the annual hours of delay that trucks accumulate on each segment
- **Unreliability** – the unreliability of shipment travel times
- **Geometric Issues** – percent grade, degree curvature or shoulders
- **Volume** – volume-to-capacity ratio and percentage of travel in congested conditions
- **Incident-Related** – frequency, and clearance times, of various collision types
- **Cost** – transportation delay costs, inventory delay costs, and unreliability costs

A significant stakeholder process supported the FHBP, which included the project management team, the Technical Advisory Committee, and OFAC, as well as ODOT regional managers and staff.

Clear series of delay areas—particularly in the Portland metropolitan area—should be considered as corridors rather than individual delay areas. This reflects the cumulative impact that longer segments have on freight movement and acknowledges the need to consider the entire corridor when developing solutions.

Tiers were established to identify the severity of the problem. The total transportation costs, along with the freight designation on the corridor or segment, were key factors used to determine the tiers for the delay areas and corridors. Figure 8.2 presents the final tiered freight highway delay area map. These tiers—together with costs, available funding, feasibility and other factors—help inform decision-makers when considering project investments.

Figure 8.2 Freight Highway Delay Areas



Source:. Oregon Department of Transportation
Note: Endorsed by the Oregon Freight Advisory Committee, January 2017

FHWA's Freight Mobility Trends Analysis tool[162] also identifies freight highway bottlenecks on the NHS. An interactive dashboard available from the FHWA website provides a ranked list of specific freight bottlenecks nationally or by state as well as a map view with accompanying data. These bottlenecks are identified based on a ranking of NHS segments by annual truck-hours of delay per mile only. This delay per mile measure is calculated for each NHS segment using relevant National Performance Management Research Data Set travel time data.[163] Reliability indices and other relevant variables such as geometrics and frequency of collision/work zone incidents do not factor into the identification of freight bottlenecks in the tool.

Despite the difference in methodology, Oregon bottlenecks identified in the FHWA's Freight Mobility Trends tool using 2021 National Performance Management Research Data Set data broadly mirror those identified in the 2017 FHBP. The 2017 FHBP identifies bottlenecks that amounts to approximately 200 miles of roadways in the Oregon freight network (Figure 8.3).

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162 Federal Highway Administration. National Freight Bottlenecks. https://explore.dot.gov/#/site/FHWA/views/FHWAFMMBottlenecks5_1/NationalBottlenecks?:iid=2

163 Federal Highway Administration. Freight Mobility Trends and Highway Bottlenecks. https://ops.fhwa.dot.gov/freight/freight_analysis/mobility_trends/index.htm

Limiting the federal tool to the top 200 miles of the most congested Oregon roadways based on truck-hours of delay per mile, a broad overlap is observed in the geographic distribution of bottlenecks across the state between the two data sources, with segments on I-5, I-205, I-405, I-84, U.S. 26, OR 99W, U.S. 30 and others occurring on both lists.

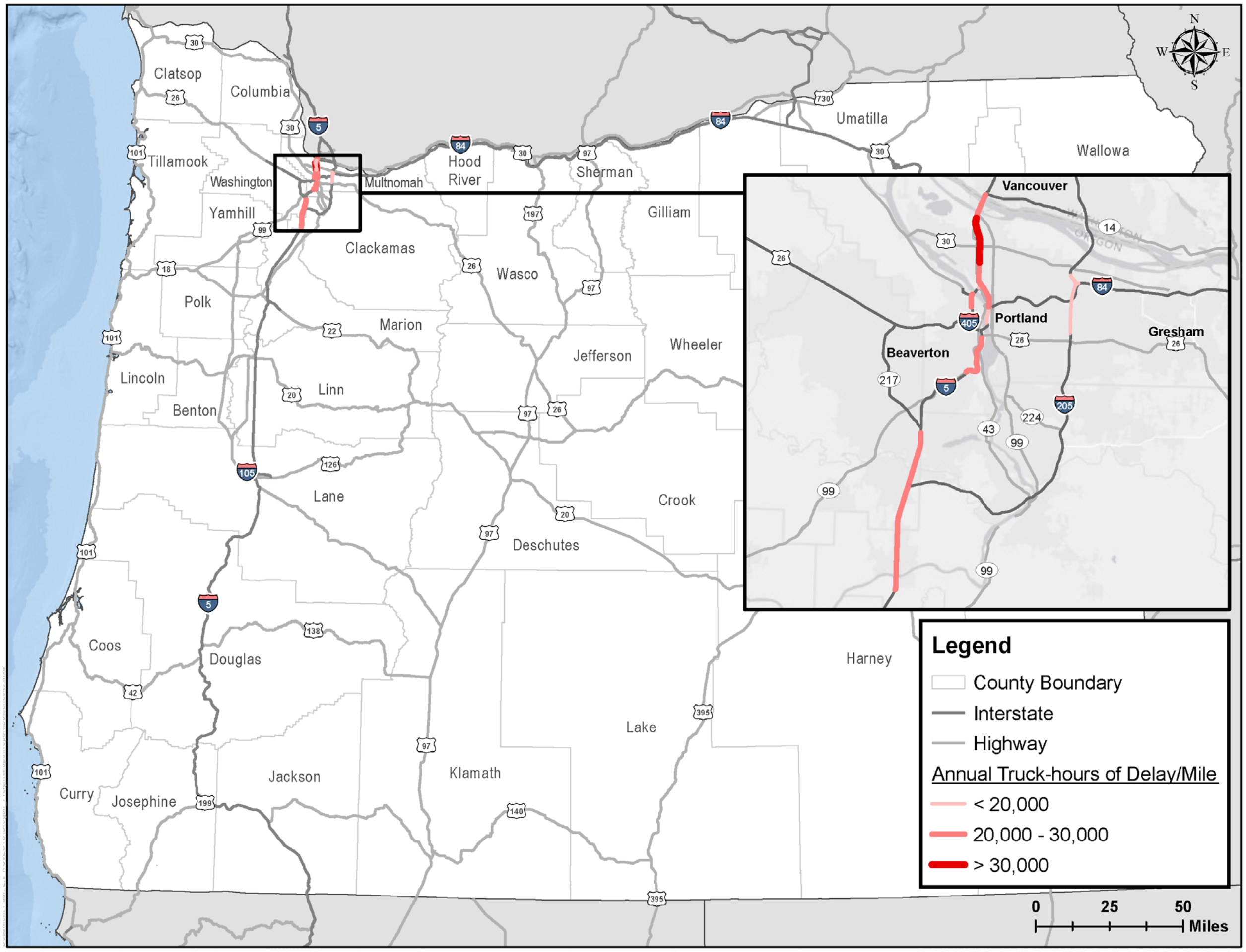
Figure 8.3 Top 200 miles of Oregon bottlenecks (left) with Portland inset (right)

Source: FHWA Freight Mobility Trends tool[164]

While the 2017 FHBP assigns distinct thresholds for urban and rural bottlenecks in order to consider the priorities of the whole state, the FHWA Freight Mobility Trends directly compares the delay per mile metric across all roadway segments. Therefore, when looking at the top 200 miles of most congested roadways, the federal tool ranks bottlenecks in the Portland metropolitan area higher because truck volumes and related truck-hours of delay are higher in urban areas. In fact, as shown in Figure 8.4 and Table 8.1, the top 10 bottleneck segments from the Freight Mobility Trends tool are all located in the Portland urban metropolitan region on I-5, I-205, and I-405. Each of these top 10 bottlenecks are represented in the 2017 FHBP analysis.

[164] https://explore.dot.gov/t/FHWA/views/FHWAFMMBottlenecks5_1/NationalBottlenecks?%3Aembed=y&%3Aiid=2&%3AisGuestRedirectFromVizportal=y

Figure 8.4 Top 10 Bottlenecks in Oregon



Source: - FHWA Freight Mobility Trends tool

Table 8.1 Top 10 Bottleneck Segments in Oregon

URBAN AREA	ROAD	SEGMENT ID	DIRECTION	APPROXIMATE SEGMENT LOCATION	LENGTH (MILES)	DELAY/ MILE
Portland	I-5	ORP0000431	Northbound	Killingsworth St. to Marine Drive	2.7	40,407
Portland	I-5	ORN0000140	Southbound	I-84 interchange to Killingsworth St.	2.8	26,266
Portland	I-5	ORP0000432	Northbound	Washington border to Marine Drive	1.5	24,895
Portland	I-5	ORN0000148	Southbound	I-205 interchange to Willamette River	5.6	24,327
Portland	I-5	ORN0000147	Southbound	SR-217 interchange to I-205 interchange	3.9	22,325
Portland	I-5	ORP0000428	Northbound	I-405 interchange to Multnomah Blvd exit	2.7	22,082
Portland	I-405	ORN0000174	Southbound	Fremont Bridge to Everett St.	0.8	20,465
Portland	I-5	ORN0000137	Southbound	Washington border to Killingsworth St.	3.5	16,666
Portland	I-205	ORP0000412	Northbound	I-84 interchange to SE Division St.	4.6	16,363
Portland	I-5	ORP0000430	Northbound	Killingsworth St. to Hawthorne Bridge	4.6	14,625

Source: - FHWA Freight Mobility Trends tool

8.5.2 Assessment of Truck Parking Facilities

The safe and efficient movement of freight in Oregon depends on adequate and strategically located truck parking. Hours-of-service[165] regulations created by the Federal Motor Carrier Safety Administration require truck operators to stop and rest at defined intervals. However, parking shortages can lead truck operators to stop at unsafe locations.

In March 2009, a truck driver named Jason Rivenburg was robbed and killed while resting in his truck in an undesignated parking lot. In 2012, "Jason's Law" was established to provide a "national priority on addressing the shortage of long-term parking for commercial motor vehicles on the NHS to improve the safety of motorized and non-motorized users and for commercial motor vehicle operators." Jason's Law was included in the federal 2015 Transportation Bill Reauthorization, which funds truck parking research and requires all states to perform the following:

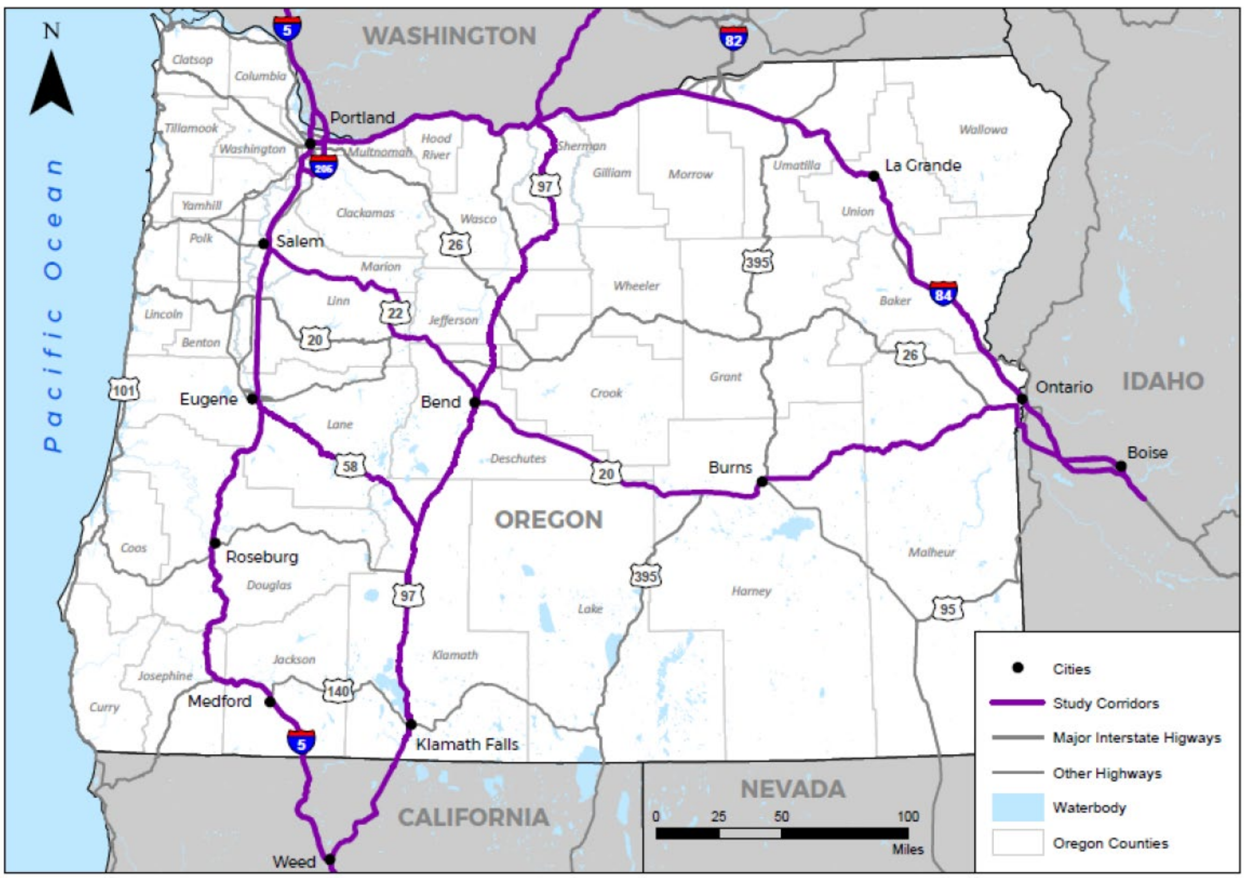
165 Federal Motor Carrier Safety Administration. Summary of Hours-of-Service Regulations. https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations

- Conduct an inventory of existing truck parking
- Assess the volume of commercial motor vehicles in the state
- Measure the adequacy of commercial motor vehicle parking facilities in the state

In July 2020, ODOT published the Oregon Commercial Truck Parking Study (OCTPS).[166] The OCTPS explores truck parking issues within six key freight corridors in Oregon and aims to address commercial parking needs along these corridors with innovative and cost-effective strategies.

The OCTPS identifies the following six key freight corridors as shown in Figure 8.5, I-5, I-84, U.S. 20/OR 22) from Salem to the Idaho border, and U.S. 97). The first four freight corridors are designated in the OHP, have significant volumes of trucks per day (over 500), and provide connectivity to significant freight generation areas of Oregon.

Figure 8.5 Oregon Commercial Truck Parking Study Corridors



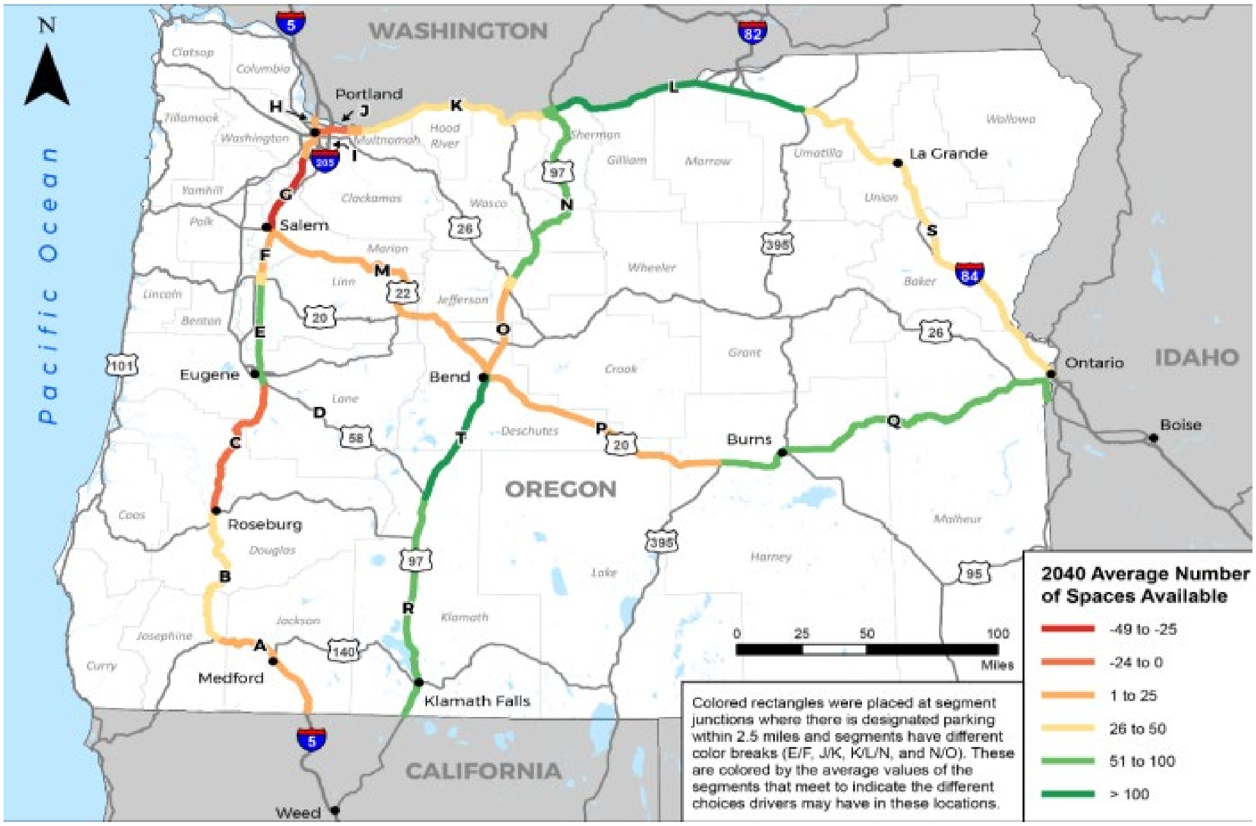
Source: Oregon Commercial Truck Parking Study (2020), Oregon Department of Transportation

166 https://www.oregon.gov/odot/Projects/Pages/Commercial-Truck-Parking-Study.aspx

The OCTPS truck parking inventory identifies approximately 5,500 truck parking spaces at rest areas, truck stops, and ports of entry on the study corridors. Of these, approximately 4,300 are striped and 1,000 are unstriped. There are 914 spaces at rest areas, about 4,400 at truck stops, and 154 at ports of entry.

The OCTPS baseline analysis identifies locations where demand exceeds capacity using truck GPS data, video recordings, and reports from a leading truck parking application. The OCTPS also includes a future parking demand analysis that estimates truck parking needs in 2040. Figure 8.6 shows the areas where truck parking demand is expected to regularly exceed parking supply by 2040 in orange and red. I-5 is projected to have the greatest undersupply of truck parking in the state.

Figure 8.6 Average Number of Spaces Available (Supply minus Demand) Weekdays at Midnight (2040)



The OCTPS provides the information necessary to support decisions regarding future approaches to addressing truck parking issues in Oregon, including the State of Oregon's role in providing parking for trucks. ODOT staff is working on implementing elements of the OCTPS through the development of a Truck Parking Information Management System project and improvements in rest area parking design.

8.5.3 Intermodal Connectors

ODOT developed the 2017 Oregon Freight Intermodal Connector System (OFICS) study[167] to help implement strategies in this OFP related to the identification of connectors that provide "last-mile" connectivity to freight locations that are not classified as NHS Connectors.[168] NHS Connectors are the public roads leading to major intermodal terminals. Although they account for less than 1% of NHS mileage, NHS Connectors are key conduits for the timely and reliable delivery of goods.[169]

NHS intermodal connectors that primarily service freight terminals are designated as NHS freight intermodal connectors. Marine terminals, truck-rail facilities, pipeline terminals, and airports are the primary types of intermodal freight facilities operating in Oregon. The OFICS study identifies additional freight intermodal connectors in the state besides the existing designated NHS freight intermodal connectors.

Intermodal connectors are important because they are critical components of the state and national intermodal freight system that enable more efficient use of all freight modes. These intermodal connectors serve as the first and last mile for many of the state's manufacturing and industrial businesses. For Oregon to remain competitive, the intermodal connectors must be able to efficiently move raw materials, partially assembled products, and finished goods to and from all areas of the state for national and international markets.

To identify intermodal connectors beyond the existing NHS intermodal connectors, it was necessary to locate intermodal terminals/businesses (ITB) first. Freight intermodal terminals are defined as facilities, which provide for the transfer of freight from one mode to another. The study identifies approximately 200 ITBs. A majority of these are in Portland, the Willamette Valley, and along the Columbia River. After the ITBs were identified, the new intermodal connectors were located by identifying the public street segments that connect to the closest state highway. Appendix H contains the full list of intermodal connectors, including those designated as NHS freight intermodal connectors.

The intermodal connectors were tiered. Tier 1 connectors are considered primary intermodal connectors and meet all of the NHS intermodal connector criteria for volume of traffic and need. Tier 2 roads are secondary intermodal connectors, which generally serve an important state

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167 https://digital.osl.state.or.us/islandora/object/osl:83990
168 OFP Strategy 3.2.
169 Intermodal connectors are roads that provide access between major intermodal facilities and the other four subsystems making up the National Highway System. NHS Connectors - FHWA Freight Management and Operations (dot.gov)

need. They must be a public road that serves as a primary access between an intermodal terminal and a state highway or NHS connector and carry a certain amount of truck traffic or serves significant intermodal terminal or air-cargo business. The Tier 3 minor intermodal connectors serve more of a regional need. They serve fewer than 50 trucks a day in each direction and typically serve only one smaller ITB.

8.5.4 Over-Dimensional Load Pinch Points

ODOT developed the 2016 Highway Over-dimensional Load Pinch Points study to help implement strategies in this OFP pertaining to the efficient movement of over-dimensional loads. The study identifies highway pinch points that restrict the movement of over-dimensional loads. Over-dimensional load pinch points are due to height, width, weight or length constraints, and can include low overpasses, narrow roadways or intersections, sharp curves, weight-restricted bridges, bridges with low overhead clearance, sign bridges, tunnels and other features.

The study prioritizes pinch points based on the degree to which resolving a pinch point would open up an entire corridor for over-dimensional loads. The study identifies 381 pinch points statewide, with 92 of them classified as high-priority pinch points and 289 low-priority pinch points.

8.5.5 Seismic

ODOT undertook an analysis of the seismic resiliency of the Oregon Highway System to address OFP strategies that call for creating a statewide emergency management plan that identifies critical vulnerable points from a freight mobility perspective. That analysis identifies key lifeline routes and establishes a strategic program to prioritize and systematically retrofit all seismically vulnerable bridges and addresses unstable slopes on key lifeline routes, which will allow for rescue and recovery following a major earthquake. Seismic resiliency is critical to freight mobility.[170]

Appendix H lists the top-priority bridge and landslide locations identified through this effort. These locations include the Phase 1 and 2 bridges and the High-Priority Phase 1 and 2 landslides. The 2014 Seismic Plus Report contains more information.

8.5.6 Regional Needs to Address Freight Impacts

The FAST Act also requires states to identify areas where freight may be creating performance issues—such as mobility, reliability, and safety—for other users. ODOT regions prepared a list

[170] ODOT, Oregon Highways Seismic Report, October 2014.

of these freight issues based upon past planning actions and operational knowledge. Projects include adding climbing and through lanes, pavement condition improvements, intersection widening, additional or longer turning lanes, truck parking, shoulder improvements, grade separation, and signage.

Appendix H contains the full list of regional highway system needs related to freight impacts that ODOT region staff identified.

8.5.7 Heavy Vehicles

In order to understand the impact of heavy-haul trucks from industries such as mining, agricultural, energy cargo or equipment, and timber vehicles in Oregon, commodity flows of grain, aggregate, lumber, and fuel were examined. Figure 8.7 shows these flows, which are generally routed along major freight corridors such as I-84, US-97, I-5 and US-26. The highest concentration of heavy loads in Oregon are along I-84 between Hood River and Biggs Junction and along US-97 between Redmond and Bend. As shown in Figure 8.8, Portland is another major generator of heavy-haul traffic in Oregon, particularly along I-5 and I-84. Grain, aggregate and lumber account for the majority of the I-84 heavy-haul traffic, while along US-97, lumber accounts for the majority of heavy loads.

The impact of heavy vehicles on roadways, which include mining, agricultural, energy cargo or equipment, and timber vehicles is projected to substantially deteriorate the condition of roadways. To account for heavy vehicles greater impact on roads, every two years the state of Oregon completes a Highway Cost Allocation Study (HCAS) to determine changes in weight-mile and fuel taxes and vehicle registration fees. This study is to ensure that heavy commercial vehicles and light vehicles pay a fair share for the maintenance, operation and improvement to the state's highways, roads and streets.[171]

The Oregon Highway Plan (OHP) includes policies that prescribe a balance between critical infrastructure preservation, safety and congestion, with modernization depending on the funding realities.[172] Whether or not funding keeps pace with inflation, the OHP sets out scenario-based guidance to ensure that there is a preservation target being met. In cases where funding does not keep pace with inflation, then modernization is limited to only that which is necessary and the primary focus is on preservation and maintenance. Should available funding keep pace or exceed inflation, then preservation and maintenance can be maximized with more consideration for modernization projects.

171 https://www.oregon.gov/das/oea/pages/hcas.aspx
172 https://www.oregon.gov/odot/Planning/Documents/OHP.pdf

Figure 8.7 Heavy-Haul Tonnage Flows across Oregon

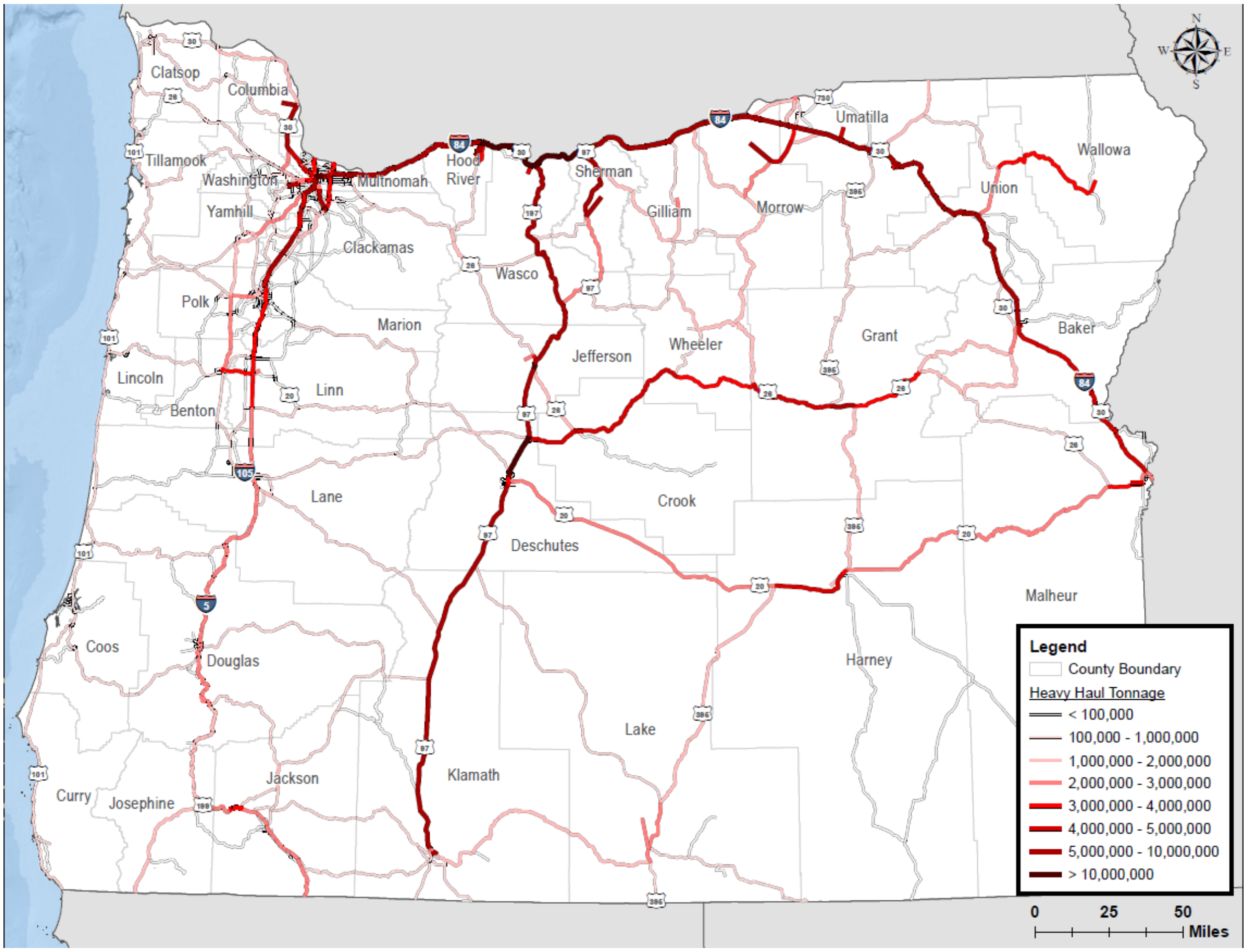
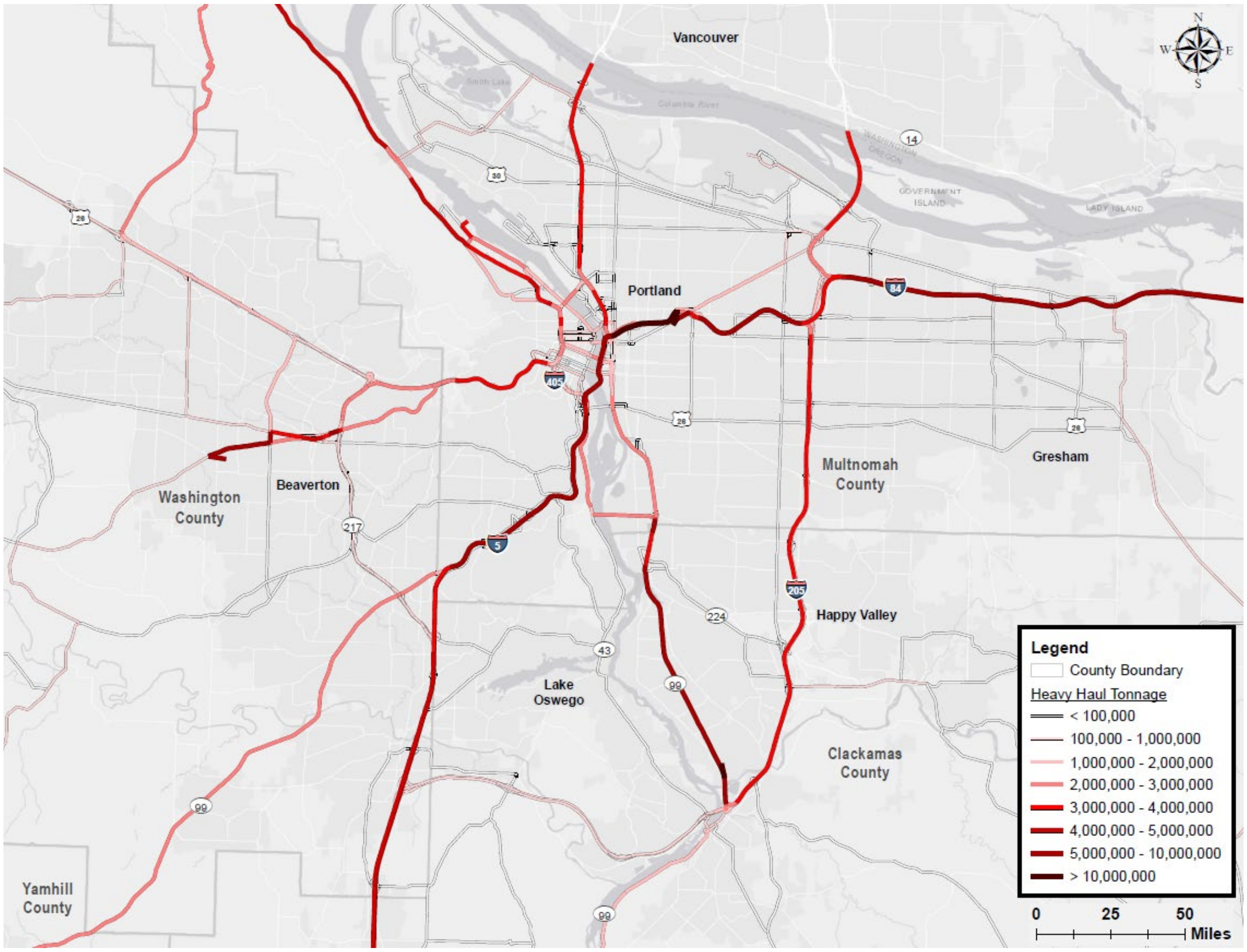


Figure 8.8 Portland Detail for Heavy-Haul Flows



The long-term impact of heavy vehicles on roadways is considered in the Oregon Transportation Asset Management Plan (TAMP). [173]The TAMP documents information about the state's National Highway System pavement and bridge assets, their condition, use and performance, the processes by which they are managed, and the results of alternative management practices and investments. The life cycle management principles include different strategies for when roadways need preservation, maintenance, rehabilitation or in some instances disposal or reconstruction. The desired approach is to identify the right treatment at the right time for the right asset to maximize the condition of the asset with minimal cost, e.g., for pavement applying periodic seal coats and thin resurface treatments, and for bridges extending the functional life through proactive maintenance and preservation and considering the functional life the whole corridor rather than individual bridges.

8.5.8 Military Freight

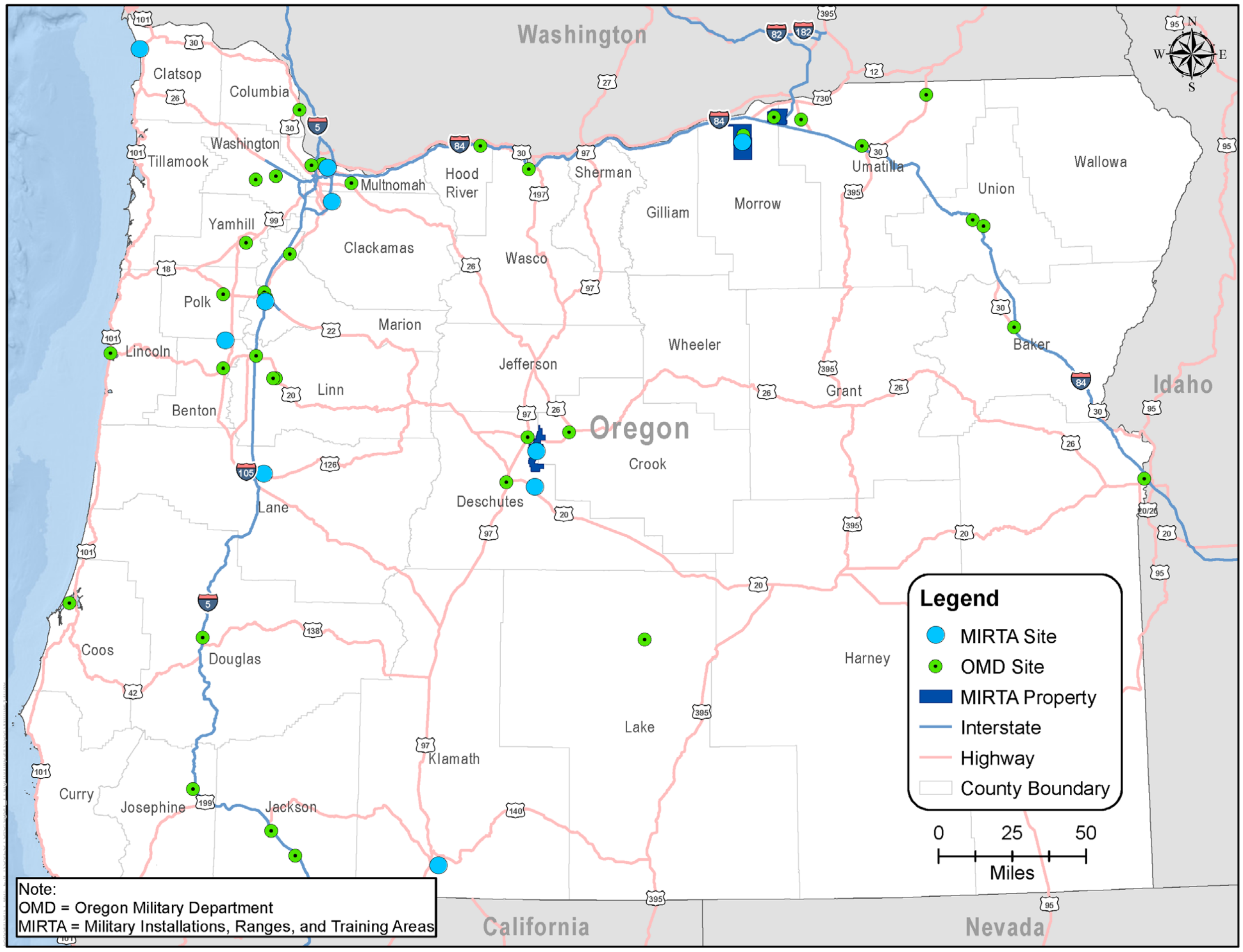
In addition to requiring state freight plans be updated every four years, the IIJA requires states to provide consideration of movements related to military freight in their freight planning activities.

Figure 8.9 illustrates the location of military sites in Oregon, including military installations, ranges, and training areas, and sites associated with the Oregon Military Department. The majority of these sites are located in the vicinity of the major freight corridors and are well-served by the state freight highway network. Key access and egress routes to military facilities statewide include sections of the following:

- I-5 and SR 99 in Marion and Benton Counties
- I-5, SR 224 and U.S. 30B in Multnomah and Clackamas Counties
- U.S. 20 and SR 126 in Deschutes County
- I-5 and SR 126 in Lane County
- SR 140 and SR 39 in Klamath County
- U.S. 101 in Clatsop County
- I-84 in Morrow County

173 https://www.oregon.gov/odot/STIP/Documents/2022-Oregon-TAMP.pdf

Figure 8.9 Military Installations, Ranges, and Training Areas (MIRTA) and Oregon Military Department (OMD) Sites in Oregon



Some of the key sections of highway noted above are part of the Strategic Highway Network (STRAHNET). The STRAHNET is a system of public highways designated by the Department of Defense (DOD) and Federal Highway Administration (FHWA) to accommodate the emergency transportation of military personnel and equipment in times of peace and war and provides connection to military installations and ports. Oregon's STRAHNET includes the entire length of I-5, I-84, I-82, US 95 and US 101 in the state and sections of US 30 (west of Rainier), SR 42 west of I-5.

Of these corridors that are important to military freight, certain sections are identified in the list of top 200 miles of congested roadways in Oregon as per the FHWA Freight Mobility Trends tool. Access/egress issues may arise from bottleneck congestion on I-5 and U.S. 30B in Multnomah County and SR 39 in Klamath County.

The Strategic Rail Corridor Network (STRACNET) provides rail access to military installations across the U.S. Oregon's STRACNET encompasses UP's Class I mainline from Portland to the California border south of Klamath Falls in Klamath County, and from Portland to the Idaho border, roughly parallel to the routing of I-84. These lines also connect to Washington's STRACNET lines at Hinkle and Portland.

The National Port Readiness Network (NPRN) is a cooperative designed to ensure readiness of commercial ports to support force deployment during contingencies and other national defense emergencies. At this time there are 18 commercial strategic seaports designated, with the closest being the Port of Tacoma in Washington. Should the NPRN determine that it's necessary to add to the list of commercial strategic seaports which could move military freight in peacetime and actual defense emergencies, the most likely candidate in Oregon to fulfill that role would be the Port of Portland.

8.5.9 Non-Highway Freight Issues and Needs

Chapter 4 provides an overview of the multimodal freight transportation network relied upon by Oregon industries that depend on efficient freight movement. This section provides an inventory of the non-highway facilities and components of the multimodal freight system that have demonstrated freight mobility issues. Specifically, this section includes needs inventories for facilities associated with the rail, marine, and aviation systems that contribute to the state's multimodal freight transportation network.

8.5.9.1 Rail

The OTC adopted the Oregon State Rail Plan (SRP) in 2014 and then amended it in 2020. The SRP contains a description of the key needs and opportunities for freight rail, including the physical needs of the freight rail system relating to capacity constraints and bottlenecks. ODOT's Rail and Public Transit Division and Freight Planning Program used information from the needs assessment conducted for the SRP and identified facilities with current freight mobility issues. The improvements to address capacity constraints and bottlenecks on the mainline rail network include the following:

- Siding and track upgrades
- Signal system upgrades
- Speed increases

For the Class III railroads (short lines) in Oregon, needs include the following:

- Track upgrades to serve increased train weight and speed
- Infrastructure improvements such as bridge upgrades

- Consideration of the carload volume and vulnerability of short-line railroads to abandonment

Generally, freight rail system preservation priorities include the following:

- Maintenance of rail functionality to current operating standards
- Preservation or improvements of critical bridge, tunnel or other structures
- Maintenance of rail lines serving key intermodal terminals and that provide significant economic value
- Protection of critical rail infrastructure from seismic vulnerability

Appendix I contains the prioritized list of rail facilities with freight mobility issues in Oregon.

8.5.9.2 Marine

Marine system components of the freight transportation network include marine highways and ports, and intermodal terminals. System preservation priorities include the following:

- Maintenance and improvement of marine highway channel depth
- Preservation of docks and piers to support cargo activity or deep-draft shipping
- Maintenance of intermodal connections to port facilities (e.g., rail or highway)
- Preservation of equipment
- Improvements that address seismic resilience

Enhancement priorities beyond system preservation include improvements to the following:

- Deep water ports
- Intermodal connections
- Port operations
- Port accessibility
- Port safety

In 2017, ODOT Freight Planning Program staff coordinated with the Oregon Public Ports Association, the Oregon Business Development Department, and marine port district representatives to develop a prioritized list of marine facilities with freight mobility issues. For the 2023 OFP amendment, ODOT staff obtained suggested revisions from ports in Oregon through coordination with the Oregon Public Ports Association. Appendix I contains the marine transportation system needs list.

8.5.9.3 Aviation

There are 14 airports in Oregon that support regularly scheduled air-cargo service, with Portland International Airport being the largest air-cargo operation. The 2018 Oregon State Aviation Plan does not specifically list needed improvements to the state airports; however, it does identify those state airports that have an air-cargo operation. The Port of Portland has identified intersection improvements around Portland International Airport that would allow more efficient movement of truck freight into and out of the airport air-cargo operations, which would also allow the existing air-cargo operators to handle a higher volume of air freight.

There are 13 airports in Oregon with contracted air-cargo feeder aircraft activity. These aircraft are smaller and handle a lower volume of freight; therefore, it is anticipated that these airports would only have minor improvement needs. Appendix I contains the aviation transportation system needs list.

8.5.10 Strategies to Address Freight Needs

Chapter 7 lists a number of actions and strategies to address freight system needs. Strategies that are relevant to the identified mobility issues above include the following:

- Preserving freight facilities
- Reducing capacity constraints, congestion, unreliability, and geometric deficiencies in all modes
- Improving safety

Specific actions and strategies improve the efficiency, reliability, and safety of long-haul freight corridors and preserve capacity for over-dimensional loads.

This OFP recognizes the significant funding needs for addressing freight issues, and includes strategies and actions geared toward maximizing and leveraging funding for freight, including establishing a statewide freight fund.

The OTP includes policies and strategies that will guide freight-related investment:

- Goal 1, Mobility and Accessibility, Policy 1.1, calls for an integrated transportation system with modal choices and related strategies and specifically mentions individual freight modes.
- Goal 2, Management of the System, Policy 2.1, calls for improving transportation capacity and operational efficiency.

Related strategies include incident management and reducing bottlenecks and geometric constraints:

- Goal 3, Economic Vitality, Policy 3.1 addresses creating an integrated efficient and reliable freight system.
  - Develop strategies around innovative technology.
  - Address barriers to efficient truck movements.
  - Give priority to projects on identified freight routes.
  - Support strategic investment in marine, air-cargo, and pipeline transportation.

The OHP contains policies and associated actions to consider a broad range of Intelligent Transportation System solutions:

- Improving safety
- Reducing conflicts between rail and highways
- Improving the efficient movement of freight
- Managing congestion through managing access and using transportation demand management techniques.

Prioritization is needed because limited funding prohibits the ability to address all the freight needs at once; most inventories are tiered or prioritized in some way. However, the planning and scheduling of transportation improvements is complex and involves a variety of funding sources, scheduling issues, and jurisdictional interests. Additionally, multiple lists of needs represent a variety of modes, issues, and prioritization processes. While investments should generally address higher tier or priority needs, investing in projects that address lower tier needs may be justified depending on opportunities to leverage public or private funds, readiness, benefits, costs and other factors.

8.6 FREIGHT INVESTMENT PLAN

8.6.1 Purpose and Requirements

The FAST Act institutes a requirement for state freight plans to include a freight investment plan. The plan must list priority projects and describe how funds made available to carry out Section 167 of Title 23 (the NHFP[174]) would be invested and matched over a five-year period.

[174] 23 U.S.C. 167: https://www.gpo.gov/fdsys/pkg/USCODE-2015-title23/html/USCODE-2015-title23-chap1-sec167.htm

The freight investment plan must be fiscally constrained.[175] In addition, these federal funds may be obligated for projects on the NHFN, which is described in greater detail in Section 8.4 and consists of the PHFS, portions of the interstate system not designated as part of the PHFS, CUFCs, and CRFCs.

It is anticipated that ODOT will receive approximately $158 million in federal formula freight funds (authorized and allocated by USDOT via the IIJA) for federal FY 2022 to 2030. Congress has authorized such funds through FY 2026 with an annual allocation to the states delineated for fiscal years 2022 to 2026, with ODOT estimating annual funds of 2027 to 2030 at 10% below the amount set for 2026.

Table 8.2 represents the state investment plan for freight funds from the FAST Act. Projects listed in the freight investment plan are expected to contribute to the efficient movement of freight on the NHFN and may address one or more of the following:

- Development phase activities
- Construction and rehabilitation of facilities
- Property and equipment acquisition
- Operational improvements
- Intelligent Transportation System
- Environmental and community impacts of freight movement
- Transportation system and work zone management systems
- Several additional issues listed in the NHFP.

The identified freight needs across all modes as detailed in the inventories in the appendices show that the level of needs outstrips the current supply of funding. The NHFP does allow for funding of maritime and port infrastructure. However, given that the state has the Connect Oregon grant program (as noted in Section 6.7) that competitively awards funding to non-highway modes including marine, the state has opted to direct the limited NHFP funding to highway projects which are not eligible for the Connect Oregon program and have a significant portion of truck freight movement.

[175] 49 U.S.C. 70202(c)(2) states "the freight investment plan component of a freight plan shall include a project, or an identified phase of a project, only if funding for completion of the project can reasonably be anticipated to be available for the project within the time period identified in the freight investment plan."

Table 8.2 IIJA Formula Freight Funds Investment Plan (federal fiscal years 2022 to 2030)

PROJECT NAME	FREIGHT FUNDS	FREIGHT FUNDS MATCH	PHASE	WORK TYPE	FEDERAL FISCAL YEAR	PROJECT TOTAL
Clackamas County Regional Freight Intelligent Transportation System	$1,600,041	$183,132	Construction	Operations	2022	**$1,783,173**
Clackamas County Regional Freight Intelligent Transportation System - Phase 2B	$200,000	$20,540	Preliminary Engineering	Operations	2023	**$1,770,400**
	$1,388,580	$158,929	Construction		2024	
I-5: Kuebler Blvd. to Delaney Road Widening	$9,222,000	$778,000	Construction	Modernization	2023	**$10,000,000**
I-84 Exit 216 Snow Zone/Truck Parking	$1,844,400	$155,600	Construction	Operations	2024	**$2,000,000**
I-82/I-84 Corridor Freight Improvements	$4,657,110	$392,890	Construction	Operations	2024	**$5,050,000**
I-5: Southbound Stage Road Pass Truck Climbing Lane	$4,149,900	$350,100	Construction	Modernization	2025	**$4,500,000**
I-84 Active Traffic Management	$1,762,324	$148,676	Construction	Operations	2025	**$1,911,000**
US 26 Active Traffic Management	$2,825,250	$323,363	Construction	Operations	2026	**$3,148,613**
I-5: N Umpqua R & CORP NB and SB Bridges	$6,543,931	$728,759	Construction	Safety	2026	**$7,096,000**
I-5: Columbia River (Interstate) Bridge*	$15,500,000	$3,875,000	Preliminary Engineering	Modernization	2022	**$3,200,000,000**
	$8,200,000	$2,050,000			2023	
	$10,100,000	$2,525,000			2024	
	$12,000,000	$3,000,000			2025	
	$9,000,000	$2,250,000	Construction		2026	
	$16,700,000	$4,175,000			2027	
	$16,700,000	$4,175,000			2028	
	$16,700,000	$4,175,000			2029	
	$16,700,000	$4,175,000			2030	
TOTAL	**$155,793,536**					

Note: Federal freight fund total shown in Table 8.2 is an estimate subject to annual federal authorization and is not a guaranteed amount for programming. Projects for fiscal years 2024-2030 are estimates as the Oregon Transportation Commission has not adopted a Statewide Transportation Improvement Program (STIP) beyond the 2021-2024 timeframe. Additional details on project funding are included in Oregon's STIP.

* The Interstate Bridge Replacement Project is expected to be completed in 2030.

Table 8.3. Financial Constraint Summary: Annual Apportionment and Annual Planned/Programmed Obligation of National Highway Freight Program Funds (2022 to 2030)

YEAR	APPORTIONED NHFP FUNDS*	OBLIGATED OR PLANNED OBLIGATION NHFP FUNDS	BALANCE NHFP FUNDS
2022	$17,334,271	$17,100,041	$234,230
2023	$17,680,956	$17,622,000	$58,956
2024	$18,034,575	$17,990,090	$44,485
2025	$18,395,267	$17,912,224	$483,043
2026	$18,763,172	$18,369,181	$393,991
2027	$16,886,855	$16,700,000	$186,855
2028	$16,886,855	$16,700,000	$186,855
2029	$16,886,855	$16,700,000	$186,855
2030	$16,886,855	$16,700,000	$186,855
TOTAL	**$157,755,661**	**$155,793,536**	**$1,962,125**

* Estimate is subject to annual federal authorization. https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf