Modeling by Committee:
The State of Oregon's Efforts to Coordinate Modeling Health Impacts of Transportation

BACKGROUND

- 2012-14, Oregon Health Authority used ITHIM[1] in health impact assessments to evaluate transportation scenarios for Climate Smart Community Scenarios[2], Metro's regional GHG reduction plan.
- 2013, Oregon Modeling Steering Committee[3] convened the Transportation and Health Subcommittee.

PURPOSE/OBJECTIVE

Purpose: Provide independent review, comment on and make recommendations for development and improvement of applications and methodologies for travel analysis tools to address health outcomes impacted by transportation.

Objective: "Given a transportation investment package, what are the health impacts?"

HEALTH IMPACTS

- Change in physical activity from active modes of transportation.
- Change in exposure to $PM_{2.5}$ from light duty vehicles.
- ~~Change in severe traffic injuries and fatalities~~ (removed from scope).

PLANNING DOMAINS[4]

- ~~Operational~~ (removed from scope)
- Programming and implementation (e.g. regional transportation plan)
- Strategic vision, goal and policy setting (e.g. long-range land use and transportation growth plans)

MODEL SELECTION

- Activity Based Model (ABM)[5]
- Integrated Transport & Health Impact Model (ITHIM)[1,6]
- CAL3QHCR Dispersion Model[7] (programming & implementation)
- MOVES[8]/GreenSTEP[9]/Other? (strategic visioning)
- ArcGIS Python Models

ENVIRONMENTAL JUSTICE

- The subcommittee will recommend EJSCREEN[10] for prescreening of regional transportation projects.
- EJSCREEN includes block group level demographic and environmental indicators and an EJ index.
- EJSCREEN also includes comparison of area of interest with state, region and U.S.
- Additional EJ tools will be considered.

NEXT STEPS

- Summer 2015: Select a corridor-level pilot project to evaluate the modeling process.
- Fall 2015: Complete a formal project proposal or recommendations for a request for proposal.

2012-2014 → February 2014 → April 2014 → July 2014 → October 2014 → January 2015 → Winter 2016

Modeling Process

Planning Domains[3]

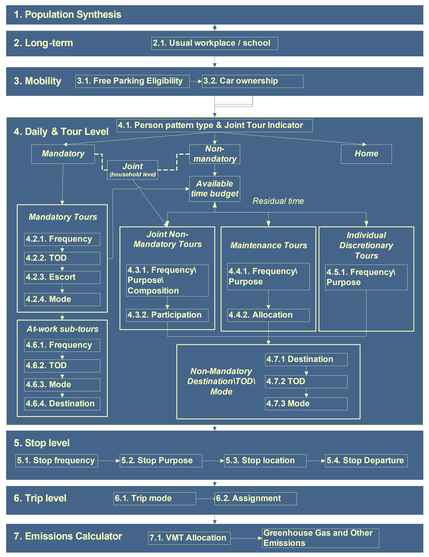
Programming & Implementation

- Regional transportation plan
- Localized bottleneck reduction
- Bus rapid transit corridor

Strategic Visioning

- Long range land-use and transportation plans
- GHG emissions reduction plans
- Regional policy setting

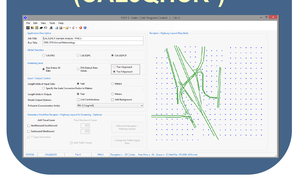
Activity Based Model[4]



- Annual average daily traffic (AADT)
- Average speed
- Average vehicle class mix
- Road network changes (e.g. lane widths, number of lanes, functional class, orientation, etc.)

Air Quality

Air Quality Dispersion Model (CAL3QHCR[6])



Near-road $PM_{2.5}$

GIS Model Near-Road $PM_{2.5}$ & RRs from Exposure

AADT	10 ft	50 ft	100 ft	200 ft	500 ft	700 ft	1,000 ft
100,000	1.136	1.101	0.908	0.590	0.204	0.148	0.100
90,000	1.022	0.991	0.818	0.531	0.184	0.133	0.090
80,000	0.908	0.881	0.727	0.472	0.164	0.118	0.080
70,000	0.795	0.771	0.636	0.413	0.143	0.103	0.070
60,000	0.640	0.624	0.529	0.346	0.123	0.087	0.060
50,000	0.485	0.477	0.421	0.278	0.103	0.072	0.049
40,000	0.342	0.334	0.300	0.215	0.087	0.058	0.041
30,000	0.278	0.270	0.238	0.167	0.062	0.045	0.027
20,000	0.199	0.191	0.175	0.111	0.043	0.029	0.016
10,000	0.159	0.135	0.095	0.045	0.015	0.014	0.014

Health Outcomes and Monetization

Health Outcomes	Scenario A DALY	Scenario A Mortality
Breast Cancer	-9	0
Colorectal Cancer	-12	-1
Stroke	-208	-19
Ischemic Heart Disease	-299	-30
Depression	-62	0
Dementia	-112	-7
Diabetes	-108	-4
Hypertensive Heart Disease	-101	-11
Physical Activity Total	*-911*	*-72*
Lung Cancer	-141	-14
Inflammatory Heart Disease	-17	-2
Respiratory Disease	-93	-12
Air Quality (PM2.5) Total	*-250*	*-28*

Health Outcomes	Scenario B DALY	Scenario B Mortality
Breast Cancer	-15	-1
Colon Cancer	-18	-1
Stroke	-296	-22
Ischemic Heart Disease	-402	-36
Depression	-119	0
Dementia	-148	-8
Diabetes	-211	-6
Hypertensive Heart Disease	-132	-13
Physical Activity Total	*-1340*	*-87*
Lung Cancer	-143	-15
Inflammatory Heart Disease	-17	-2
Respiratory Disease	-95	-12
Air Quality (PM2.5) Total	*-255*	*-29*

Health Outcome	Cost of Illness Scenario A	Cost of Illness Scenario B
Breast cancer	-$1,551,182	-$1,803,717
Colorectal cancer	-$2,714,834	-$3,143,721
Lung cancer	-$274,660	-$274,660
Stroke	-$13,646,125	-$15,206,731
Heart disease	-$98,405,392	-$109,149,144
Asthma	-$88,667	-$88,667
Dementia	-$8,871,086	-$10,275,736
Depression	-$12,906,690	-$14,960,695
Diabetes	-$113,231,579	-$126,180,453
Total Disease Cost	*-$251,690,215*	*-$281,083,524*

Disclaimer: results displayed are illustrative and may not accurately represent model output.

Regional Air Quality Model (e.g. MOVES[8])

Physical Activity

- Distance traveled/person/week by mode
- Impacted population by sex and age group
- Ratio of walking and cycling times by age group (if available)
- Mean speed of travel by mode (if available)

ITHIM[1,2]

- Oregon burden of disease (rural/urban)[11]
- Relative Risks (RRs)
- Energy expenditure metabolic equivalency tasks (METs)

- Years living with a disability (YLD)
- Years of potential life lost (YPLL)
- Disability adjusted life years (YLD+YPLL=DALY)
- Premature deaths

Suggested citation: Main E, Hamberg A, Haggerty B, Dubuisson N, Cude C. Modeling by Committee: The State of Oregon's Efforts to Coordinate Modeling Health Impacts of Transportation. Poster session presented by Oregon Health Authority at: Moving Active Transportation to Higher Ground: Opportunities for Accelerating the Assessment of Health Impacts. 2015, April 13-14. Washington D.C: Transportation Research Board.

March 25, 2015 v.1

Transportation & Health Subcommittee Members

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Phil Allen, Oregon Dept. of Environmental Quality
Sarah Armitage, Oregon Dept. of Environmental Quality
Aida Biberic, Oregon Dept. of Environmental Quality
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Brian Gregor, Oregon Systems Analytics

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1 Woodcock J, Givoni M, Morgan AS. Health Impact Modeling of Active Travel Visions for England and Wales Using an Integrated Transport and Health Impact Modeling Tool (ITHIM). PLoS One. 2013;8 (1):e51462.

2 Green M, Hamberg A, Main E, Early-Alberts J, Dubuisson N, Douglas JP. Climate Smart Communities Scenarios Health Impact Assessment. Oregon Health Authority. April 2013: Portland, Oregon.

3 Oregon Dept. of Transportation. (2015). Oregon Modeling Steering Committee. Retrieved March 2015 from Transportation Development-Planning: http://www.oregon.gov/ODOT/TD/TP/pages/omsc.aspx.

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6 San Diego Association of Governments. (January 2013). Health Effects Methodology Assessment Report: Model Validation for Health Modules. San Diego, California: SANDAG.

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10 Stohs, S. (2014, December 17). EJSCREEN: Environmental Justice Screening Tool. Region 10 EJ Program v.2 Training Webinar. Portland, Oregon: US EPA.

11 Oregon Health Authority. (2014). Oregon Public Health Assessment Tool (OPHAT). Retrieved July 2014, from Office of the State Epidemiologist, Public Health Division: https://ophat.public.health.oregon.gov/Dataset (Restricted Use).

12 Bay Area Air Quality Management District. (May 2011). Recommended Methods for Screening and Modeling Local Risks and Hazards. San Francisco, California: BAAQMD.

OMIP Oregon Modeling Improvement Program · DEQ · LCOG · Metro · Oregon Department of Transportation · Oregon Health Authority · TREC

QUALITY OF LIFE

PHYSICAL ACTIVITY

QL.1 Health Benefits of Active Transportation

What is this Specific Indicator?

This Specific Indicator examines the health benefits from active transportation. Travel choices are connected to changes in physical activity, resulting in health outcomes. Morbidity and mortality are the two health outcomes explored in this indicator, as affected by the changes in the number of miles walked and biked (active transportation), or changes in the amount of time spent participating in these activities. Lives saved and disease reduced due to active transportation is a monetizable indicator and whenever possible should be calculated for economic valuation.

How is Data Generated?

The Mosaic tool provides a series of sketch models to estimate the morbidity and mortality reduction effects of cycling and walking. It is important to note that in order to estimate this indicator, Mosaic users must have travel data on cycling and walking. At a minimum, users should have a (1) baseline estimate of the number of cycling and walking trips taken per day, (2) ability to estimate the *future* number of cycling and walking trips taken per day based on changes in population and/or additional facilities, and (3) ability to estimate the number of miles walked and biked per day (or per trip, extrapolated to a per day amount). Much of this information may be produced by more robust travel demand models. Users should consult their travel model staff to understand what data the model can produce. However, there are several sketch models in Mosaic (see the User's Guide) available to help in estimating bicycle and walking trips within a region. The user must look to other sources, though, to determine how the number of walking and cycling trips in a region might change due to increased population or construction of additional facilities.

Once data and the number of cycling and walking trips, users enter data into other sketch models to produce both morbidity and mortality reduction (or increase) statistics, which are then automatically monetized by Mosaic.

The following sections provide some details about how the morbidity and mortality components of this indicator or calculated. See the User's Guide for detailed information on how to estimate these indicators.

QUALITY OF LIFE

PHYSICAL ACTIVITY

QL.1 Health Benefits of Active Transportation

Mortality

The mortality rates by sex and age group included in Mosaic are available through the State of Oregon's Public Health Department. Using the sketch tool, the number of avoided deaths per year (i.e. change in mortality risk) would be multiplied by the value of a statistical life. ODOT guidelines for measuring the value of statistical life are used for consistency with valuing lives saved from safety measures, reducing air emissions, and all other pathways to reducing mortality impacts. Travel demand model data is only available for Metropolitan Planning Organizations (MPOs). Corresponding data is not available for all areas outside of MPO boundaries.

Morbidity

Disease specific relative risks, with confidence intervals, were obtained from the Integrated Transport and Health Impact Modeling Tool (ITHIM) meta-analysis. A *Compendium of Activities and Corresponding Metabolic Activity* relates the outputs from the ITHIM to minutes of physical activity. Data can then be compared to a baseline/existing conditions of current morbidity and disease rates (from the statewide Center for Health Statistics, the Oregon State Cancer Registry, and the Behavioral Risk Factor Surveillance System).

The demographic categories available from the travel model outputs should be determined to evaluate the potential for developing the baseline conditions and risk reductions for key diseases. Risk reductions vary by certain demographic characteristics.

Additional Resources

2011 Compendium of Physical Activities: a second update of codes and MET values. Medicine and Science in Sports and Exercise, 2011;43(8):1575-1581. Available for download at https://sites.google.com/site/compendiumofphysicalactivities/compendia

Gill, D. L., Chang, Y.-K., Murphy, K. M., Speed, K. M., Hammond, C. C., Rodriguez, E. A., et al. (2010). *Quality of Life Assessment for Physical Activity and Health Promotion*. Applied Research Quality Life Journal, 15-19.

QUALITY OF LIFE

PHYSICAL ACTIVITY

QL.1 Health Benefits of Active Transportation

Genter J. A., Donovan S., Petrenas, B., and Badland, H. 2008. *Valuing the health benefits of active transport modes.* NZ Transport Agency research report 359. 72 pp

Guenther Samitz, Matthias Egger and Marcel Zwahlen. *Domains of physical activity and all-cause mortality: systematic review and dose–response meta-analysis of cohort studies*, International Journal of Epidemiology 2011;40:1382–1400 doi:10.1093/ije/dyr112

Oregon Vital Statistics: http://public.health.oregon.gov/BirthDeathCertificates/VitalStatistics/annualreports/09V2/Documents/chapter6/table601.pdf

Ragland, David – SafeTREC, UC Berkeley, *Transportation and Health: Policy Interventions for Safer, Healthier People and Communities*, http://www.prevent.org/Additional-Pages/Transportation-and-Health.aspx

U.S. Department of Transportation (DOT). March 18, 2009. "Treatment of the Economic Value of a Statistical Life in Departmental Analysis – 2009 Annual Revision," Memorandum to Modal Administrators

Oregon Policy Plans

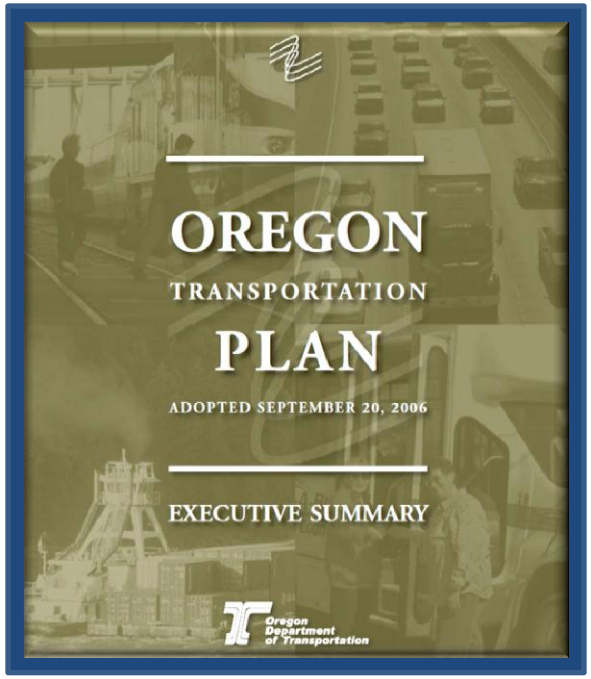
Status Update

Oregon Modeling Steering Committee

April 29, 2015

State Policy Plans

Oregon Transportation Plan

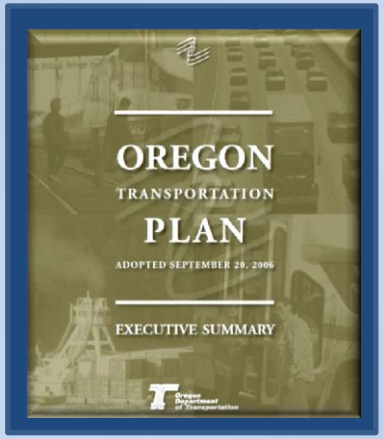


- Establishes statewide multimodal policies
- Is refined through mode and topic plans
- Regions and locals must be consistent with plans

State Policy Plans

Mode and Topic Plans

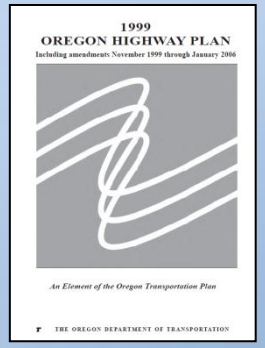
TO - 2015



OTP - 2006

Rail - 2014

Freight - 2011



OHP - 1999

Updates

Bike-Ped - 2016

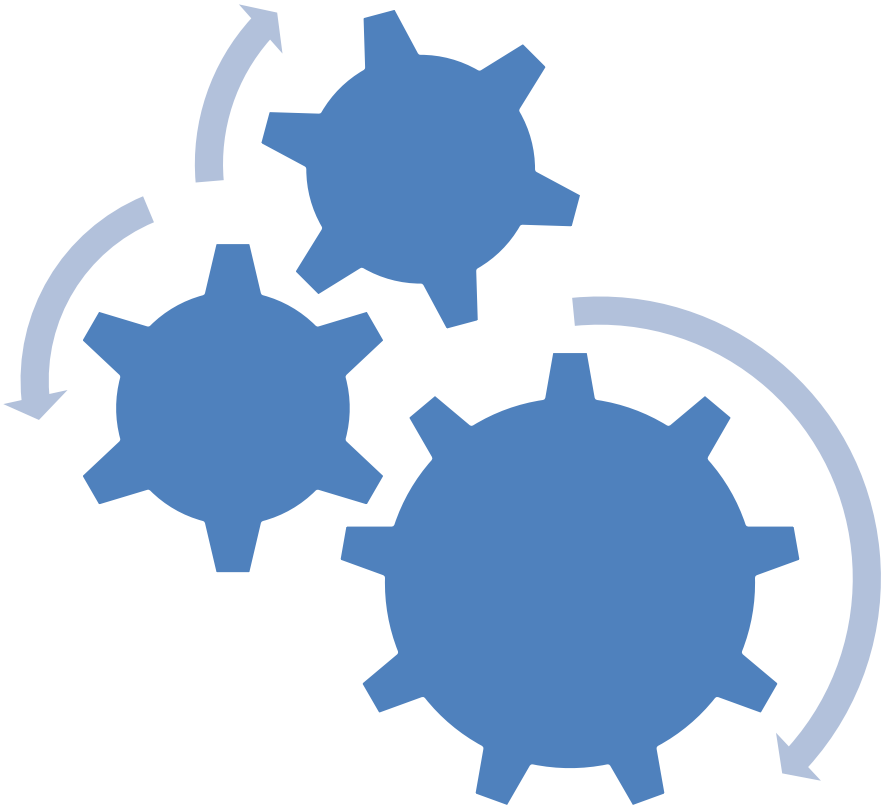
Safety - 2016

Transit - 2017

New Era of Plans

Newly Adopted and in Process Policy Plans

- Multimodal and intermodal
- Substantive but not prescriptive
- Accountable
- Adaptive



Plan Development Process

Plan Elements

Understand today

Envision tomorrow

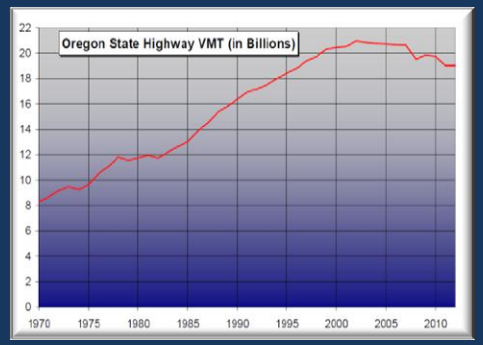
ID what to do

Discuss getting there

Understand Today (and Tomorrow)

Trends, challenges, and opportunities

Trends



Funding

Technology

Understand issues and opportunities and seek right solutions

Envision Tomorrow

Vision and goals

Mobility

Safety

Equity

Community & Economic Vitality

Accessibility & Connectivity

Health

Sustainability

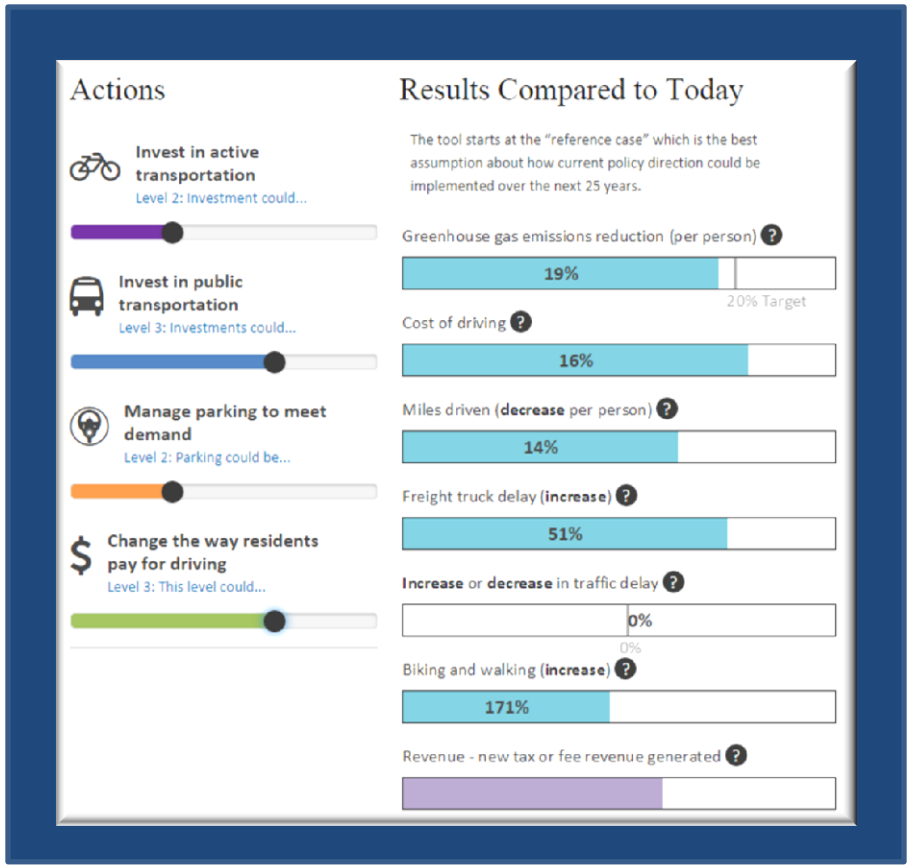
Strategic Investment

Coordination & Collaboration

Identify What to Do

Actions to Achieve Outcomes (Goals)

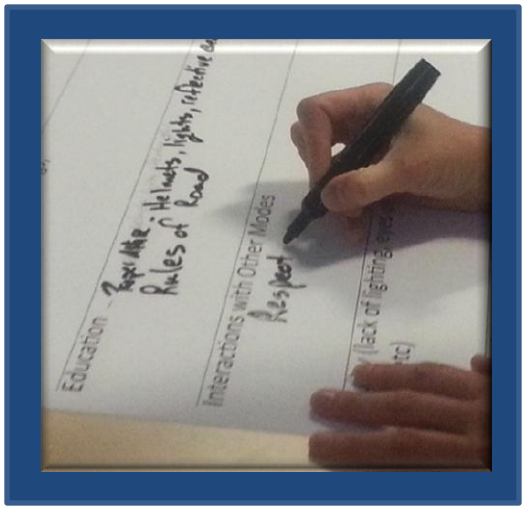
Policies and Strategies



Discuss Getting There

Investments and Implementation

Investment Considerations

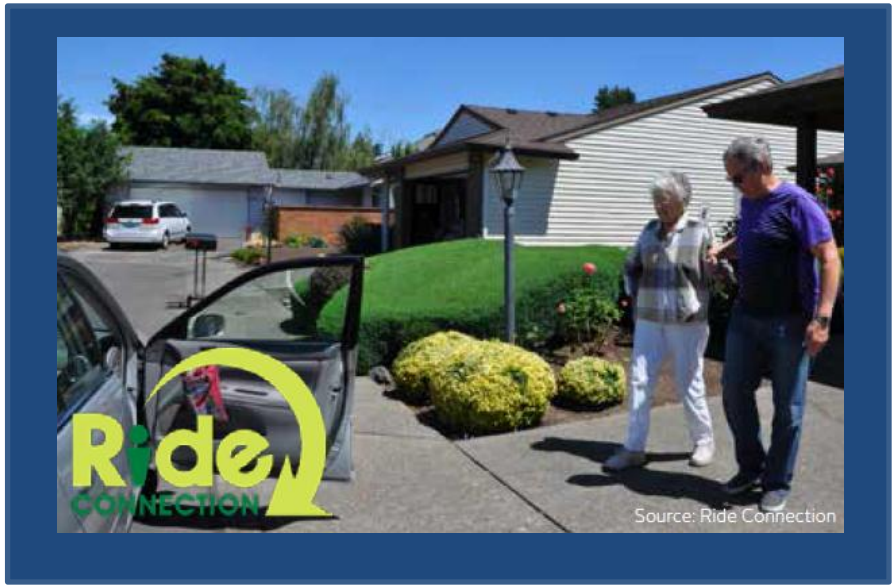


Implementation Considerations

PLAN

Plan Highlights

Transportation Options



- Defines TO business case
- Recognizes "human capital" needs
- Sets performance measures
- Includes implementation phase

- Identifies policies
  - Connections
  - Spreading demand
  - Coordination, etc

Model enhancements

Plan Highlights

Bicycle and Pedestrian

- Touches planning – maintenance
- Goes beyond infrastructure to user
- Points to analysis for safety, health, equity
- Will set performance measures

Level of Traffic Stress

Health Modeling

Plan Highlights

TSAP and Public Transportation

- Transportation Safety Action Plan (TSAP)
  - Programmatic focus
  - Start to fold safety into planning
- Public Transportation Plan
  - All shapes and sizes
  - Coordination

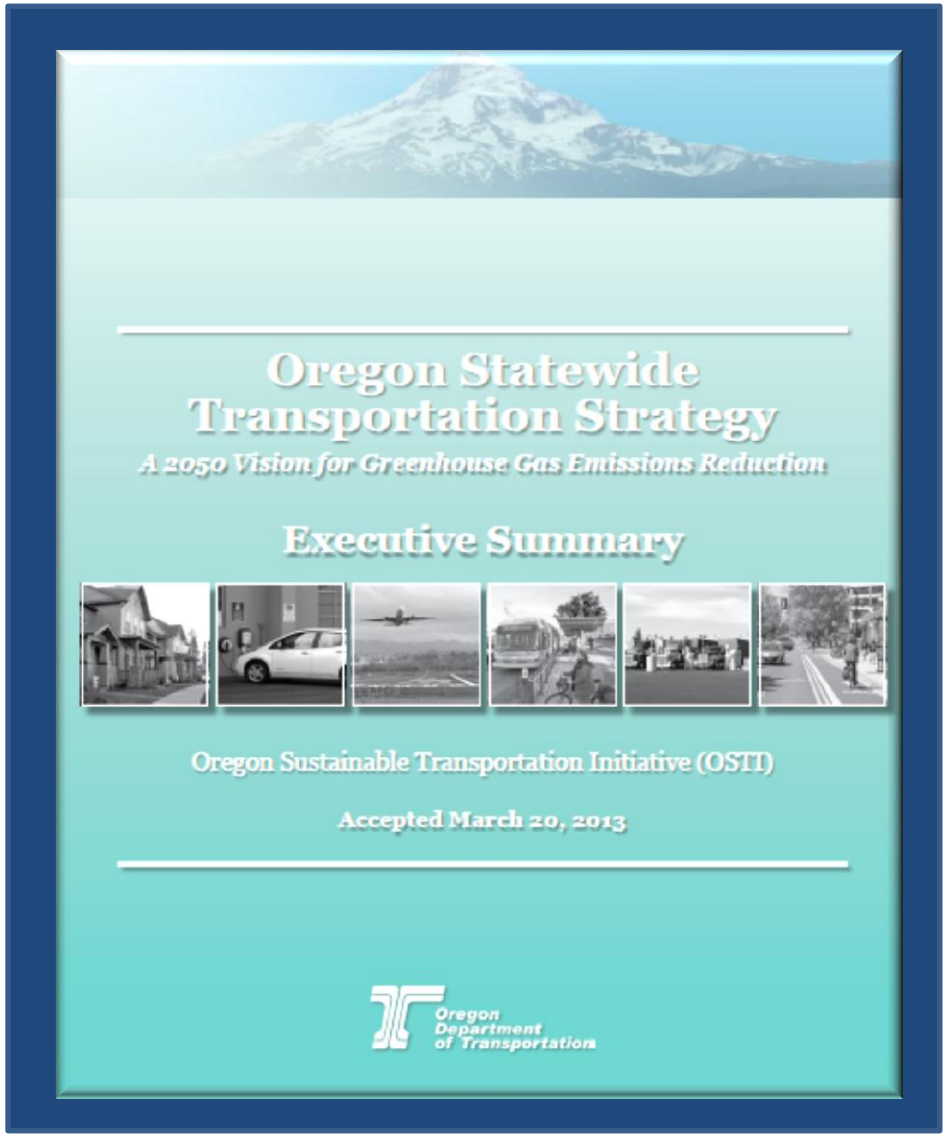
Predictive safety

Identifying transit needs

Other Updates

OSTI

Oregon Sustainable Transportation Initiative



OSTI

Strategic Assessments

Beyond GHG Emissions…

Performance-Based Planning

GreenSTEP

Strategic Planning Model

STRATEGIC ASSESSMENT OF TRANSPORTATION AND LAND USE PLANS

Corvallis Area Metropolitan Planning Organization

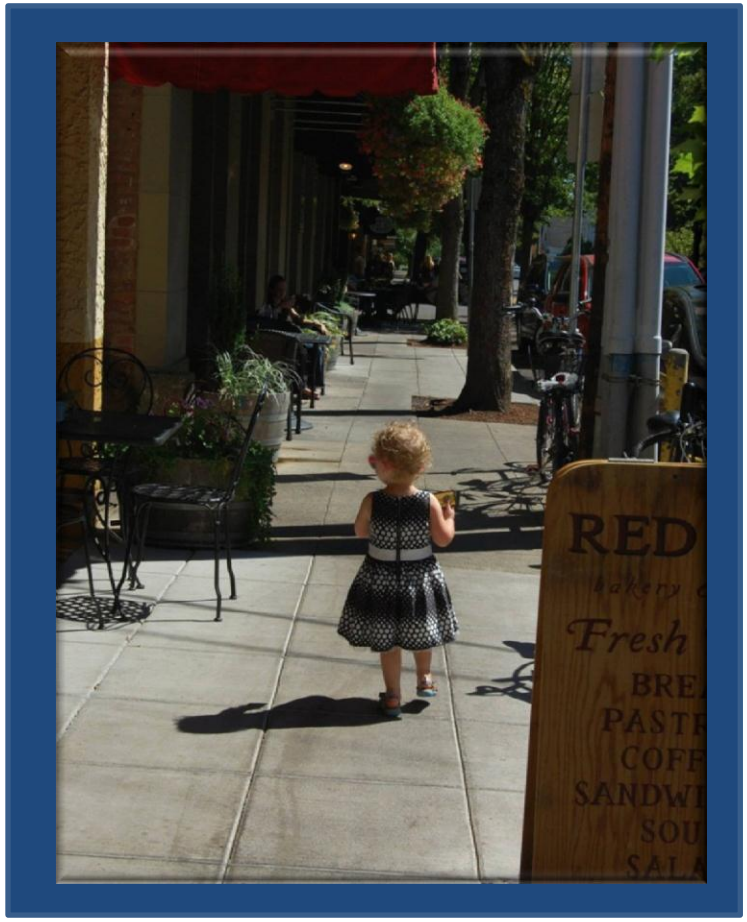
July 2014

Corvallis Area Metropolitan Planning Organization

Oregon Department of Transportation

Oregon Department of Land Conservation and Development

Questions



Website:
http://www.oregon.gov/ODOT/TD/TP/pages/index.aspx

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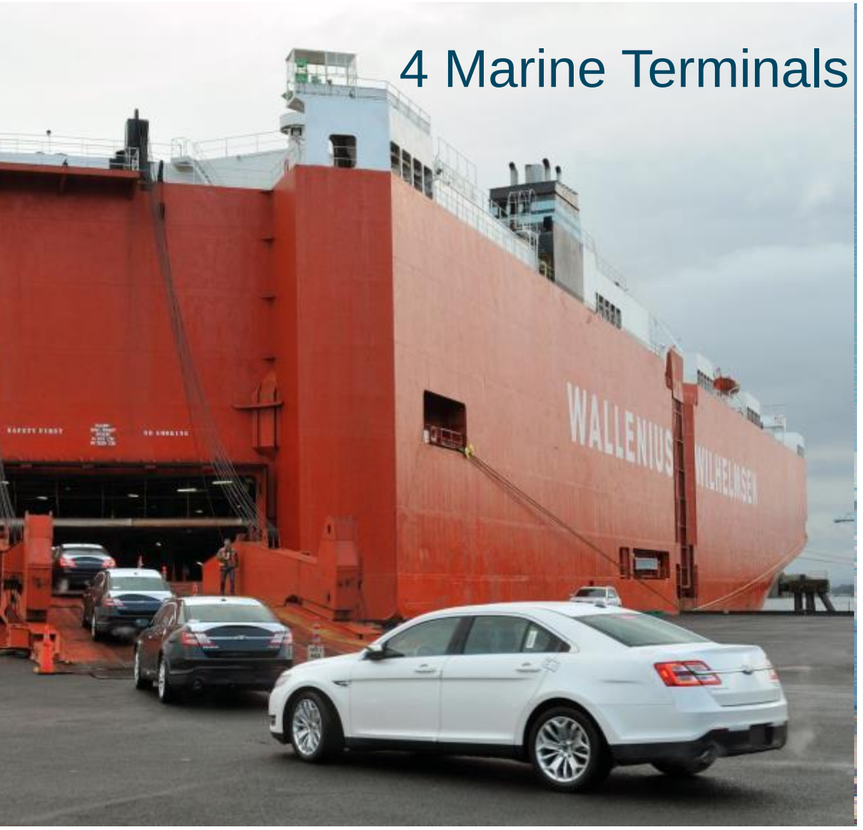
Five-Year Strategic Plan

Scott Drumm

If You've Seen One Port…



- Consolidated Port: Marine and Aviation, plus industrial land, navigation
- NOT a part of city, county, or state government
- Marine operations account for 50% of total harbor volumes
- 97% of revenues derived from business transactions, 3% from property tax revenue
- Annual property tax revenues of $7-8 million; Port of Seattle $65-75 million

Port of Portland Financial Structure

Aviation

Airline Cost Center (PDX)

- Operating & Non-operating
- Capital Expenditures

Port Cost Center

- Operating & Non-operating
- Capital Expenditures

General Fund

General Fund

- Operating & Non-operating
- Capital Expenditures

General Aviation *

Marine

Industrial Development

Navigation

All Administrative Departments

* - Per PDX Bond Ordinance, GA shortfall is covered by Port Cost Center.

Business Lines: Which Came First?

Business Lines

- Aviation
- Industrial Land
- Navigation
- Marine

Chronology

- Navigation
- Aviation
- Industrial Land
- Marine

Economic Update

- Year 6 of Recovery
  - No recovery lasts forever, but no signs of slowing yet
  - No clear sector of concern (dot com surge, consumer and housing bubble)
  - Most likely cause of end of recovery cycle: fiscal tightening (3 to 4 years away)
- Solid job growth will continue
- Expect wage gains to start coming over the next year
- Trade growth could slow
  - Growth has slowed nationally
  - Stronger dollar

Marine Business Line Outlook

Aviation Business Line Outlook

Passengers

+2-3%

Landed Weight

+2%

Cargo Tonnage

+2.5%

Load Factor

Flat

Industrial Development Business Line Outlook

Projected Sales

$16 Million

Metro Area Vacancy Rate

6.8%

Gross Metro Product since Recession

+23.6%

Metro Area Unemployment Rate

-1 PPT

Process Recap

- Expert Panels – February/March/April
- Commission Retreat on SWOT Analysis and Strategic Questions – May
- Plan Development – May through September
- Implementation – September 2014 through June 2020

Mission/Vision/Values

Statute—ORS 778.015

Purposes and general powers of port

The object, purpose and occupation of the Port of Portland shall be to promote the maritime, shipping, aviation, commercial and industrial interests of the port as by law specifically authorized. The port may acquire, hold, use, dispose of and convey real and personal property, make any and all contracts the making of which is not by this chapter expressly prohibited. It may do any other acts and things which are requisite, necessary or convenient in accomplishing the purpose described or in carrying out the powers granted to it by law. The port may supply surface and air craft with fuel and other supplies at reasonable cost as may be for the best interests of the port. [Amended by 1959 c.362 § 1; 1971 c.728 § 104]

Mission/Vision

Mission

To enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets, and by promoting industrial development.

Vision

…to be a prominent, innovative economic development engine while stewarding the region's community and environmental best interests.

Port of Portland Role of Value

The Port plays three primary roles:

Economic Engine	Facilitator of Freight and Air Passenger Transportation	Advocate for Trade, Transportation, and Industrial Land

We facilitate trade and air passenger travel to foster our region's prosperity.

We do this by:

- ✓Planning or building or operating rail and maritime and aviation facilities and supporting transportation infrastructure.
- ✓Operating PDX in a manner that ensures an exceptional customer experience, reflects the character of our region, and is a source of civic pride.
- ✓Acquiring and developing industrial property for traded-sector development.
- ✓Advocating for public policy and fostering market development that supports commerce and trade.
- ✓Catalyzing private investment that results in quality jobs, supports local business and provides a tax base for public services.

2015/16 to 2019/20 Strategic Areas of Focus

Drive Regional Prosperity

Deliver an Outstanding PDX Passenger Experience

Connect People and Businesses to Markets

Promote Excellence in Organizational Effectiveness

Comparing Strategic Plans: Top Level Areas of Focus

2007-2010	2010-2015	2015-2020
One Port	Retain and Grow Key Service	Drive Regional Prosperity
Marine	Be a Leader in Industrial Land Acquisition and Development	Deliver an Outstanding PDX Customer Experience
Industrial Land Acquisition and Development	Develop a Port-wide Environmental Strategy	Connect People and Business to Markets
Aviation	Maintain a Sustainable Financial Model	Promote Excellence in Organizational Effectiveness
Environmental	Be a Leader in Regional Transportation Infrastructure	
	Leverage the Port's Culture as a Strategic Asset	

Drive Regional Prosperity

- Increase region's supply of traded-sector, large-lot, market-ready land
- Promote and encourage middle-wage or higher jobs through policy & practice
- Elevate the Port's role as a leader in promoting the importance of trade and transportation to the regional economy
- Advocate for a Lower Willamette cleanup that is protective of human health and the environment and that is also affordable for our region.
- Maintain and enhance the role of waterfront economic activity in the region
- Enhance community engagement about the Port and its activities
- Provide leadership in integrating social equity considerations into Port economic development programs, partnerships, and planning

Deliver an Outstanding PDX Passenger Experience

- Develop, maintain, and adapt facilities to align with the ambitious PDX brand

Connect People and Businesses to Markets

- Ensure efficient access between Portland and top markets
- Grow the market for cargo service
- Anticipate and plan for future customer needs and facility requirements
- Obtain federal, state, regional/local, and private funding to develop and maintain infrastructure supporting access to Port facilities and lands

Promote Excellence in Organizational Effectiveness

- Establish the Port as an employer of choice
- Create a behavior-based safety and wellness culture
- Improve process efficiencies (agility)
- Reduce environmental impact of Port operations and promote responsible environmental stewardship in Port decisions and actions

Strategic Plan Objectives

Drive Regional Prosperity	Deliver and Outstanding PDX Customer Experience	Connect People and Businesses to Markets	Promote Excellence in Organizational Effectiveness
• Retain/Grow Tax Base • Number of Industrial Acres to Market • Increase Per Capita Income • Increased Awareness of and Support for Port Activities	• PDX Passenger/User Satisfaction • Execute on an Ambitious PDX Brand	• Investment Growth in Maritime Commerce in the River System • Retain and Grow Business: throughput – passenger and cargo volumes, air passenger markets served, container markets served, bulk volumes, air cargo volumes • Financial Sustainability	• Increased Employee Engagement • Advance Environmental Performance • Injury-free Workplace