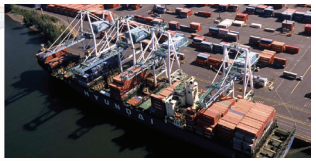
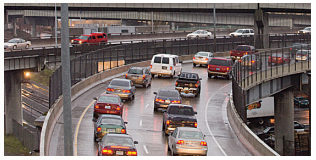


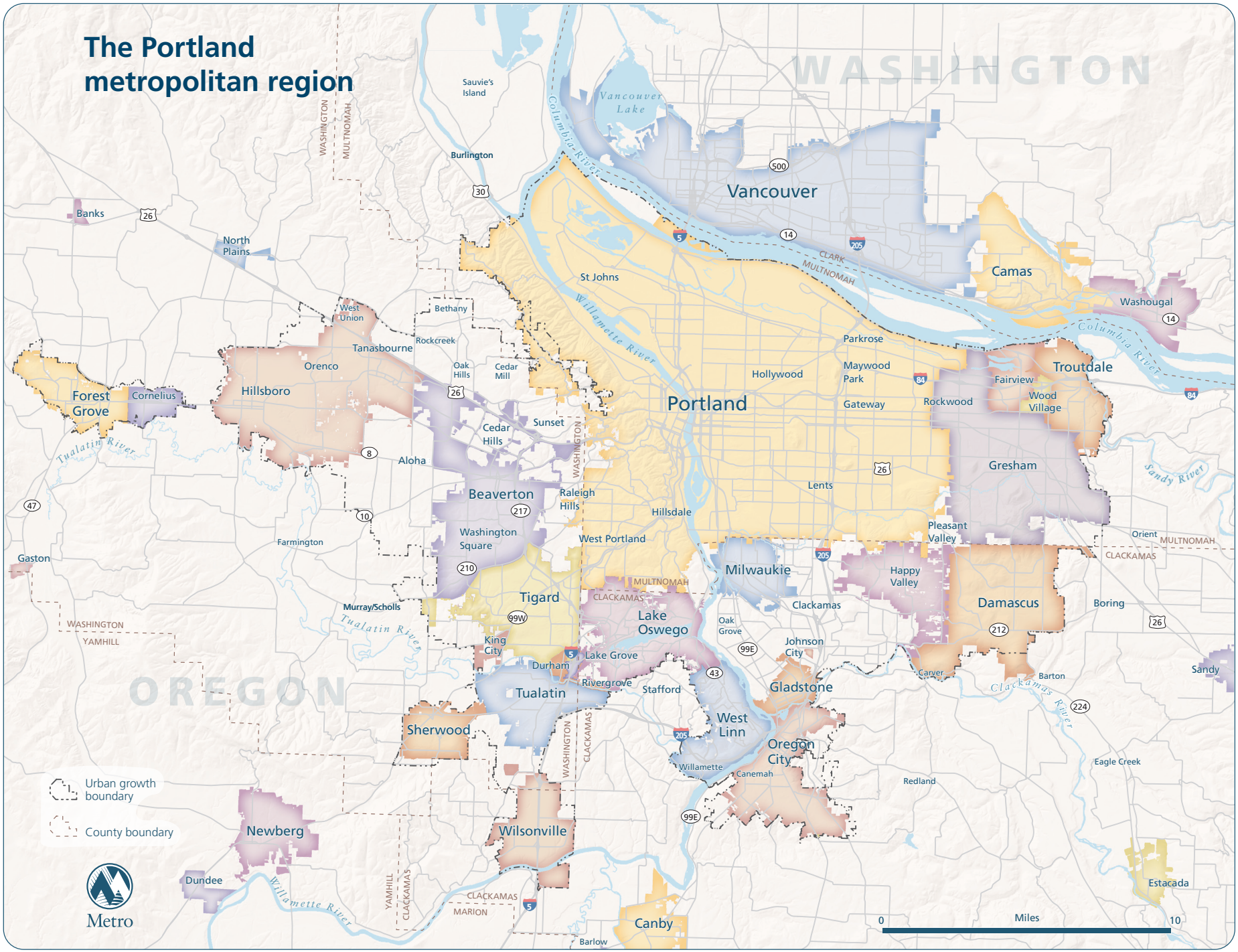


Climate Smart Communities Scenarios Project

Understanding Our Land Use and Transportation Choices

PHASE 1 FINDINGS | JANUARY 12, 2012

Metro | *Making a great place*


The Portland metropolitan region
WASHINGTON
OREGON
Vancouver
Portland
Camas
Washougal
Troutdale
Gresham
Fairview
Wood Village
Rockwood
Parkrose
Maywood Park
Hollywood
Gateway
Lents
Pleasant Valley
Happy Valley
Damascus
Boring
Orient
Milwaukie
Clackamas
Oak Grove
Johnson City
Gladstone
Carver
Barton
Sandy
Lake Oswego
Tigard
Tualatin
Sherwood
West Linn
Oregon City
Rivergrove
Stafford
Lake Grove
Durham
King City
Beaverton
Raleigh Hills
Washington Square
Aloha
West Portland
Hillsdale
Cedar Hills
Sunset
Bethany
Rockcreek
West Union
Tanasbourne
Orenco
Hillsboro
Forest Grove
Cornelius
Banks
North Plains
Gaston
Farmington
Murray/Scholls
Newberg
Dundee
Wilsonville
Canby
Barlow
Estacada
Eagle Creek
Redland
Canemah
Willamette
St Johns
Sauvie's Island
Burlington
Vancouver Lake
Columbia River
Willamette River
Tualatin River
Sandy River
Clackamas River
CLARK
MULTNOMAH
WASHINGTON
CLACKAMAS
YAMHILL
MARION
Urban growth boundary
County boundary
Metro
0
10
Miles

Acknowledgements

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Table of contents

For more information, visit **www.oregonmetro.gov/climatescenarios**

The following pages summarize the purpose, scope and key findings from Phase 1 of the Climate Smart Communities Scenarios Project. The region's decision-makers will use this information to direct development of alternative scenarios in Phase 2.

This information is for research purposes only and does not necessarily reflect current or future policy decisions of the Metro Council, MPAC or JPACT.

Executive summary

The region's six desired outcomes – endorsed by city and county elected officials and adopted by the Metro Council in December 2010.

Over the years, the diverse communities of the Portland metropolitan region have taken a collaborative approach to planning and investment that has helped make our region one of the most livable in the country. We have set the region on a wise course – but times are challenging. A faltering economy, troubling jobless rates, rising energy, housing and transportation costs, climate change and other challenges demand continued leadership, innovation and collaboration to ensure this region remains a great place to live, work and play.

Joining other states around the country, Oregon has been a leader in addressing climate change with ambitious goals to reduce greenhouse gas (GHG) emissions from all sources to 75 percent below 1990 levels by the year 2050. The Oregon Legislature, in 2009, passed the Jobs and Transportation Act (House Bill 2001). Section 37 of the Act requires Metro, the regional government of the Portland metropolitan area, to develop two or more alternative land use and transportation scenarios designed to accommodate planned population and job growth and reduce GHG emissions from light vehicles. Section 37 also requires Metro to adopt a preferred scenario after public review and consultation with local governments, and calls for local governments in the Portland metropolitan region to implement the adopted scenario. Adoption is anticipated in 2014, but Section 37 does not define a specific deadline.

To guide Metro's scenario planning work, the Land Conservation and Development Commission (LCDC) adopted, in May 2011, the Metropolitan Greenhouse Gas Reduction Targets Rule, OAR 660-044, also required by section 37. The rule identifies GHG emissions reduction targets for each of Oregon's six metropolitan areas. The targets identify the percentage reduction in per capita GHG emissions from light vehicle travel that is needed to help Oregon meet its GHG emissions reduction goals. In 2005, the region's roadway GHG emissions were 4.05 MT CO_2e per capita. The adopted target for the region is the equivalent of 1.2 MT CO_2e per capita by 2035. LCDC will review the state targets in 2015 and may identify adjustments in light of new information available at that time.

The Portland metropolitan region is undertaking scenario planning in three phases as part of the Climate Smart Communities Scenarios Project to demonstrate climate change leadership and respond to the Jobs and Transportation Act. The Scenarios Project is building on the land use and transportation strategies contained in the 2040 Growth Concept, the long-range vision adopted by the region in 1995. Since its adoption, Metro and its partners have collaborated to help communities realize their local aspirations while moving the region toward its goals for making a great place: vibrant communities, economic prosperity, transportation choices, equity, clean air and water, and regional climate change leadership. Local and regional efforts to implement the 2040 Growth Concept provide a good basis for the GHG scenario planning work required of the region.

The region has completed the first of three phases of the Scenarios Project – Understanding Choices. Phase 1 focused on understanding the region's land use and transportation choices by conducting a review of published research and testing 144 regional scenarios. The analysis demonstrated the GHG emissions reduction potential of current plans and policies, as well as which combinations of more ambitious land use and transportation strategies are needed to meet the state target.

Phase 1 Scenarios Project Findings

The work completed to date yielded the following findings:

Finding 1: Current local and regional plans and policies are ambitious and provide a strong foundation for meeting the region's GHG reduction target.

1.2 MT CO_2e

The region's per capita roadway GHG emissions target for 2035

Finding 2: The reduction target is achievable but will take additional effort and new strategic actions.

Finding 3: Most of the strategies under consideration are already being implemented to varying degrees in the region to achieve the 2040 Growth Concept vision and other important economic, social and environmental goals.

Finding 4: A range of policy choices exists to reduce GHG emissions; the best approach is a mix of strategies.

Finding 5: Community design and pricing play a key role in how much and how far people drive each day and provide significant GHG emissions reductions.

Finding 6: Fleet, technology and pricing strategies provide similar significant GHG emissions reductions, but no single strategy is enough to meet the region's target.

Finding 7: Road management and marketing strategies improve system and vehicle efficiency and reduce vehicle travel to provide similar, but modest, GHG emissions reductions.

The assumptions used in Phase 1 are ambitious and were based on the need to create a starting point to test scenarios. The region's decision-makers will use the Phase 1 research and subsequent stakeholder engagement to direct development and evaluation of additional scenarios in Phases 2 and 3.

The Scenarios Project will continue to build on the region's long tradition of innovation, excellence in urban planning and conservation and stewardship of our natural environment. People are already making personal choices that will help reduce the region's GHG emissions – they carpool or take transit to work and walk to the store when possible. They support investments that are needed to create climate smart communities – thriving downtowns and main streets supported by transit, neighborhoods with safe and convenient sidewalks and bicycle connections and proximity to jobs, parks and services, and more fuel-efficient vehicles. Future project phases will likely identify additional policies and strategies needed to achieve the needed GHG emissions reductions while meeting other economic, social and environmental goals and supporting the individual needs and aspirations of communities throughout the region.

All those involved in the Scenarios Project recognize that there are many unknowns. The region will need to be innovative and flexible as the work moves forward to respond to and take advantage of what is learned in each project phase. This can be achieved but will require strong partnerships and close collaboration with local, regional, and state partners as well as engaging a diversity of individual, community and business perspectives to help shape the region's preferred strategy.

This report was prepared by Metro staff in consultation with a technical work group, the Transportation Policy Alternatives Committee (TPAC), the Metro Technical Advisory Committee (MTAC), the Joint Policy Advisory Committee (JPACT), the Metro Policy Advisory Committee (MPAC) and the Metro Council.

Introduction

Making a Great Place

Over the years, the diverse communities of the Portland metropolitan region have taken a collaborative approach to planning and investment that has helped make our region one of the most livable in the country. We have set the region on a wise course – but times are challenging. A faltering economy, troubling jobless rates, rising energy, housing and transportation costs, climate change and other challenges demand continued leadership, innovation and collaboration to ensure this region remains a great place to live, work and play.

Purpose and scope

In 2009, the Oregon Legislature passed House Bill 2001, the Jobs and Transportation Act.[1] Section 37 of the JTA directs Metro to "develop two or more alternative land use and transportation scenarios" by January 2012 that are designed to reduce greenhouse gas (GHG) emissions from light-duty vehicles.

The Climate Smart Communities Scenarios Project, and this report, respond to HB 2001 and subsequent GHG emissions reduction targets adopted by the Land Conservation and Development Commission in May 2011. During Phase 1, more than 140 regional scenarios were tested to learn the GHG emissions reduction potential of current plans and policies, as well as which combinations of more ambitious land use and transportation strategies are needed to meet the state GHG targets. A review of published research complemented the scenarios analysis.

Policy areas tested in Phase 1

This report summarizes key findings from Phase 1 and implications for future project phases. Metro staff conducted the research with the assistance of a technical work group of members from the Transportation Policy Alternatives Committee (TPAC) and the Metro Technical Advisory Committee (MTAC), consistent with policy direction from the Joint Policy Advisory Committee (JPACT) and the Metro Policy Advisory Committee (MPAC).

[1]http://www.leg.state.or.us/09reg/measpdf/hb2000.dir/hb2001.en.pdf

Why this work matters

Responding to climate change by making a great place

More than a decade ago, the region set a course for growth with the adoption of the 2040 Growth Concept. Over the years, Metro and its partners have collaborated to help communities realize their unique aspirations while moving the region toward its goals to make the Portland metropolitan area a great place to live, work and play.

Responding to climate change is one of the most pressing issues of our time. Mounting scientific evidence shows Oregon's climate is changing. Oregon has been a national leader in addressing climate change with ambitious goals to reduce GHG emissions. Now it's time for regional and local leaders to focus and act on the investments and actions needed to collaboratively realize local aspirations and shared regional goals, as well as address state climate goals. The Scenarios Project is intended to do just that.

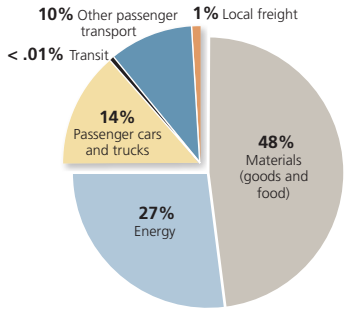
Reducing greenhouse gas emissions is important to the health of the region and the planet. The Scenarios Project will demonstrate that the region can progress toward the GHG reduction goals set by the state within the context of achieving outcomes of equal importance to residents: a healthy economy; clean air and water; and access to good jobs, affordable housing, transportation options, nature, trails and recreational opportunities.

The Scenarios Project is not only addressing climate change for the sake of state mandates. Through this effort, the region will build on a long tradition of innovation, excellence in urban planning, and conservation and stewardship of our natural environment. The bold decisions made decades ago mean we drive much less than other regions our size – giving Portland metropolitan area a head start over other cities and regions across the country. In this context, the Scenarios Project will consider policies, investments and actions needed by 2035 to tackle the climate challenge. The Project will show that solutions are at hand that will turn the challenge of climate change into opportunities to enhance the region's resilience, prosperity and quality of life, now and for generations to come.

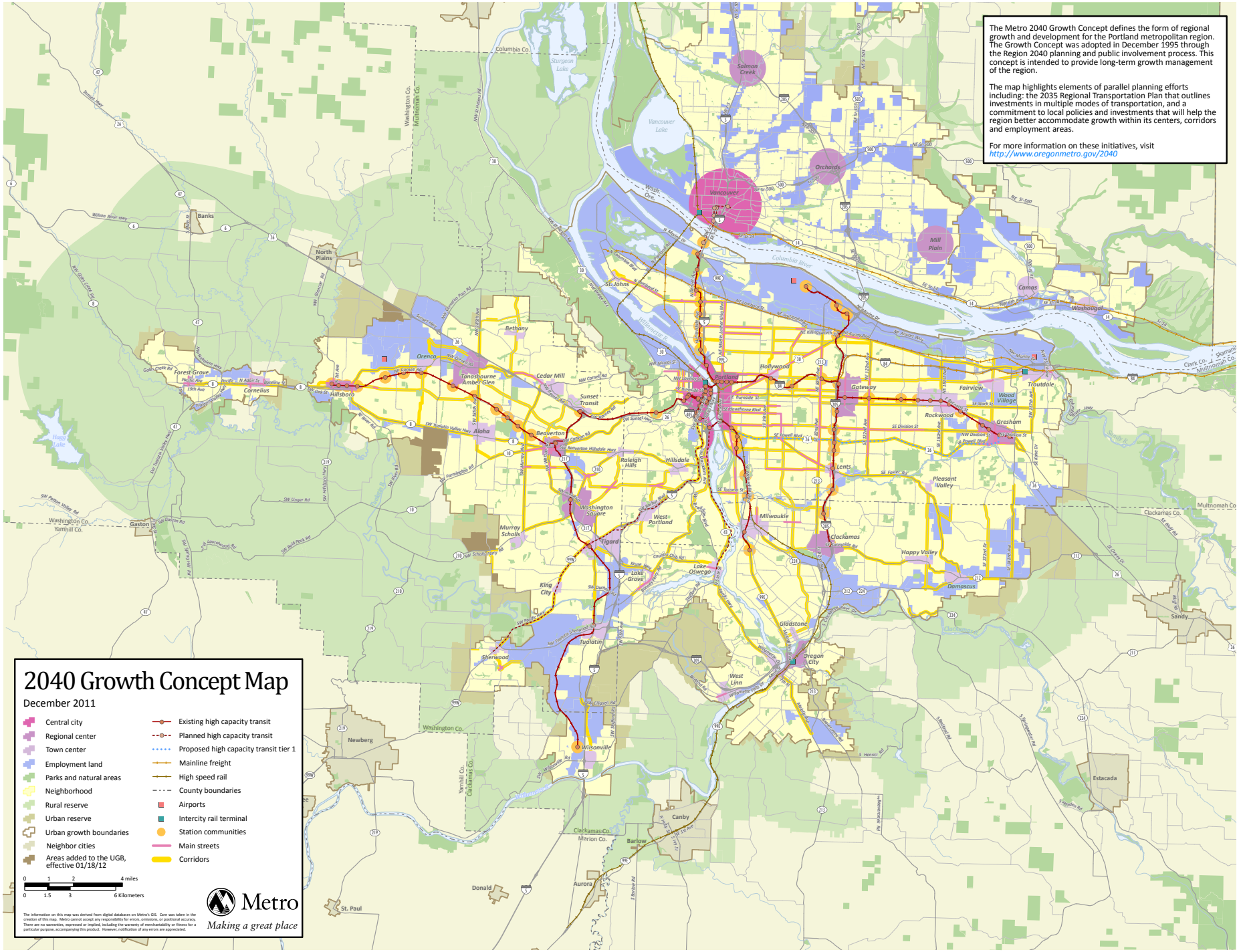
For now, the Scenarios Project will focus on developing a regional strategy for reducing GHG emissions from cars, small trucks and sport utility vehicles (SUVs) – as required by the Jobs and Transportation Act. Preparation for and adaptation to a changing climate will be addressed in future phases and through other efforts already underway in the region and state.

Climate smart strategies can bring many benefits to the region – including significant savings in fuel costs, less time spent in traffic as well as other benefits to the environment, public health and the economy.

Regionalgreenhouse gas emissions sources (2006)



Source: Metro


The Metro 2040 Growth Concept defines the form of regional growth and development for the Portland metropolitan region. The Growth Concept was adopted in December 1995 through the Region 2040 planning and public involvement process. This concept is intended to provide long-term growth management of the region.
The map highlights elements of parallel planning efforts including: the 2035 Regional Transportation Plan that outlines investments in multiple modes of transportation, and a commitment to local policies and investments that will help the region better accommodate growth within its centers, corridors and employment areas.
For more information on these initiatives, visit http://www.oregonmetro.gov/2040
2040 Growth Concept Map
December 2011
Central city
Regional center
Town center
Employment land
Parks and natural areas
Neighborhood
Rural reserve
Urban reserve
Urban growth boundaries
Neighbor cities
Areas added to the UGB, effective 01/18/12
Existing high capacity transit
Planned high capacity transit
Proposed high capacity transit tier 1
Mainline freight
High speed rail
County boundaries
Airports
Intercity rail terminal
Station communities
Main streets
Corridors
0 1 2 4 miles
0 1.5 3 6 Kilometers
Metro
Making a great place
Portland
Vancouver
Beaverton
Hillsboro
Gresham
Tigard
Lake Oswego
Tualatin
Wilsonville
Oregon City
West Linn
Milwaukie
Clackamas
Happy Valley
Sandy
Estacada
Canby
Newberg
Sherwood
King City
Forest Grove
Cornelius
North Plains
Banks
St. Johns
Hollywood
Gateway
Fairview
Troutdale
Camas
Washougal
Orchards
Salmon Creek
Mill Plain
Columbia Co.
Washington Co.
Multnomah Co.
Clackamas Co.
Yamhill Co.
Clark Co.
Skamania Co.

A collaborative approach

Building on community aspirations and the 2040 Growth Concept to achieve state climate goals

Adopted in 1995, the 2040 Growth Concept is the region's blueprint for the future, guiding growth and development based on a shared vision to create livable, prosperous and equitable communities. The growth concept encourages development in centers, corridors and employment areas to support environmental, social and economic objectives.

How we get there

The Scenarios Project is a multi-year collaborative effort designed to help communities realize their aspirations for growth and development and maximize achievement of the region's six desired outcomes and state climate goals.

Phase 1 (January to December 2011)
Understanding choices by testing policy options

In 2011, the region used scenario planning and other research to understand the choices for meeting the state GHG emissions reduction target. The analysis included development of a Strategy Toolbox report synthesizing published research on different strategies in terms of their GHG reduction potential, benefits to communities, synergies, and implementation opportunities and challenges to be addressed in Phase 2.

In addition, Metro in collaboration with state and local partners, developed and analyzed 144 alternative scenarios. The scenarios will be used to identify potential policy options for policymakers to discuss during 2012. The regional policy discussion will shape potential strategies recommended for further evaluation in Phase 2.

Phase 2 (January to December 2012)
Shaping the direction by turning policy options into a draft regional strategy

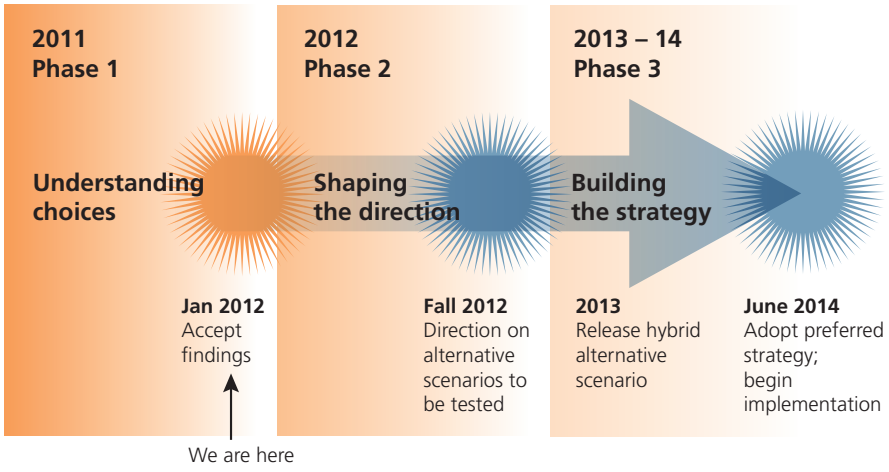
In 2012, the region will design and evaluate more customized alternative scenarios, applying the findings from Phase 1 and incorporating strategies identified in local and regional planning efforts that are underway. This phase will also evaluate the benefits, impacts, costs and savings associated with different strategies across environmental, economic and equity goals. Case studies will be developed to illustrate potential community effects. This phase will result in development of alternative scenarios that will be subject to further analysis and review in Phase 3.

Phase 3 (January 2013 to June 2014)
Building the strategy and implementation

In 2013 and 2014, the region will collaboratively build and select a preferred scenario after public review and consultation with local governments. This phase will define policies, investments and actions needed to implement the preferred scenario. This work will also include development of a finance strategy. Effective implementation of the preferred strategy will likely require the participation and cooperation of government agencies, the private sector and community organizations.

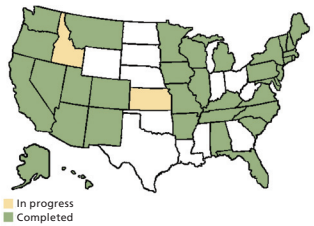
For more information, visit the project website at **www.oregonmetro.gov/climatescenarios**

Climate smart communities scenarios project timeline



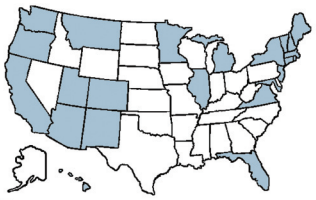
Oregon joins other states, regions and communities to lead the way

States with adopted climate action plans



Source: Center for Climate & Energy Solutions

States with adopted GHG emissions reduction targets



Source: Center for Climate & Energy Solutions

For years, states and metropolitan regions have been taking action to address climate change in the absence of federal legislation. A wide range of policies have been adopted at the state and regional levels to reduce greenhouse gas emissions, develop clean energy resources and promote more energy-efficient vehicles, buildings and appliances. More information on these efforts can be found at www.c2es.org.

Although climate change will ultimately require national and international responses, the actions taken by states and regions will continue to play an important role by developing and testing innovative solutions, demonstrating successful programs, and laying the groundwork for broader action.

Many states have completed or are in the process of revising or developing comprehensive Climate Action Plans. They view policies that address climate change as an economic opportunity, not as a burden on commerce. These states are trying to position themselves as leaders in new markets related to climate action: producing and selling alternative fuels, ramping up renewable energy exports and attracting high-tech business.

Economic issues are just one motivator for state policies that address climate change. Policies to improve air quality, reduce traffic congestion, and develop domestic, clean energy supplies can all have climate benefits. Thus states are discovering that climate policies often bring about benefits in these other areas as well.

Like many other states, Washington, Oregon and California have significant state laws on climate change, with specific and varied provisions focusing on reducing transportation-related GHG emissions.

2007

Similar to many other states, the Oregon Legislature established statewide GHG emissions reduction goals in 2007. The goals apply to all emission sectors – energy production, buildings, solid waste and transportation – and direct Oregon to:

- stop increases in GHG emissions by 2010
- reduce GHG emissions to 10 percent below 1990 levels by 2020
- reduce GHG emissions to at least 75 percent below 1990 levels by 2050.

The 2007 Oregon Legislature also established the Oregon Global Warming Commission (OGWC) – a 25-member commission charged with helping coordinate statewide efforts to reduce greenhouse gas emissions and guide the state toward its climate goals. The commission was charged with helping the state, local governments, businesses and residents prepare for the effects of climate change. More information about the OGWC can be found at www.keeporegoncool.org/

West Coast MPOs

The largest West Coast metropolitan planning organizations have been engaged in scenario planning and climate action planning to meet state GHG emissions reduction targets.

2009

The Oregon Legislature passed House Bill 2001, directing Metro to "develop two or more alternative land use and transportation scenarios" by January 2012 that are designed to reduce GHG emissions from light-duty vehicles. The legislation also mandates:

1) adoption of a preferred scenario after public review and consultation with local government
2) local government implementation through comprehensive plans and land use regulations that are consistent with the adopted regional scenario.

2010

In 2010, the OGWC developed an Interim Roadmap to 2020 that includes recommendations in all sectors of the state's economy – energy, transportation and land use, materials management, forestry, agriculture, and industrial use – to meet state climate goals.

The first Oregon-specific assessment of climate change impacts was released by the Oregon Climate Change Research Institute (OCCRI) in December 2010. The OCCRI Oregon Climate Assessment Report is the work of over 100 researchers across the Oregon University System with input from the OGWC. The report documents likely impacts to Oregon's weather patterns, water supplies, agricultural production, forest health, fish and wildlife species and ecosystems, public health, transportation infrastructure and coastal communities.

In addition, state agencies collaborated with the OGWC, the OCCRI and each other to produce the first comprehensive Oregon policy framework for climate change adaptation planning in December 2010. The Oregon Climate Change Adaptation Framework identifies near term, low cost and high benefit actions Oregon can take. These actions will help Oregonians minimize the impacts of climate change to their communities and livelihoods, and to the environmental values we hold dear in this state.

2011

The Oregon Department of Transportation (ODOT) and the Department of Land Conservation and Development (DLCD) are leading the state response relative to the transportation sector through the Oregon Sustainable Transportation Initiative (OSTI). As part of this effort, the Land Conservation and Development Commission (LCDC) adopted per capita roadway GHG emissions reduction targets for light-duty vehicles for all six metropolitan areas within Oregon on May 19, 2011.[1]

While there is no legislative direction to reduce GHG emissions beyond the transportation sector, the Interim Roadmap to 2020 and other state efforts provide a comprehensive framework and starting point for considering how best to address climate change in Oregon.

2035 GHG targets for Oregon metropolitan areas

per capita light vehicle GHG emissions reduction

Metropolitan area	Adopted target[1]
Portland Metro[2]	20%
Salem-Keizer	17%
Corvallis	21%
Eugene-Springfield[3]	20%
Bend	18%
Rogue Valley	19%

[1] Adopted by the Land Conservation and Development Commission in May 2011
[2] Required scenario planning and adoption
[3] Required scenario planning

[1] http://www.oregon.gov/LCD/docs/rulemaking/trac/660_044.pdf

The challenge for our region

The region's per capita roadway GHG emissions target for 2035

MT CO_2e stands for metric ton of carbon dioxide equivalent.

Measured and stored at standard atmospheric pressures, one metric ton of CO_2 occupies a cube approximately the size of a 3-story building (27 x 27 x 27 feet). It is equivalent to 112 gallons of gasoline.

While the overall state GHG emissions reduction goals call for reductions from 1990 emissions levels by 2050, state agencies were tasked with estimating a 2005 baseline and an intermediate GHG emissions reduction goal for the year 2035 to inform the Scenarios Project.

LCDC adopted the Metropolitan Greenhouse Gas Reduction Targets Rule (OAR 660-044) in May 2011.[1] The rule identifies GHG emissions reduction targets for Oregon's six metropolitan areas. The targets identify the percentage reduction in GHG emissions from light vehicle travel that is needed to help Oregon meet its long-term goal of reducing GHG emissions to 75 percent below 1990 levels by the year 2050.

The LCDC target-setting process assumed changes to the vehicle fleet mix, improved fuel economy, and the use of improved vehicle technologies and fuels that would reduce 2005 emissions levels from 4.05 to 1.51 MT CO_2e per capita by the year 2035.[2]

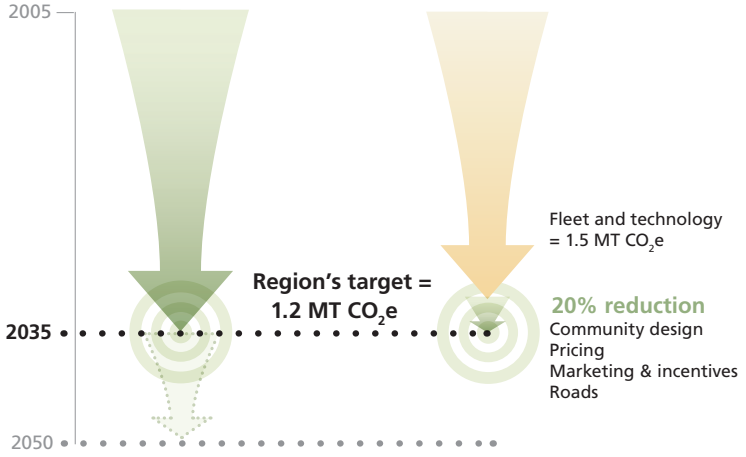
The adopted target for the Portland metropolitan area calls for a 20 percent per capita reduction in GHG emissions from light vehicle travel by the year 2035. This target reduction is in addition to the reduction expected from changes to the fleet and technology sectors as identified in the Agencies' Technical Report. Therefore, to meet the target, per capita roadway GHG emissions must be reduced by an additional 20 percent below the 1.51 MT CO_2e per capita by the year 2035 – to 1.2 MT CO_2e per capita.

[1] http://www.oregon.gov/LCD/docs/rulemaking/trac/660_044.pdf

[2] See Agencies' Technical Report at http://www.oregon.gov/ODOT/TD/TP/docs/OSTI/TechRpt.pdf.

The region's 20 percent per capita reduction is anticipated to come from a combination of community design, pricing, marketing/incentives and road policies. If the fleet and technology improvements assumed in OAR 660-044 are not achieved, then greater reductions may be needed through these other policies. LCDC will review the state targets in 2015 and may identify adjustments at that time in light of new information available at that time.

Region's 2035 GHG emissions reduction target in per capita terms



The adopted target for the region is the equivalent of 1.2 MT CO_2e per capita. While the target is based on 2005 emissions values, it has been calibrated to 1990 emissions levels, and if achieved by the year 2035 ensures the region is on track to meet the overall state 2050 GHG emissions reduction goal.

Principles to guide our approach

Regional and local leaders agree that the Portland region must provide leadership in addressing climate change. The Scenarios Project supports this goal by supplementing state actions with a collaborative regional effort that will also advance local aspirations and the implementation of the 2040 Growth Concept. In this spirit, the Metro Council and the region's transportation and land use policy committees agreed upon six principles to guide this scenario planning effort.

Phase 1 of the Scenarios Project focused on understanding the region's choices for reducing light vehicle GHG emissions. Testing broad-level, regional scenarios revealed the potential of current plans and policies as well as what combinations of land use and transportation strategies (grouped under six policy areas) are needed to meet the state GHG targets.

Successful centers like downtown Hillsboro are dynamic, walkable places that have a concentration of businesses, shops and entertainment, and strong transit service. They combine offices, retail and housing with quality streetscapes, parks and plazas, fountains or other urban amenities.

Climate Smart Communities Scenarios Project guiding principles

1. Focus on outcomes and benefits
The strategies that are needed to reduce GHG emissions can help save individuals, local governments and the private sector money, grow local businesses, create jobs and build healthy, livable communities. These multiple benefits should be emphasized and central to the evaluation and communication of the results.

The region's six desired outcomes – endorsed by city and county elected officials and adopted by the Metro Council in December 2010.

2. Build on existing efforts and aspirations
Start with existing local and regional plans that include strategies to achieve the six desired outcomes for a successful region, illustrated at right.

3. Show cause and effect
Provide sufficient clarity to discern cause and effect relationships between strategies tested.

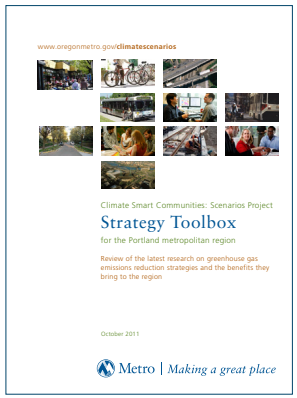
4. Be bold, yet plausible and well-grounded
Explore a range of futures that may be difficult to achieve but are possible in terms of market feasibility, public acceptance and consistency with local aspirations.

5. Be fact-based and make information relevant, understandable and tangible
Develop and organize information so decision-makers and stakeholders can understand the choices, consequences (intended and unintended) and tradeoffs. Use case studies, visualization and illustration tools to communicate results and make the choices real.

6. Meet state climate goals
Demonstrate what is required to meet the state GHG emissions reduction target for cars, small trucks and SUVs, recognizing reductions from other emissions sources must also be addressed in a comprehensive manner.

The Metro Policy Advisory Committee (MPAC) and the Joint Policy Advisory Committee on Transportation (JPACT) endorsed the six principles on June 8 and June 9, 2011 respectively, to guide all Scenarios Project phases.

Phase 1: methods and tools



In May 2011, a work group of members from TPAC and MTAC was charged with helping Metro staff develop the Phase 1 scenarios assumptions, consistent with the guiding principles and evaluation framework endorsed by the Metro Council, JPACT and MPAC in June 2011.

The technical work group defined the scenario assumptions to be tested while Metro and ODOT staff developed tools to support the analysis in summer 2011. The model development work concluded in September 2011, and the initial model runs were completed in October.

Metro staff used a regionally tailored version of ODOT's Greenhouse Gas State Transportation Emissions Planning (GreenSTEP) model to conduct the analysis. Using GreenSTEP – the same model used to set the region's GHG emissions reduction target – ensures compatibility with state's planning efforts and provides a common GHG emissions reporting tool across the state.

The U.S. Department of Transportation has made GreenSTEP available to other states and regions as part of the Energy and Emissions Reduction Policy Analysis Tool (EERPAT). EERPAT was developed to assist with analyzing greenhouse gas reduction scenarios and alternatives for use in the transportation planning process, scenario planning efforts and to measure the reduction potential of various transportation strategies to meet state greenhouse gas reduction goals and targets. The Tool uses GreenSTEP, developed by the Oregon State DOT, as its foundation, and is expected to have regular enhancements.[1]

The foundation of this work is the development of a Base Case – the existing conditions for 2010 – and a Reference Case – a forecast of how the region will perform in 2035 based on projected population and demographic trends.

[1] http://www.planning.dot.gov/FHWA_tool

The Reference Case assumes the realization of existing plans and policies, and represents the Level 1 assumptions for each policy area. The remaining 143 scenarios test plausible combinations of land use and transportation strategies that could affect GHG emissions from light-duty vehicles.

Strategies were organized into six policy areas:

- Community design
- Pricing
- Marketing and incentives
- Roads
- Fleet
- Technology

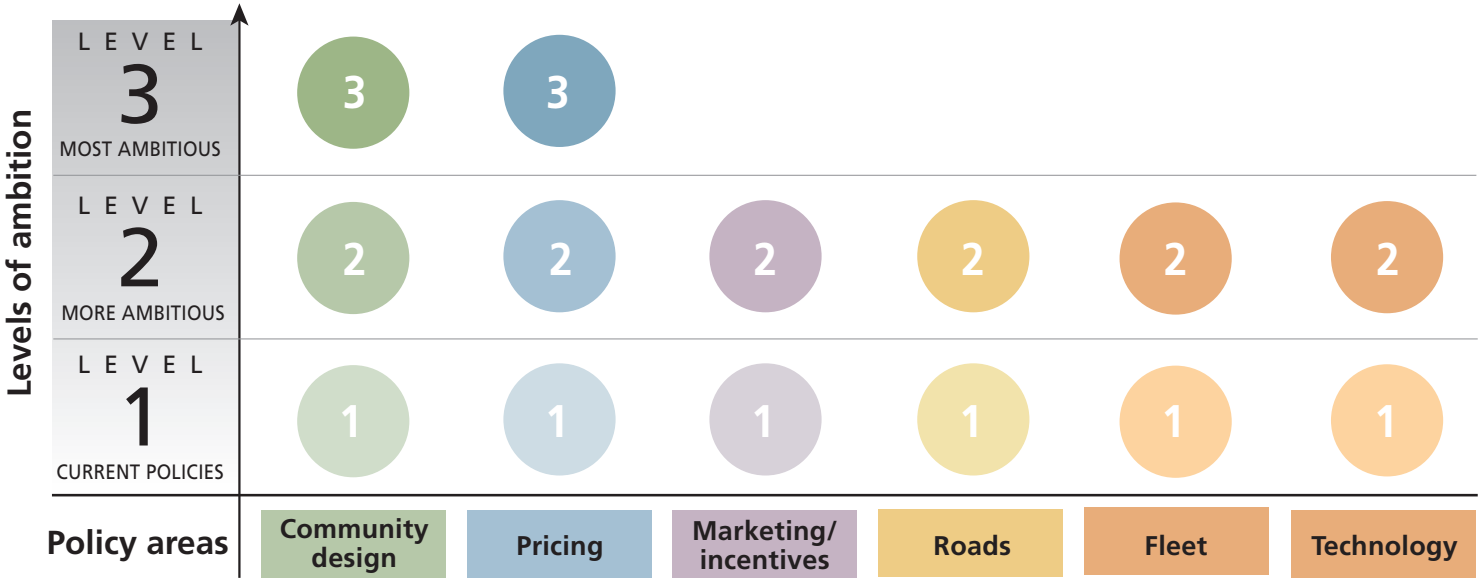
Each of these policy areas include individual strategies that have been shown to affect GHG emissions (see page 15). While some strategies are new, many of the strategies tested are already being implemented to varying degrees to realize the 2040 Growth Concept and the aspirations of communities across the region. A summary of the strategies tested is provided on pages 22 to 35.

Including the Reference Case, a total of 144 scenarios have been analyzed at a preliminary level for their GHG emissions reduction potential. In addition to the scenarios analysis, staff completed the Strategy Toolbox report. The Strategy Toolbox report summarizes published local, national and international research on strategies that can help reduce transportation-related GHG emissions and meet other policy objectives. The report documents benefits of different strategies to a community, synergies between strategies, and implementation opportunities and challenges to be addressed in Phase 2.

Key findings from Phase 1 will be used to refine scenario inputs to develop customized alternative scenarios for further analyses in Phase 2 and Phase 3.

Phase 1: building blocks for regional scenarios

Testing combinations of plausible strategies



Strategies tested

- **Community design:** Complete neighborhoods and mixed-use areas, urban growth boundary, transit service, bike travel, parking
- **Pricing:** Pay-as-you-drive insurance, gas tax, road use fee, carbon fee
- **Marketing and incentives:** Eco-driving, individualized marketing programs, employer commute programs, car-sharing
- **Roads:** Freeway and arterial capacity, traffic management
- **Fleet:** Fleet mix and age
- **Technology:** Fuel economy, carbon intensity of fuels, electric and plug-in hybrid electric vehicle market share

Putting stakes in the ground to create a starting point

The assumptions used Phase 1 are ambitious and were based on the need to create a starting point to test scenarios. Each level of effort tests different implementation levels for each of the policy areas.

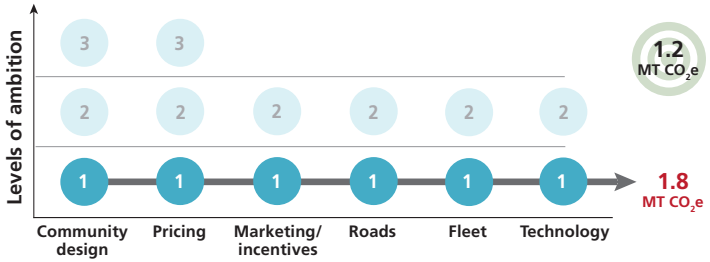
In Phase 2, the level of implementation of these strategies as well as their timing and sequencing will be explored and further refined to develop alternative scenarios that will be subject to analysis and further review in Phase 3.

Phase 1: findings

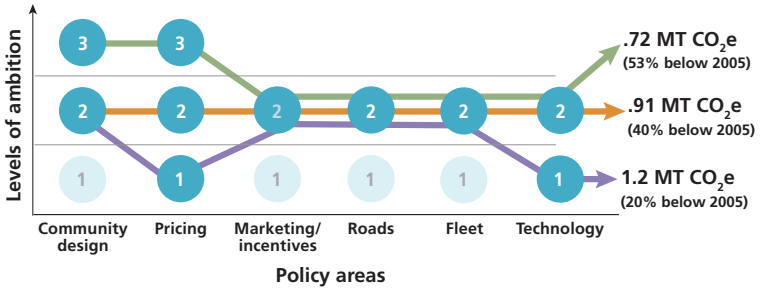
The region's per capita roadway GHG emissions target for 2035

Phase 1 of the Scenarios Project has focused on understanding the region's choices by conducting a review of published research and testing 144 regional scenarios. Phase 1 was designed to accomplish two things: 1) to understand the GHG emissions reduction potential of current plans and policies and 2) to understand the combinations of plausible land use and transportation strategies that reduce GHG emissions from light duty vehicles to 1.2 MT CO_2e per capita by 2035. The region's decision-makers will use this information to direct development of alternative scenarios in Phase 2.

Current plans and policies provide a strong foundation but do not meet target



Targets are achievable but will take additional effort and new strategic actions



What we learned from the Phase 1 Scenarios

The work completed to date yielded the following findings:

Overall findings

Finding 1: Current local and regional plans and policies are ambitious and provide a strong foundation for meeting the region's GHG target. If realized, they will result in substantial per capita GHG emissions reductions from 2005 levels. However, a continued shift in consumer preferences and significant investment, commitment and leadership are needed to realize these aspirations.

Finding 2: The reduction target is achievable but will take additional effort and new strategic actions. Ninety-three of 144 scenarios tested meet the 20 percent per capita GHG emissions reduction target. Various combinations of policies achieved GHG emissions reductions ranging from 20 percent to 53 percent below 2005 levels.

Finding 3: Most of the strategies under consideration are already being implemented to varying degrees in the region to achieve the 2040 Growth Concept vision and other important economic, social and environmental goals. Driving less conserves energy, reduces fuel consumption and keeps money in the region that consumers and businesses can spend on other things to help stimulate the region's economy. Supporting investments such as bike lanes, sidewalks, new transit service, and electric vehicle charging stations will help expand travel options for everyone.

Finding 4: A range of policy choices exists to reduce GHG emissions; the best approach is a mix of strategies. Light-duty vehicle emissions are a function of vehicle efficiency, technology, fuel content and vehicle travel. While improving vehicle and fuel efficiency achieves significant reductions in GHG emissions, per capita vehicle travel must be reduced to meet the target.

Comparison of Phase 1 policy areas

Estimated reductions in roadway GHG emissions from current plans and policies

Policy area	Level	Estimated percent reduction from 1.8 MTCO$_2$e*
Community design	2	18%
Community design	3	36%
Pricing	2	13%
Pricing	3	14%
Marketing and incentives	2	4%
Roads	2	2%
Fleet	2	11%
Technology	2	14%

*MT CO$_2$e percent change from 2035 Reference Case (current plans and policies)

The analysis used the Metropolitan GreenStep model to test six different policy areas and their ability to reduce light vehicle GHG emissions. The table above demonstrates the effect of applying each policy area at each level of implementation beyond the Reference Case (Level 1). The estimated percent reduction represents the average reduction in roadway GHG emissions for each policy area, while considering all possible combinations of policy areas.

It should be noted that these reduction estimates do NOT assess the relative effect of changes to individual strategies, but rather the reductions attributable to each policy area. In addition, the reduction estimates are NOT additive.

Policy area findings

Finding 5: Community design and pricing play a key role in how much and how far people drive each day and provide significant GHG emissions reductions. The analysis revealed that community design or pricing strategies must be more ambitious than current policies to meet the target. However, pricing and community design together yield the largest GHG emissions reduction per capita.

Finding 6: Fleet, technology and pricing strategies provide similar significant GHG emissions reductions but no single strategy is enough to meet the region's target. Pricing, when combined with the most ambitious fleet and technology strategies, meets the target.

Finding 7: Road management and marketing strategies improve system and vehicle efficiency and reduce vehicle travel to provide similar, but modest GHG emissions reductions. Combining these strategies with community design provides additional emissions reduction that can help meet the region's GHG target.

Bringing it all together: implications for Phase 2

The results reflect the underlying model assumptions used in Phase 1 Scenarios analysis, and provide a starting point for Phase 2. The assumptions used in Phase 1 are ambitious and were based on the need to create a starting point to test scenarios. The assumptions and scenarios tested do not represent specific policy decisions of the Metro Council, MPAC or JPACT. The Phase 1 Scenarios were intended to show whether it is possible for the region to reduce GHG emissions enough to meet the region's target. *During Phase 2, the level of implementation of these strategies as well as their timing and sequencing will be explored and further refined to develop alternative scenarios that will be subject to further analysis and review in Phase 3.*

Each strategy presents its own opportunities and challenges. The cost, level of effort and type of actions needed will vary by policy and strategy. The process of defining a preferred approach must be inclusive and engage stakeholders from diverse backgrounds to allow for a variety of perspectives to be shared and considered. *Effects on the economy, equity, the environment, costs, savings, public acceptance, and actions needed to implement a particular strategy must be considered.*

Existing governance structures require that scenario planning be a collaborative effort between the state, Metro, cities and counties. While Metro is responsible for coordinating regional land use and transportation planning and implementation, scenario planning involves evaluation of policies and strategies that are the responsibility of all levels of government. *A collaborative planning and decision-making model allows agreement to be reached at each level.*

Metro, cities, counties and the state will need to be flexible and innovative to be successful. Existing staff are fully subscribed with current planning responsibilities. Additional financial and technical support will be needed. *It will also be important for Metro and local governments to integrate GHG scenario planning with existing Metro, county and city planning processes.*

Leadership, partnerships and coordination are keys to success. Strategies under consideration have a mix of "sponsors" and funding sources. *Metro and local governments cannot achieve the targets alone; it will take leadership, collaboration and coordinated action at the local, regional, state and federal levels.* New governance structures and funding mechanisms may be needed to implement the strategies.

Selecting strategies will involve policy decisions that could have political, economic, environmental, equity, community and lifestyle implications. By framing the policy choices that decision-makers will consider throughout the process, *Phase 1 research serves as a basis for continuing a regional dialogue on how best to reach our GHG reduction target while advancing local and regional efforts to build livable, prosperous and equitable communities.* The region's approach must also advance realization of the region's six desired outcomes, and support the individual needs and aspirations of each community in the region.

Where we are headed in Phase 2

The primary objective of the Phase 1 analysis is to estimate the GHG emissions reduction potential of current policies and that of alternative combinations of strategies. Phase 2 (January to December 2012) will build on this work and consider:

Cost effectiveness: Cost-effectiveness will be important in the selection and implementation of GHG emissions reduction strategies. Further research is needed to estimate cost-effectiveness, including accounting for the benefits and cost impacts of different strategies. The evaluation will consider the costs and benefits across environmental, economic and equity goals from multiple perspectives – business, individual, household, community and region. The evaluation will illustrate the political, community, social equity and economic implications of different strategies, as well as public and private costs and savings and the potential costs of inaction.

Fiscal considerations: The evaluation will assess how revenues generated from parking management and other strategies could be funding sources for community investments, such as expanded transit service, implementing system and demand management programs, building sidewalks, fixing bottlenecks and providing electric vehicle infrastructure.

Economic considerations: The feasibility of implementing different strategies, potential financing strategies and the timeframe required will be assessed to inform next steps and recommendations. Recommended solutions should not put the state, region or local governments at an economic disadvantage, but rather boost economic competitiveness and provide greater economic opportunity for everyone.

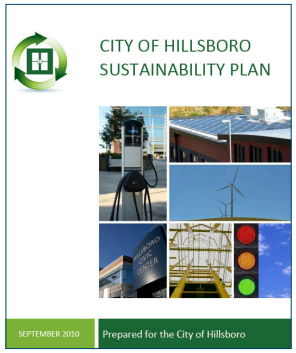
Equity considerations: The evaluation will meaningfully consider equity. This should include assessing the impacts to communities without well-connected street systems, transit, sidewalks, and bicycle facilities, or households of modest means that may lack access to lower carbon vehicle options or affordable housing options.

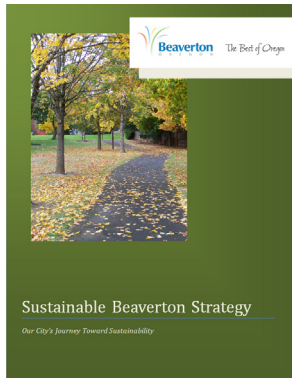
Moving forward: policy questions to be addressed

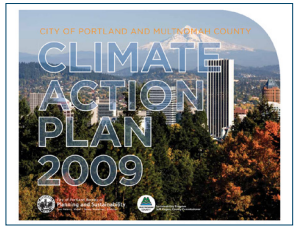
Together, we must answer pivotal policy questions to identify the right mix of land use and transportation investments and strategies:

- Which actions are local and regional leaders currently taking and which of the possible new actions are most consistent with existing efforts?
- Which strategies are most cost-effective and efficient? Which strategies are easiest to implement, both technically and politically? How do we overcome obstacles to the most effective actions that are difficult or expensive to implement?
- What are the benefits and impacts of these strategies to individuals, businesses, the region's economy and other desired outcomes communities and the region are trying to achieve?
- How do we ensure the region's strategy is inclusive and equitable, reflects the diversity of needs and interests in the region and does not perpetuate disparities or leave any community behind, especially households of modest means and people of color?
- How do we ensure the region's strategy creates good jobs, provides greater economic opportunity for everyone and boosts economic development and competitiveness?

Other local and regional climate initiatives







Local climate initiatives

Communities around the Portland metropolitan region are already taking steps to address climate change.

- In 2006, the **City of West Linn** developed a strategic plan that recommends specific actions to achieve sustainability, including reducing GHG emissions.
- The cities of **Beaverton, Forest Grove, Gladstone, Gresham, Hillsboro, Lake Oswego, Milwaukie, Oregon City,** and **Portland**, which together currently represent 66 percent of the region's population, committed to reducing greenhouse gas emissions as a signatory to the 2007 U.S. Conference of Mayors Climate Protection Agreement.
- In 2008, the **Clackamas County** developed an action plan that calls for reductions in GHG emissions and specific actions to support meeting the plan's reduction goals.
- In 2008, **Washington County** completed an inventory of GHG emissions from agency operations.
- In 2009, the **City of Portland and Multnomah County** adopted a Climate Action Plan to guide policies and programs to achieve reductions in GHG emissions. The plan builds on previous plans adopted in 1993 and 2001.
- In 2010, the **City of Hillsboro** completed an inventory of GHG emissions from local government operations. The inventory provides a baseline for tracking reductions in GHG emissions called for in the city's 2010 Sustainability Plan.
- In 2011, the **City of Gresham** prepared a sustainability plan for the city's operations and facilities that includes specific goals for reducing GHG emissions.
- The **City of Lake Oswego** is developing a community-based GHG inventory. The inventory will provide a baseline for tracking reductions in GHG emissions from all sources and is a component of the city's comprehensive plan update.
- The **City of Beaverton** has conducted GHG inventories for its operations and the community. Beaverton is now finalizing its Sustainability Strategy with goals that support the regional and state objectives.

Regional climate activities

The Scenarios Project is one element of a larger set of climate-related initiatives at Metro collectively known as Climate Smart Communities:

Regional Greenhouse Gas Emissions Inventory: In 2010, Metro completed a regional GHG emissions inventory for the year 2006. The inventory establishes a snapshot of the region's carbon footprint to focus planning and monitoring efforts to achieve long-term GHG reductions.

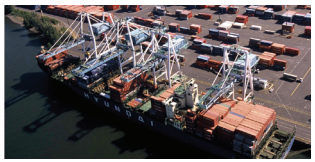
Greenhouse Gas Emissions Assessment Toolkit: Metro developed a regional GHG Emissions Assessment Toolkit that establishes a framework for regional climate impact assessments and provides consistent guidance on analysis methods, reporting, and evaluation of Metro projects, programs and policies.

Climate Leadership Initiative: Metro participated in the Climate Leadership Initiative, completed in January 2010, which engaged local experts and stakeholders on how to prepare the lower Willamette Valley River Basin for climate change impacts.

Climate Prosperity Strategy: Metro worked with local governments, businesses, educational institutions, and the Portland Oregon Sustainability Institute to develop the 2011 Portland Metro Climate Prosperity Strategy – a "greenprint" for integrating climate change policy and economic development into a single strategy.



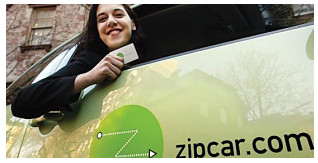












Climate Smart Communities Scenarios Project

Phase 1: Supplemental Information

Phase 1: 2010 base year and alternative scenario inputs

The input assumptions are for research purposes only and do not necessarily reflect current or future policy decisions of the Metro Council, MPAC or JPACT.

This table summarizes the inputs for the 2010 Base Year and 144 alternative scenarios that reflect different levels of implementation for each category of policies. The inputs were developed by Metro staff in consultation with a technical work group of MTAC and TPAC members. Documentation of the inputs and rationale behind each input can be found in the Phase 1 Metropolitan GreenSTEP Scenarios Technical Documentation report (January 2012). This information is for research purposes only and does not necessarily reflect current or future policy decisions of the Metro Council, MPAC or JPACT.

			Reference case		
		2010	2035		
	Strategy	**Base Year** Reflects existing conditions	**Level 1** Reflects current plans and policies	**Level 2** Reflects more ambitious policy changes	**Level 3** Reflects even more ambitious policy changes
Community design	Households living in mixed-use areas and complete neighborhoods (percent)	GreenSTEP calculates			
	Urban growth boundary expansion (acres)	2010 UGB	7,680 acres	7,680 acres	No expansion
	Bicycle mode share[1] (percent)	2%	2%	12.5%	30%
	Transit service level	2010 service level	2035 RTP service level	2.5 times RTP service level	4 times RTP service level
	Workers/non-work trips paying for parking (percent)	13% / 8%	13% / 8%	30% / 30%	30% / 30%
	Average daily parking fee ($2005)	$5.00	$5.00	$5.00	$7.25
Pricing	Pay-as-you-drive insurance (percent of households participating and cost)	0%	0%	100% at $0.06/mile	No change from Level 2
	Gas tax (cost per gallon $2005)	$0.42	$0.48	$0.18	
	Road use fee (cost per mile $2005)	$0	$0	$0.03	
	Carbon emissions fee (cost per ton)	$0	$0	$0	$50

[1] Percent of all tours less than 6 miles roundtrip.

Strategy		Reference case			
		2010	2035		
		Base Year Reflects existing conditions	**Level 1** Reflects current plans and policies	**Level 2** Reflects more ambitious policy changes	**Level 3** Reflects even more ambitious policy changes
Marketing and incentives	Households participating in eco-driving	0%	0%	40%	No Level 3
	Households participating in individualized marketing programs (percent)	9%	9%	65%	
	Workers participating in employer-based commuter programs (percent)	20%	20%	40%	
	Car-sharing in high density areas (target participation rate)	Participation rate of 1 member/100 people	Participation rate of 1 member/100 people	Double participation to 2 members/100 people	
	Car-sharing in medium density areas (target participation rate)	Participation rate of 1 member/200 people	Participation rate of 1 member/200 people	Double participation to 2 members/200 people	
Roads	Freeway and arterial expansion	2010 system	2035 financially constrained system	No expansion	
	Delay reduced by traffic management strategies (percent)	10%	10%	35%	
Fleet	Fleet mix (proportion of autos to light trucks and SUVs)	auto: 57% light truck/SUV: 43%	auto: 56% light truck/SUV: 44%	auto: 71% light truck/SUV: 29%	
	Fleet turnover rate (age)	10 years	10 years	8 years	
Technology	Fuel economy (miles per gallon)	auto: 29.2 mpg light truck/SUV: 20.9 mpg	auto: 59.7 mpg light truck/SUV: 41 mpg	auto: 68.5 mpg light truck/SUV: 47.7 mpg	
	Carbon intensity of fuels	90 g CO_2e/megajoule	81 g CO_2e/megajoule	72 g CO_2e/megajoule	
	Light-duty vehicles that are electric or plug-in electric vehicles (percent)	auto: 0% light truck/SUV: 0%	auto: 4% light truck/SUV: 1%	auto: 8% light truck/SUV: 2%	

Our starting point is the Reference Case – current plans and policies

Key population and household assumptions

- Between the years 2010 and 2035, the population within the Metro urban growth boundary is forecast to increase by more than 625,000 residents. This assumption is based on Metro's draft Beta forecast and represents the lower end of the middle-third of the population growth forecast range. This range value is consistent with Metro Council's recent adoption of an ordinance (in October 2011), which focused its growth management decision on the lower end of the middle-third of the population growth forecast range.
- Metropolitan GreenSTEP travel behavior estimates are made irrespective of housing choice or supply. Therefore, there is no assumption about the type of housing assumed to be built in the future.
- The following housing supply growth characteristics are presented for context purposes only. Recently, approximately 40 percent of new housing units constructed in the region are multi-family (MF), and 60 percent is single-family (SF). The draft Beta forecast reflected a marginal growth split of 78 percent MF and 22 percent SF by 2035, which would result in a total housing stock split of 34 percent MF and 66 percent SF by 2035. However, Metro in coordination with regional partners, have refined these assumptions resulting in a draft Gamma forecast. The Gamma forecast demonstrates that over the next 25 years approximately 59 percent of new housing units in the region will be MF, and 41 percent will be SF. This growth split results in a total housing stock split of 35 percent MF and 65 percent SF.

Key pricing assumptions

- The federal gas tax is 18 cents per gallon – the same as today.
- State gas tax is 30 cents per gallon – the same as today.
- The average daily cost of parking is $5 per day – the same as in 2005.
- Locations with paid parking are limited to downtown Portland, the Oregon Health Science University campus and the Lloyd District, representing approximately 13 percent of the region's workers and 8 percent of other trips made each day – the same as in 2005.
- Zero households participate in pay-as-your-drive insurance.

Key marketing and incentives assumptions

- 9 percent of households participate in individualized marketing – the same as today.
- 20 percent of workforce participates in employer-based commute programs – the same as today.
- Participation in carsharing programs remains the same as today: one member for every 100 people in higher-density areas like the Pearl District in Portland and one member for every 200 people in medium-density areas like inner eastside Portland neighborhoods.

Key fleet and technology assumptions

- The region's fleet mix stays nearly the same as today – 56 percent of the fleet is passenger cars and the remaining 44 percent is small trucks and sport utility vehicles.
- The Low Carbon Fuel Standard (as proposed by the Oregon Department of Environmental Quality) is adopted; carbon intensity of fuels will decline by 10 percent below today's average.
- Federal Corporate Average Fuel Economy (CAFÉ) standards calling for a fleet average of 50 miles per gallon for model years 2017-2025 are achieved. This fleet average represents a fuel economy of 59.7 mpg for passenger cars and 41 mpg for light-trucks.
- Electric vehicles and plug-in hybrid electric vehicles represent 4 percent of the total passenger vehicle fleet and 1 percent of the light-truck fleet.

Key transportation system assumptions

- The 2035 Financially-Constrained Regional Transportation Plan includes $13.6 billion of investments, reflecting the amount of revenue reasonably expected to be available in the Metro region from 2007 to 2035.
- The 2035 RTP financial strategy assumes existing federal, state and local funding plus new revenues that are not part of the Phase 1 modeled pricing assumptions. Significant increases in transportation revenue are likely to be needed if anticipated improvements in vehicle fuel economy are realized.

Key road assumptions

- The 2035 Regional Transportation Plan financially constrained system of highway and investments is implemented.
- Future delay on the highway and arterial network is reduced by 10 percent through traffic management, such as clearing crashes and breakdowns more quickly, traffic signal timing and other strategies.

Targeted highway investments

- I-5 / Columbia River Crossing (CRC) Project is completed.
- Interchanges in the OR 217, US 26, I-205 corridors and at the junction of I-5/I-84 are improved.
- The Sunrise Project connection from I-205 to 172nd Avenue is built.
- US 26 West is widened to six through lanes to Cornelius Pass Road.

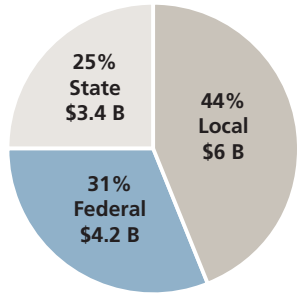
Regional transit investments

- Milwaukie light rail and Columbia River Crossing light rail are constructed.
- Lake Oswego streetcar, Portland streetcar loop, and Burnside/Couch streetcar to Hollywood Transit Center are constructed.
- Frequent bus service is expanded in key transit corridors.

Other multi-modal investments

- On-street bicycle and pedestrian projects, such as bicycle lanes, cycle tracks, bicycle boulevards, sidewalks and crossing improvements are constructed.
- Off-street regional trail projects are constructed, such as the Lake Oswego to Portland trail, Fanno Creek (Red Electric) trail, Beaverton Creek Trail, Westside trail, Tonquin trail, Columbia Slough trail, Scouter's Mountain trail, E. Buttes Loop trail, and the Gresham-Fairview trail.
- New street connections that build out the regional street grid are constructed.
- Freight rail and street extensions and expansions focused on serving industrial areas are constructed.
- Major streets are widened or retrofitted with sidewalks, bicycle facilities and other multi-modal designs.

2035 RTP Funding Sources



Source: 2035 Regional Transportation Plan (approved June 10, 2010)

2035 RTP by investment type and share of total cost

Investment type	Cost	Percent of total RTP cost
Sidewalks, bike facilities and trails	$948 M	7%
Freight rail and road access to industrial areas	$623 M	5%
Traffic management, signal timing and other ITS projects	$ 19 M	<1%
Regional programs • Regional Travel Options • Regional Transportation System Management and Operations • Regional Transit-Oriented Development	$196 M	1%
Multi-modal roads and bridges	$4.3 B	32%
Highway widening and fixing bottlenecks	$4.0 B	29%
Public transit	$3.5 B	25%
Total (costs have been rounded)	**$13.6 B**	**100%**

Source: 2035 Regional Transportation Plan (approved June 10, 2010)

Community design – what we tested

Households living in mixed-use areas: GreenSTEP estimates the probability that a household lives in a mixed-use area or complete neighborhood based on Census tract population density. In Phase 1, GreenSTEP internally calculated the following values:
2010 Base year: 24%
2035 Level 1: 33%
2035 Level 2: 33%
2035 Level 3: 34%
In future project phases these values can be adjusted to reflect land use policies aimed at changing the amount and type of mixed-use development.

Urban growth boundary: Input tests the effect of urban growth boundary expansion.
2010 Base Year captures the existing land area with the UGB.
2035 Level 1 assumes one-quarter of the adopted urban reserves areas come into the UGB by 2035.
2035 Level 2 assumes the same level of expansion as Level 1.
2035 Level 3 tests the effect of a no-expansion policy.

Bicycle mode share: Input reflects the share of all trips less than 6 miles round trip in length are made by bicycle.
2010 Base Year reflects the estimated regional bike mode share, as reflected in the 2035 RTP.
2035 Level 1 assumes no change from 2010 in the share of regional bike travel, an estimate consistent with the 2035 RTP.
2035 Level 2 assumes the same share of bicycle travel as Level 3 of the first round of Statewide Transportation Strategy scenarios.
2035 Level 3 assumes regional bike mode share grows to 30 percent.

Transit service level: Input reflects per capita transit service growth.
2010 Base Year reflects current TriMet service levels for light-rail, streetcar and bus service growth. This ratio represents the equivalent of 29 revenue miles per capita.
2035 Level 1 assumes the per capita service rate in the 2035 RTP.
2035 Level 2 assumes transit service levels grow significantly – the equivalent of 69 revenue miles per capita, roughly comparable to the service levels of Chicago and Washington D.C., or 2.5 times the 2035 RTP service level.
2035 Level 3 assumes even more substantial growth, the equivalent of 115 revenue miles per capita, roughly comparable to New York City service levels, or 4 times the 2035 RTP service level.

Workers/non-work trips paying for parking: GreenSTEP considers parking pricing as a trip-based cost. There are two types of parking costs addressed in GreenSTEP: (1) parking costs at places of employment and (2) non-work parking costs.
2010 Base Year reflects the current estimate of areas with work and non-work parking fees – this includes downtown Portland, OHSU and the Lloyd District.
2035 Level 1 assumes no change from 2010 parking areas.
2035 Level 2 assumes new areas charge parking fees, based on the 2035 RTP. This is the only community design input where Level 2 reflects adopted policy, not Level 1.
2035 Level 3 assumes no change from Level 2.

Average daily parking fee: Input provides the opportunity to evaluate the effects of adjusting work and non-work parking fee amounts (2005 $): 2010 Base Year: $5.00
2035 Level 1: $5.00
2035 Level 2: $5.00
2035 Level 3: $7.25

Strategy		2010 Base Year Reflects existing conditions	2035 Level 1 Reference case Reflects current plans and policies	2035 Level 2 Reflects more ambitious policy changes	2035 Level 3 Reflects even more ambitious policy changes
Community design	Households living in mixed-use areas and complete neighborhoods (percent)	GreenSTEP calculates			
	Urban growth boundary expansion (acres)	2010 UGB	7,680 acres	7,680 acres	No expansion
	Bicycle mode share[1] (percent)	2%	2%	12.5%	30%
	Transit service level	2010 service level	2035 RTP service level	2.5 times RTP service level	4 times RTP service level
	Workers/non-work trips paying for parking (percent)	13% / 8%	13% / 8%	30% / 30%	30% / 30%
	Average daily parking fee ($2005)	$5.00	$5.00	$5.00	$7.25

[1] Percent of all tours less than 6 miles roundtrip.

Community design – considerations moving forward

Community design	Strategy lead			
	Federal	State	Regional	Local
Complete neighborhoods and mixed-use areas			●	●
Urban growth boundary			●	
Transit service			●	
Bicycle travel				●
Parking				●

Most of the community design strategies are focused on changes to the built environment. With modest UGB expansion from today, a greater number of residents live in mixed-use areas and "complete neighborhoods," thereby making walking, biking, personal electric vehicles, and transit more feasible and likely. Expanding transit service and managing the supply and cost of parking in targeted mixed-use areas provide additional GHG reduction benefits.

While these strategies combined provide significant GHG emissions, there are a number of implications that have not yet been assessed. The following are some of the implications to be accounted for and further analyzed during Phases 2 and 3:

Housing supply, capacity and affordability: Metropolitan GreenSTEP does not consider any housing supply assumptions and travel behavior estimates are made irrespective of housing choice. The model only considers the demand forecast components – household size, income and age – and does not relate any changes in travel behavior to housing preference or existing housing supply. Therefore, there is no Phase 1 assumption about the type of housing to be built in the future.

For Phase 2 of the Scenarios Project, Metro staff is developing a model – compatible with Metropolitan GreenSTEP – that will incorporate housing preference, supply and capacity considerations. The result of this work is an innovative model that introduces explicit modeling of household size, age, and income to distinguish housing type choice (e.g., single-family or multi-family) and willingness to pay in a sketch-planning tool. This Project will provide new tools needed to evaluate changes in housing assumptions and implications on housing affordability as part of the process.

Market feasibility, consumer preferences and infrastructure needs: Research reviewed in the Strategy Toolbox Report showed growing consumer demand for walkable neighborhoods and mixed-use development served by transit. The research also showed that while compact, mixed-use development can reduce public costs and provide benefits, it can be more complicated and have significantly higher upfront costs than traditional single-use development. Today, individual communities have varying capacity and desire to support redevelopment of existing areas or new mixed-use development. Investment in transit, street connectivity, sidewalks, bicycle facilities, urban parks and other assets is needed to support mixed-use development to result in shorter trips, and more walking, bicycling and use of transit in a community.

In Phase 2, the Scenarios Project will need to further evaluate the effectiveness of mixed-use development, parking management and transit service. Phase 2 will consider the market feasibility, investment needs and implications on affordability throughout the region. In addition, more research is needed on changing consumer preferences in the region to better understand how changes in demographics and housing demand may affect housing need, supply and costs. All of these considerations influence the timing and sequencing of implementing community design strategies. Thus, the full GHG emissions reduction potential of this policy area is constrained to some degree by local market conditions, consumer preferences, public incentives, financial feasibility, and public acceptance.

Other potential benefits from the Strategy Toolbox

Community benefits

Increased physical activity

Enhanced public safety; reduced risk of traffic injuries and fatalities

Improved air quality and fewer air toxics emissions

Environmental benefits

Less pollution

Less energy use

Natural areas, farm and forest protection

Economic benefits

Job opportunities

Improved access to jobs, goods and services

Consumer and municipal savings

Leverage private investment, increased local tax revenues

Increased property values

Reduced fuel consumption

Pricing – what we tested

Pay-as-you-drive-insurance

2010 Base Year reflects current program options with no pay-as-you-drive insurance options available to consumers.
2035 Level 1 assumes no change in program options from 2010.
2035 Level 2 reflects a 100 percent transition to pay-as-you-drive insurance. This assumption reflects the State's most ambitious assumption for the first round of STS scenarios.
2035 Level 3 assumes no change from Level 2.

Gas tax

2010 Base Year reflects the 2010 state and federal gas tax levels.
2035 Level 1 reflects the state gas tax increase resulting from HB 2001.
2035 Level 2 assumes no change in the federal gas tax and reflects a shift of the state gas tax to an equivalent road use fee (see road use fee Level 2).
2035 Level 3 assumes no change from Level 2.

Road use fee

2010 Base Year reflects the current policy status of no light-duty vehicle mileage-based road use fee.
2035 Level 1 assumes no change from 2010 (no implementation of a light-duty vehicle road use fee).
2035 Level 2 assumes a transition of the 2011 State gas tax (HB 2001 increased the state gas tax to 30 cents per gallon) to an equivalent cost per mile road use fee. The total road use fee also includes the equivalent of an annual increase of $.01 per year state gas tax increase. The state gas tax increase was assumed in the 2035 RTP strategy to address maintenance and operation of the transportation system.
2035 Level 3 assumes no change from Level 2.

Pricing	Strategy lead			
	Federal	State	Regional	Local
Pay-as-you-drive insurance	●	●		
Gas tax	●	●		●
Road use fee	●	●	●	
Carbon fee	●	●		

Carbon emissions fee

2010 Base Year reflects the current policy status of no carbon emissions fees in place.
2035 Level 1 assumes no change from 2010 (no implementation of a carbon emissions fee).
2035 Level 2 assumes no change from Level 1.
2035 Level 3 assumes implementation of a carbon emissions fee that represents an estimated value of the external cost of transportation GHG emissions.

Strategy		2010	2035		
		Base Year Reflects existing conditions	Level 1 Reference case Reflects current plans and policies	Level 2 Reflects more ambitious policy changes	Level 3 Reflects even more ambitious policy changes
Pricing	Pay-as-you-drive insurance (percent of households participating and cost)	0%	0%	100% at $0.06/mile	No change from Level 2
	Gas tax (cost per gallon $2005)	$0.42	$0.48	$0.18	
	Road use fee (cost per mile $2005)	$0	$0	$0.03	
	Carbon emissions fee (cost per ton)	$0	$0	$0	$50

Pricing – considerations moving forward

Pricing strategies charge users directly for using transportation facilities, affecting mode choice, timing and distance of travel. Pricing can result in more efficient use of the transportation system by shifting demand to make the most of past and future investments and limited sources of revenue. The scenarios analysis shows these strategies offer potentially significant GHG emissions reductions. Other potential benefits identified in the Strategy Toolbox include the potential to be a significant source of revenue for community investments, congestion relief and inducing improvements in fuel economy and the purchase of fuel-efficient vehicles. In order to avoid pricing becoming a punitive strategy, it should be implemented in combination with expanding travel choices, and marketing and incentives programs.

While the pricing strategies tested in Phase 1 of the Scenarios Project provided significant GHG emissions reductions. The Scenarios Project needs to be realistic about pricing as a strategy given the lack of public acceptance and current economic climate.

Public acceptance, communications, evaluation of benefits, costs, equity, and use of revenues generated pose specific issues and challenges that have not yet been assessed. The following are some of the implications to be accounted for and further analyzed during Phases 2 and 3:

Equity considerations: The fairness of a given type of pricing mechanism depends on how it is structured, what transportation choices are provided to users and which aspects of equity are most relevant and important to consider. It will be important to more fully understand the potential issues, impacts and tradeoffs between benefits and costs of different pricing strategies. As pricing strategies are considered, it is important to evaluate their effect on other parts of the region's transportation system and equity to ensure any unintended consequences are identified and addressed.

Stable and sustainable funding considerations: Federal and state funding for infrastructure investments are not keeping pace with needs, particularly for operations, maintenance and preservation of existing public assets but also needed expansion of the system. Local revenue sources are being used to fund the majority of RTP investments. State and local government purchasing power has steadily declined. Operating funds for the regional transit system are also declining, making it difficult to maintain existing service levels and replace older bus fleets. Financing mechanisms to support land development and other community infrastructure needs are also limited.

Current transportation pricing strategies reflect declining revenues sources as improvements in fuel efficiency and inflation reduce the purchasing power of existing gas tax revenues. For example, the 2035 Regional Transportation Plan finance strategy assumes an increase in the state gas tax by $.01 per year, a price increase that the state is not currently implementing. In addition, there is no indication that current federal and state gas tax levels will be adjusted to account for inflation or improvements in fuel efficiency. Without addressing these issues (either through new or existing pricing mechanisms) the region will not have the revenues needed to implement existing plans and investment priorities, let alone consider more ambitious strategies such as doubling transit service levels or accommodating more growth in downtowns and other designated centers and employment areas.

While there is concern that increases in household and business transportation costs may negatively affect the economic health of the region, there may be opportunities to transition existing pricing mechanisms to more stable revenue sources without drastically increasing the cost to drive. For example, the Phase 1 findings demonstrate that applying a carbon tax of $50 per ton had little impact on household travel behavior.[1] However, transitioning the existing state gas tax, which is negatively impacted by both fuel efficiency and inflation, to a road use fee or carbon tax could provide a more stable funding mechanism. It should be noted that a carbon fee is also affected by changes in fuel efficiency, which needs to be further explored.

Other potential benefits from the Strategy Toolbox

Community benefits
Reduced number of uninsured motorists

Improved air quality and fewer air toxics emissions

Environmental benefits
Less pollution

Economic benefits
New and more stable revenue sources

Consumer savings

Reduced fuel consumption

[1] The per capita costs of applying a carbon tax of $50 per ton to a scenario that exactly meets the region's GHG emissions reduction target (per capita roadway emissions of 1.2MT CO2e per year), is $120 per year. The Phase 1 scenario results indicate that this cost increase by 2035 did not significantly affect travel behavior.

Marketing and incentives – what we tested

Households participating in eco-driving

Eco-driving involves educating motorists on how to drive in order to reduce fuel consumption and cut emissions. Examples of eco-driving practices include avoiding rapid starts and stops, matching driving speeds to synchronized traffic signals, and avoiding idling.

2010 Base Year reflects the current status of no existing eco-driving marketing programs. There is also no supporting data to indicate the proportion of households that follow eco-driving practices.

2035 Level 1 assumes no change from 2010 (no eco-driving marketing programs).

2035 Level 2 reflects an adoption of and participation in eco-driving marketing programs. The participation rate for this marketing program reflects the state's Level 2 input assumption for the first round of STS scenarios.

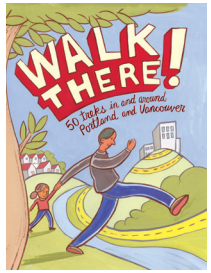
Household participating in individualized marketing programs

Individualized marketing (IM) programs are travel demand management programs focused on individual households.

2010 Base Year is an estimate of current participation rates.

2035 Level 1 assumes no change from 2010 (continuation of existing participation levels).

2035 Level 2 assumes a significant increase in participation rates, which reflects the percent of households with proximity to high capacity transit and frequent bus service, as reflected in the 2035 RTP.



Workers participating in employer-based commuter programs

Employee commute options (ECO) programs are work-based travel demand management programs, which can include, employer-subsidized transit passes, bicycle parking, education and promotion, carpool and vanpool programs, etc.

2010 Base Year is an estimate of current participation rates.

2035 Level 1 assumes no change from 2010 (continuation of existing participation levels).

2035 Level 2 assumes a doubling of participation rates, which could reasonably be accomplished with increased programmatic resources/funding and would not require a legislative change to the State ECO Rule.

Car-sharing in high density areas

Because car-sharing is a relatively new phenomenon, GreenSTEP models the approximate effects of car-sharing on vehicle travel and vehicle ownership.

2010 Base Year is an estimate of current participation rates.

2035 Level 1 assumes no change from 2010 (continuation of existing participation rates).

2035 Level 2 assumes a doubling of participation rates.

Car-sharing in medium density areas

Because car-sharing is a relatively new phenomenon, GreenSTEP models the approximate effects of car-sharing on vehicle travel and vehicle ownership.

2010 Base Year is an estimate of current participation rates.

2035 Level 1 assumes no change from 2010 (continuation of existing participation rates).

2035 Level 2 assumes a doubling of participation rates.

	Strategy	2010 Base Year Reflects existing conditions	2035 Level 1 Reference case Reflects current plans and policies	2035 Level 2 Reflects more ambitious policy changes	2035 Level 3 Reflects even more ambitious policy changes
Marketing and incentives	Households participating in eco-driving	0%	0%	40%	No Level 3
	Households participating in individualized marketing programs (percent)	9%	9%	65%	
	Workers participating in employer-based commuter programs (percent)	20%	20%	40%	
	Car-sharing in high density areas (target participation rate)	Participation rate of 1 member/100 people	Participation rate of 1 member/100 people	Double participation to 2 members/100 people	
	Car-sharing in medium density areas	Participation rate of 1 member/200 people	Participation rate of 1 member/200 people	Double participation to 2 members/200 people	

Marketing and incentives – considerations moving forward

	Strategy lead			
Marketing and incentives	**Federal**	**State**	**Regional**	**Local**
Eco-driving	●	●	●	
Individualized marketing			●	●
Employer commute programs				●
Car-sharing				●

Public education, marketing and incentives programs include teaching motorists to drive and maintain vehicles to operate more efficiently and building awareness of travel choices for personal and commute travel. Public education and marketing are often less costly than building new infrastructure and are supported by the public. These strategies can be tailored to a diversity of perspectives and needs and provide the necessary platform from which to encourage eco-driving among the general public and employees. In addition to encouraging eco-driving, public education and marketing can raise public awareness about the benefits of driving less and riding transit, carpooling, ridesharing, telecommuting, biking, and walking – a focus of the region's Drive Less Save More campaign.

The Phase 1 scenarios analysis shows these strategies provide moderate GHG emissions reductions. However, combining marketing and incentives with other strategies, especially community design, provides additional emissions reductions that can help meet the region's target. Other potential benefits identified in the Strategy Toolbox report include increased physical activity from walking and biking, leading to additional positive health outcomes; improved air quality; increased access to jobs, goods and services; and consumer savings.

The implications outlined below will be further explored during Phases 2 and 3 of the project:

Application and timing: These strategies are relatively easy and inexpensive to implement, likely making them ideal near-term options for GHG emissions reduction. Marketing and incentive programs are often successful when targeting neighborhoods with good access to transportation options or planned transportation investments, such as the opening of new high capacity transit or frequent bus service. Because individualized marketing and employee commute option programs provide information and incentives for a variety of travel options, it is critical that these programs be linked to transit investments and other community design strategies to realize their full potential. Not only are these programs more successful at reducing the amount people drive and, therefore, GHG emissions, they can also increase the effectiveness of transit investments through improved ridership. Individualized marketing programs are also effective when implemented with new transportation projects.

Employer-based commute programs: The Employee Commute Options (ECO) Rule directs employers in the Portland metropolitan region with more than 100 employees at a given worksite to show a good faith effort towards reducing drive-alone commute trips by 10 percent from an established baseline.[1] Businesses affected by the ECO rule must survey their employees every two years to measure progress towards the goal, and create a plan that identifies the steps they will take in pursuit of the 10 percent reduction. The most recent estimates for the region assume a roughly 20 percent participation rate for ECO programs. However, Level 2 demonstrates a doubling of this participation rate, which could reasonably be accomplished with increased programmatic resources and funding and would not require a legislative change to the state ECO rule. It is possible that any further participation rate increases beyond Level 2 could require changes to the state ECO rule.

Other potential benefits from the Strategy Toolbox

Community benefits
Increased physical activity

Enhanced public safety; reduced risk of traffic injuries and fatalities

Improved air quality and fewer air toxics emissions

Environmental benefits
Less pollution

Less energy use

Economic benefits
Job opportunities

Improved access to jobs, goods and services

Consumer savings

Reduced fuel consumption

Increased cost effectiveness of transit investments through improved ridership

[1] The Employee Commute Options Program (Oregon Administrative Rule 340-242) is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200.

Roads – what we tested

Freeway and arterial expansion

The road capacity input in GreenSTEP only models the affect of roadway expansion relative to population growth and does not distinguish between the impact of new connections and projects that widen existing roads.

2010 Base Year reflects current freeway and arterial system.

2035 Level 1 assumes implementation of the 2035 financially constrained RTP road system.

2035 Level 2 assumes no roadway expansion beyond the 2010 base year, and relies only on system management.

Delay reduced by traffic management

GreenSTEP provides a mechanism to evaluate the effects of system management programs on GHG emissions. System management includes clearing vehicle breakdowns and crashes more quickly, traffic signal timing and other Intelligent Transportation System strategies that improve traffic flow and reduce delay.

2010 Base Year assumes delay reduction as assumed in the state's first round of STS Scenarios.

2035 Level 1 assumes no change from 2010 (no change in delay reduction).

2035 Level 2 assumes a tripling of delay reduction as assumed in the state's first round of STS Scenarios.

Freeways allow people and goods to connect to major destinations across the region, accommodating longer-distance regional and state-wide travel and providing important access to the region's major activity centers, such as downtown Portland, and freight access to industrial areas and freight intermodal facilities.

	Strategy	2010 Base Year Reflects existing conditions	2035 Level 1 Reference case Reflects current plans and policies	2035 Level 2 Reflects more ambitious policy changes	2035 Level 3 Reflects even more ambitious policy changes
Roads	Freeway and arterial expansion	2010 system	2035 financially constrained system	No expansion	No Level 3
	Delay reduced by traffic management strategies (percent)	10%	10%	35%	

Roads – considerations moving forward

	Strategy lead			
Roads	**Federal**	**State**	**Regional**	**Local**
Freeway and arterial capacity		●		●
Traffic management		●	●	●

Though our region has changed dramatically over the past century, the shape of the major street network serving the region has changed little. Most of the region's arterial streets were once farm-to-market roads, many established along Donation Land Claim boundaries at half-mile or one-mile spacing. The region's highway system evolved from the mid-1930s, when the first highway was built from Portland to Milwaukie, to the completion of I-205 in the early 1980s. Most of the highway system was built along the same donation land claim grid that shapes the major street system, with most throughways following older farm-to-market routes or replacing arterial streets.

The roads policy area focused on managing existing road capacity to improve traffic operations through a variety of strategies and expanding the existing road system as planned for in the 2035 Regional Transportation Plan to support all modes of travel. When compared to traditional capital investments such as new transit service, roads or additional lanes, traffic management solutions offer a number of benefits for a comparatively low cost, and can delay or remove the need for additional capital-intensive infrastructure. In addition to replacing some expensive capital projects, management solutions can also complement new capital projects as well as education and marketing strategies.

The scenarios analysis shows this policy area provided more modest GHG emissions reductions compared to the other policy areas. The following implications will be accounted for and further analyzed during Phases 2 and 3 of the Scenarios Project:

Declining transportation revenues: As described in the pricing strategies section, the purchasing power of transportation revenues is in decline and infrastructure investments are not keeping pace with needs. This decline is anticipated to worsen as the vehicle fleet shifts to alternative fuels and light vehicle fuel economy continues to improve. The 2035 RTP finance strategy assumes existing federal, state and local funding for the region's road system, plus other new revenues that were not part of the Phase 1 pricing assumptions, including increases in vehicle registration fees and tolling of the Columbia River Crossing bridge to fund planned improvements in that corridor. Changes to existing funding mechanisms are needed to implement existing plans and investment priorities.

Improving safety and system reliability for commuters and freight: Traffic management and other targeted capacity and arterial connectivity investments that improve safety and access to jobs and provide freight access to industrial areas are critical investments to support the outcomes the region is trying to achieve – particularly when combined with other strategies that serve to expand transportation choices. Together these coordinated efforts provide for mobility and accessibility in a way that supports all modes of travel and the region's role as an international gateway and domestic freight hub. This in turn helps businesses and industry remain competitive.

Other potential benefits from the Strategy Toolbox

Community benefits
Increased physical activity

Enhanced public safety; reduced risk of traffic injuries and fatalities

Improved air quality and fewer air toxics emissions

Environmental benefits
Less pollution

Less energy use

Economic benefits
Job opportunities

Improved access to jobs, goods and services

Consumer and business savings

Reduced fuel consumption

Fleet and technology – what we tested

Fleet mix

The vehicle type model in GreenSTEP calculates the likelihood that a vehicle is a light truck, which in western states tend to be higher than the national average.
2010 Base Year is an estimate of existing conditions.
2035 Level 1 assumes a relatively constant ratio between light trucks and autos compared to the 2010 base year.
2035 Level 2 assumes a significant shift in fleet mix with a growth in auto ownership relative to light truck ownership.

Fleet turnover rate

Fleet turnover reflects the rate at which new vehicles will replace existing vehicles. Since newer vehicles are typically more fuel efficient than older vehicles, newer fleets will yield greater GHG reductions.
2010 Base Year is an estimate of existing conditions.
2035 Level 1 maintains the current fleet turnover rate of 10 years.
2035 Level 2 increases the rate vehicle replacement to 8 years.

Fuel economy

The fuel economy values reflect anticipated improvements in light vehicle fuel efficiency for 2035 model year vehicles.
2010 Base Year is an estimate of existing conditions.
2035 Level 1 assumes a significant increase in fuel efficiency; on average it reflects a doubling of fuel efficiency by model year 2035.
2035 Level 2 assumes a slight increase from the Level 1 assumptions.

Carbon intensity of fuels

2010 Base Year is an estimate of existing conditions (see page 18 for a detailed description).
2035 Level 1 assumes that the carbon intensity of vehicle fuels will be 10 percent below the current average by 2035, consistent with the adopted low carbon fuel standard.
2035 Level 2 assumes that vehicle fuel carbon intensity will be 20 percent below the current average by 2035, which reflects a doubling of the proposed low carbon fuel standard.

Plug-in hybrid and electric vehicles

2010 Base Year is an estimate of existing conditions (see page 24 for a detailed description).
2035 Level 1 assumes the the mid-point between the Base Year and Level 2 and is the only technology input that varies from the assumptions in the state Agencies' Technical Report (http://www.oregon.gov/ODOT/TD/TP/docs/OSTI/TechRpt.pdf).
2035 Level 2 is a general estimate of percent of light-duty vehicles that are plug-in hybrids or electric vehicles, as reflected in the state Agencies Technical Report.

Strategy		2010 Base Year Reflects existing conditions	2035 Level 1 Reference case Reflects current plans and policies	2035 Level 2 Reflects more ambitious policy changes	2035 Level 3 Reflects even more ambitious policy changes
Fleet	Fleet mix (proportion of autos to light trucks and SUVs)	auto: 57% light truck/SUV: 43%	auto: 56% light truck/SUV: 44%	auto: 71% light truck/SUV: 29%	No Level 3
Fleet	Fleet turnover rate (age)	10 years	10 years	8 years	
Technology	Fuel economy (miles per gallon)	auto: 29.2 mpg light truck/SUV: 20.9 mpg	auto: 59.7 mpg light truck/SUV: 41 mpg	auto: 68.5 mpg light truck/SUV: 47.7 mpg	
Technology	Carbon intensity of fuels	90 g CO_2e/megajoule	81 g CO_2e/megajoule	72 g CO_2e/megajoule	
Technology	Light-duty vehicles that are electric or plug-in hybrid electric	auto: 0% light truck/SUV: 0%	auto: 4% light truck/SUV: 1%	auto: 8% light truck/SUV: 2%	

All fleet and technology assumptions reflect the values defined in the State Agencies' Technical report (3/1/11). Level 2 relects the assumptions recommended in the Metropolitan GHG Reduction Target Rule adopted by LCDC in May 2011 (http://www.oregon.gov/ LCD/docs/rulemaking/trac/ 660_044.pdf).

Fleet and technology – considerations moving forward

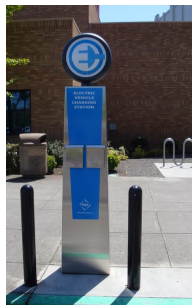
	Strategy lead			
Fleet and technology	**Federal**	**State**	**Regional**	**Local**
Fleet mix		●	●	●
Fleet turnover		●		
Fuel economy	●	●		
Carbon intensity of fuel	●	●		
Electric and plug-in hybrid market share	●	●	●	●

The proportion of vehicles on the road with improved fuel technology is a major determinant of GHG emissions per mile of travel. Other potential benefits of fleet and technology improvements, identified in the Strategy Toolbox, include improved air quality; consumer and business savings; and reduced fuel consumption. The Phase 1 scenarios analysis demonstrates these strategies provide significant GHG emissions reduction potential. Much work is being done at the state and federal levels to expand the number of vehicles with higher fuel efficiency and lower emissions, and to reduce the carbon content of fuels. However, there is uncertainty about whether or not the technology and fleet assumptions recommended through the LCDC Target Rulemaking process will be achieved by 2035. This uncertainty, and the implications outlined below, will be further explored during Phases 2 and 3 of the project.

The role of Level 1 fleet and technology: While the region's Reference Case is consistent with the state's scenario work, it should be noted that some of the technology assumptions reflect considerable efficiency improvements, the certainty of which are unknown. Specifically, the carbon intensity and fuel economy improvements in the Reference Case reflect considerable advancements that more closely reflect Level 2 levels than current conditions.

Uncertainty around fleet and technology assumptions: The region's target represents an additional reduction after accounting for anticipated fleet and technology improvements. After estimating the reduction potential of these fleet and technology improvements, the region's 20 percent per capita reduction is anticipated to come from a combination of community design, pricing, marketing incentives and road policies. However, if the fleet and technology improvements assumed in OAR 660-044 are not achieved, then greater reductions may be needed through these other policies. LCDC will review the state targets in 2015 and may identify adjustments at that time in light of new information.

To meet technology and fleet assumptions, actions are needed across multiple sectors and all levels of government: Both Levels 1 and 2 of the fleet and technology policy areas will take considerable effort to implement. For example, the Phase 1 Reference Case assumes a doubling in fuel efficiency for model year 2035 vehicles from 2010. This technology improvement will require significant financial investments and policy actions across multiple sectors and scales, including funding for research and partnerships with businesses and educational institutions. In addition, state and local policy changes can be made to encourage acceptance of low-carbon fuels and electric vehicle and plug-in hybrid technology. For example, the carbon intensity of fuels for the Reference Case (Level 1) is anticipated to decrease 10 percent from 2010 levels by 2035, reflecting implementation of the Low Carbon Fuel Standards (LCFS) – a standard that has not yet been implemented and without legislative action will sunset in 2015.[1, 2] The existence of a LCFS program would likely increase the incentive to expand the EV market share. A sunset of the LCFS in 2015 could undermine existing efforts to improve fuel efficiency.



Other potential benefits from the Strategy Toolbox

Community benefits
Improved air quality and fewer air toxics emissions

Environmental benefits
Less pollution

Less energy use

Economic benefits
Job opportunities

Consumer and business savings

Municipal savings

Leverage private investment

Reduced fuel consumption

[1] Pursuant to HB 2186, the authority to implement a Low Carbon Fuel Standard in Oregon will sunset on December 31, 2015 unless that sunset is lifted by the Oregon Legislature.

[2] Oregon Department of Environmental Quality, Oregon Low Carbon Fuel Standards Advisory Committee Process and Program Design, January 25, 2011.

Phase 1 at a glance: results from selected scenarios

How far do current policies get us?

Findings: Current plans and policies are on the right track and provide substantial per capita GHG emissions reductions but do not meet the target.

Community design or pricing must be more ambitious than current policies to meet the target.

LEGEND

Region's per capita target = 1.2 MT CO_2e

Policy areas:

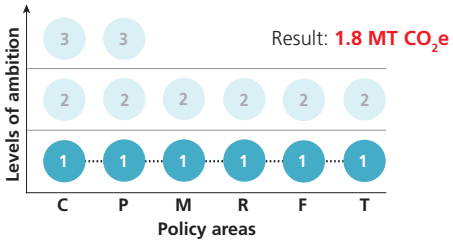
- **C** Community design
- **P** Pricing
- **M** Marketing and incentives
- **R** Roads
- **F** Fleet
- **T** Technology

Results:

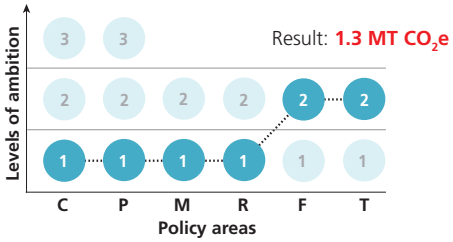
- **1.8** MT CO_2e does not meet target
- **1.2** MT CO_2e meets target
- **%** Percent reduction in GHG emissions from 2005

The scenarios tested are for research purposes only and do not necessarily reflect current or future policy decisions of the Metro Council, MPAC or JPACT.

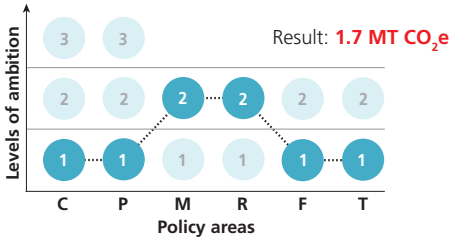
Scenario 1 – **2035 Reference Case**
Current policies



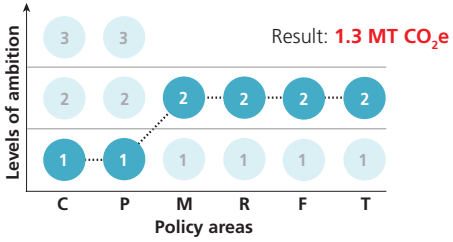
Scenario 2
Boost fleet and technology



Scenario 3
Boost system efficiency



Scenario 4
Boost fleet, technology and system efficiency

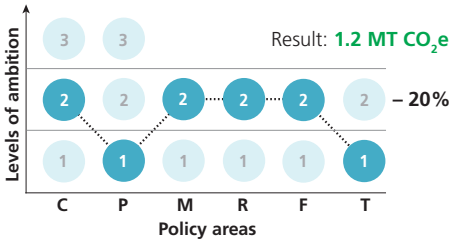


What is the range of possible reductions?

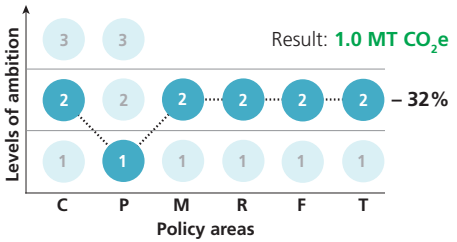
Findings: Ninety-three out of 144 scenarios meet or exceed the target.

The reductions ranged from 20 to 53 percent below 2005 levels on a per capita basis.

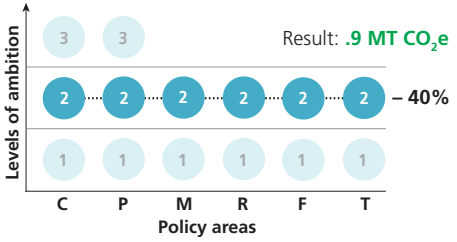
Scenario 5
Boost all policies but pricing and technology



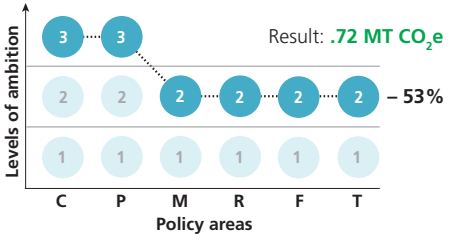
Scenario 6
Boost all policies but pricing



Scenario 7
Boost all policies to level 2



Scenario 8
Boost all policies to their most ambitious level

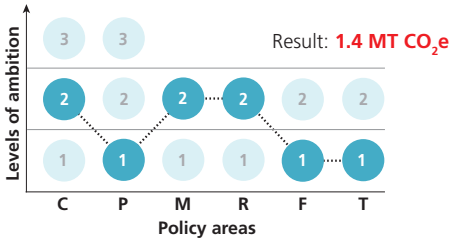


What is the effect of the built environment?

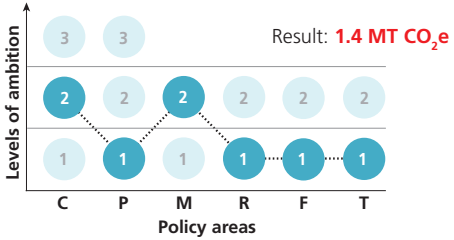
Findings: Similar reductions are possible through the most ambitious community design and fleet/technology scenarios.

Combining more ambitious community design with the most ambitious system efficiency policies is not enough to meet target.

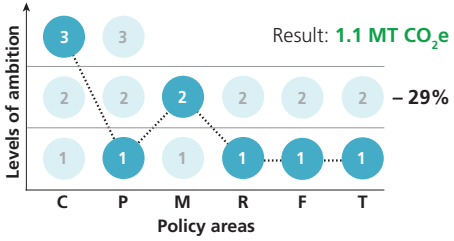
Scenario 9
Boost community design and system efficiency



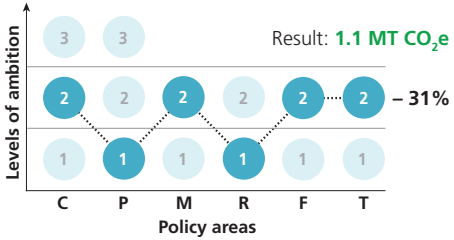
Scenario 10
Boost community design and marketing



Scenario 11
Boost community design even more



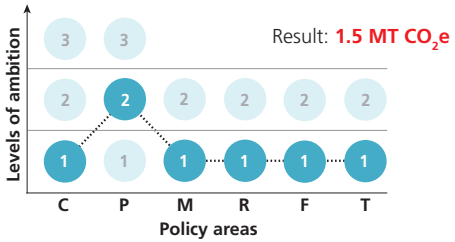
Scenario 12
Boost fleet and technology



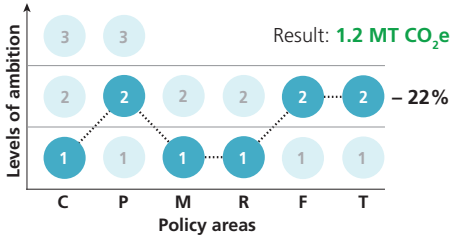
What is the effect of pricing?

Findings: Pricing when combined with the most ambitious fleet and technology strategies meets the target.

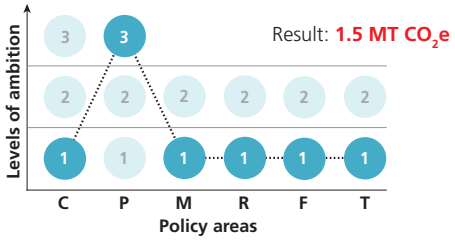
Scenario 13
Boost pricing alone



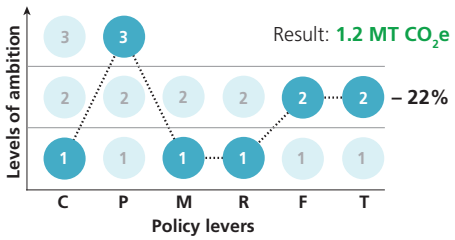
Scenario 14
Boost pricing, fleet and technology



Scenario 15
Boost most ambitious pricing alone



Scenario 16
Most ambitious pricing, fleet and technology



Glossary

Car-sharing: A model similar to a car rental where a member user rents cars for short periods of time, often by the hour. Such programs are attractive to customers who make only occasional use of a vehicle, as well as others who would like occasional access to a vehicle of a different type than they use day-to-day. The organization renting the cars may be a commercial business or the users may be organized as a company, public agency, cooperative, or peer-to-peer. The Portland region has Zipcar – http://www.zipcar.com/

Eco-driving: A combination of public education and driving practices that result in more efficient vehicle operation and reduced fuel consumption and emissions. Examples of eco-driving practices include avoiding rapid starts and stops, matching driving speeds to synchronized traffic signals, and avoiding idling.

Employer-based commute programs: Work-based travel demand management programs that can include transportation coordinators, employer-subsidized transit pass programs, ride-matching, carpool and vanpool programs, telecommuting, compressed or flexible work weeks and bicycle parking and showers for bicycle commuters.

Fleet mix: The percentage of vehicles classified as automobiles compared to the percentage classified as light trucks (weighing less than 10,000 lbs.); light trucks make up 43 percent of the light-duty fleet today.

Fleet turnover: The rate of vehicle replacement or the turnover of older vehicles to newer vehicles; the current turnover rate in Oregon is 10 years.

Greenhouse gas emissions: According to the Environmental Protection Agency, gases that trap heat in the atmosphere are called greenhouse gases emissions. Greenhouse gases that are created and emitted through human activities include carbon dioxide (emitted through the burning of fossil fuels), methane, nitrous oxide and fluorinated gases. For more information see www.epa.gov/climatechange/emissions/index.html.

GreenSTEP: GreenSTEP is a new model developed to estimate GHG emissions at the individual household level. It estimates greenhouse gas emissions associated with vehicle ownership, vehicle travel, and fuel consumption, and is designed to operate in a way that allows it to show the potential effects of different policies and other factors on vehicle travel and emissions. Metropolitan GreenSTEP travel behavior estimates are made irrespective of housing choice or supply; the model only considers the demand forecast components – household size, income and age – and the policy areas considered in this analysis. Therefore, there is no Phase 1 assumption about the type of housing assumed to be built in the future. For Phase 2 of the Scenarios Project, Metro staff are developing a model – compatible with Metropolitan GreenSTEP – that will incorporate housing preference, supply and capacity considerations. This will provide the tools needed to evaluate changes in housing assumptions as part of the decision-making process.

House Bill 2001 (Oregon Jobs and Transportation Act): Passed by the Legislature in 2009, this legislation provided specific directions to the Portland metropolitan area to undertake scenario planning and develop two or more land use and transportation scenarios by 2012 that accommodate planned population and employment growth while achieving the GHG emissions reduction targets approved by LCDC in May 2011. Then Metro, after public review and consultation with local governments, is to select a preferred scenario. Following selection of a preferred scenario, the local governments within the Metro jurisdiction are to amend their comprehensive plans and land use regulations to be consistent with the preferred scenario. For more information go to: http://www.leg.state.or.us/09reg/measpdf/hb2000.dir/hb2001.en.pdf.

Individualized marketing: Travel demand management programs focused on individual households. IM programs involve individualized outreach to households that identify household travel needs and ways to meet those needs with less vehicle travel.

Light vehicles: Vehicles weighing 10,000 pounds or less, and include cars, light trucks, sport utility vehicles, motorcycles and small delivery trucks.

Low Carbon Fuel Standard: In 2009, the Oregon legislature authorized the Environmental Quality Commission to develop low carbon fuel standards (LCFS) for Oregon. Each type of transportation fuel (gasoline, diesel, natural gas, etc.) contains carbon in various amounts. When the fuel is burned, that carbon turns into carbon dioxide (CO_2), which is a greenhouse gases. The goal is to reduce the average carbon intensity of Oregon's transportation fuels by

10 percent below 2010 levels by 2022 and applies to the entire mix of fuel available in Oregon. Carbon intensity refers to the emissions per unit of fuel; it is not a cap on total emissions or a limit on the amount of fuel that can be burned. The lower the carbon content of a fuel, the fewer greenhouse gas emissions it produces.

Pay-as-you-drive insurance (PAYD): This pricing strategy converts a portion of liability and collision insurance from dollars-per-year to cents-per-mile to charge insurance premiums based on the total amount of miles driven per vehicle on an annual basis and other important rating factors, such as the driver's safety record. If a vehicle is driven more, the crash risk consequently increases. PAYD insurance charges policyholders according to their crash risk.

Oregon Sustainable Transportation Initiative (OSTI): An integrated statewide effort to reduce GHG emissions from the transportation sector by integrating land use and transportation. Guided by stakeholder input, the initiative has built collaborative partnerships among local governments and the state's six Metropolitan Planning Organizations to help meet Oregon's goals to reduce GHG emissions. The effort includes five main areas: Statewide Transportation Strategy development, GHG emission reduction targets for metropolitan areas, land use and transportation scenario planning guidelines, tools that support MPOs and local governments and public outreach. For more information, go to www.oregon.gov/odot/td/osti

Policy areas: Categories of land use and transportation strategies used in GreenSTEP to show how the application of different policies may impact GHG emissions. A policy area can be adjusted at different levels of implementation in the model, for example, changes in fuel economy standards.

Scenario: A term that is used to describe a possible future, representing a hypothetical set of strategies or sequence of events.

Scenario planning: A process that tests different actions and policies to see their affect on GHG emissions reduction and other quality of life indicators.

Statewide Transportation Strategy: The strategy, as part of OSTI, will define a vision for Oregon to reduce its GHG emissions from transportation systems, vehicle and fuel technologies and urban form by 2050. Upon completion, the strategy will be adopted by the Oregon Transportation Commission. For more information go to: http://www.oregon.gov/ODOT/TD/OSTI/STS.shtml.

System efficiency: Strategies that optimize the use of the existing transportation system, including traffic management, employer-based commute programs, individualized marketing and car-sharing.

Traffic incident management: A coordinated process to detect, respond to, and remove traffic incidents from the roadway as safely and quickly as possible, reducing non-recurring roadway congestion.

Traffic management: Strategies that improve transportation system operations and efficiency, including ramp metering, active traffic management, traffic signal coordination and real-time traveler information regarding traffic conditions, incidents, delays, travel times, alternate routes, weather conditions, construction, or special events.

This report contains information that is intended for research purposes only and does not necessarily reflect current or future policy decisions of the Metro Council, MPAC or JPACT.

The preparation of this report was financed in part by the Oregon Department of Transportation, U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration. The opinions, findings and conclusions expressed in this report are not necessarily those of the Oregon Department of Transportation, U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration.

For more information, visit **www.oregonmetro.gov/climatescenarios**

About Metro

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy, and sustainable transportation and living choices for people and businesses in the region. Voters have asked Metro to help with the challenges and opportunities that affect the 25 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to providing services, operating venues and making decisions about how the region grows. Metro works with communities to support a resilient economy, keep nature close by and respond to a changing climate. Together we're making a great place, now and for generations to come.

www.oregonmetro.gov

Metro | *Making a great place*

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