

Lake Oswego Comprehensive Plan Background Report

Energy and Climate Change

May 24, 2012

1. EXECUTIVE SUMMARY

Introduction

This report is intended to provide background information on energy and climate change and the roles and responsibilities of the City and community within a global, state, regional, and local context, for consideration during the update of the Lake Oswego Comprehensive Plan.

Energy is the major lifeblood of our society, used all the time by all of us, and fundamental to our economy and quality of life. The economic expansion of the 20th century in the United States and other industrialized nations was powered by abundant, inexpensive energy, primarily from fossil fuels: coal, oil, and natural gas. Our immense energy needs are all around us—transportation fuels to move people and goods, electricity to power our buildings and manufacturing, natural gas to heat the air and water in our homes, and energy embodied in the goods we buy and used to grow the food we eat. As energy supply and pricing become more volatile and uncertain, strategies to reduce reliance on non-renewable energy sources are becoming even more critical.

Energy issues and climate change are closely interrelated. Energy usage, both type and amount, influences the extent and rate of global climate change, while climate change influences weather conditions that affect energy use. Responses to climate change can be put in two categories: mitigation or adaptation. Mitigation responses focus on reducing the amount of human-caused greenhouse gases (GHGs) entering the atmosphere; while climate adaptation and resilience strategies address the impacts of climate change on communities and people's abilities to adapt.

Without decisive actions across the globe, the warming already underway is expected to lead to changes in the earth's physical and biological systems that would be adverse to human beings, their communities, economies, and cultures. These are changes that we are unintentionally bringing upon ourselves, but that are also in our power to reverse. Our failure to return atmospheric accumulations of GHGs back to levels that will sustain historic climate patterns may lead to an Earth that is dramatically altered and far less habitable within only a few generations.

The impacts of such changes on Oregon citizens, businesses, and natural environment are likely to be extensive and destructive. Two recent studies focused on Oregon describe what we can expect over the coming decades: *Oregon Climate Assessment Report*¹, developed by the Oregon Climate Change Research Institute, and *Oregon Climate Change Adaptation*

¹ *Oregon Climate Assessment Report*, December 2010, developed by Oregon Climate Change Research Institute can be found online at <http://occri.net/wp-content/uploads/2011/04/cover.pdf>.

*Framework*², developed by the Department of Land Conservation and Development. The Framework document outlines the likely physical changes (listed below) and the initial low-and no-cost strategies state and local government can take to adapt to these changes.

Risks identified as *very likely* (greater than 90% chance for Oregon) include:

- Risk 1: Increase in average annual temperatures and likelihood of extreme heat events.
- Risk 2: Changes in hydrology and water supply; reduced snowpack and water availability in some basins; changes in water quality and timing of water availability.

Risks identified as *likely* (greater than 66% chance for Oregon) include:

- Risk 3: Increase in wildfire frequency and intensity.
- Risk 4: Increase in ocean temperatures, with potential for changes in ocean chemistry and increased ocean acidification.
- Risk 5: Increased incidence of drought.
- Risk 6: Increased coastal erosion and risk of inundation from increasing sea levels and increasing wave heights and storm surges.
- Risk 7: Changes in abundance and geographical distributions of plant species and habitats for aquatic and terrestrial wildlife.
- Risk 8: Increase in diseases, invasive species and insect, animal and plant pests.
- Risk 9: Loss of wetland ecosystems and services.

Risks identified as *more likely than not* (greater than 60% chance for Oregon) include:

- Risk 10: Increased frequency of extreme precipitation events and incidence and magnitude of damaging floods.
- Risk 11: Increased incidence of landslides.

The means to arrest, reverse, and prepare for these effects are at hand or within technological reach. Many of them carry co-benefits that would justify acting on them without the impetus of global warming: positive economic returns on dollars invested in energy efficiency, energy price stability, and healthier air and water. Others will cost us something up front to prevent the costly effects we can expect absent any action. The earlier we take many of these actions, the less drastic they will have to be to achieve the same emissions reduction result.

Planning now for a different and uncertain future can benefit the present in many ways. Thinking strategically now about future risks posed by climate change can reduce those risks and also produce future benefits; for example, by increasing energy and water efficiency now and reducing the need for additional supplies in the future or building infrastructure such as storm treatment facilities that can handle extreme storm events now, rather than paying for the costs of repair and cleanup in the future.

² *Oregon Climate Change Adaptation Framework*, December 2010, developed in partnership with the Department of Land Conservation and Development, Oregon Climate Change Research Institute and participating State of Oregon agencies and Oregon University System can be found online at http://www.oregon.gov/LCD/docs/ClimateChange/Framework_Final.pdf.

2. BACKGROUND AND EXISTING CONDITIONS

Lake Oswego has been working to address energy and climate issues for many years. The 1994 Comprehensive Plan addresses energy conservation (Goal 13) as well as air resources quality (Goal 6, Section 1) and land resources quality – solid waste management (Goal 6, Section 3). These goal areas did not directly address climate change; however all have climate-related impacts and opportunities that we have become very aware of in the past 20 years.

Background

In 2005, Mayor Hammerstad signed on to the U.S. Mayor’s Climate Protection Agreement³, which was reaffirmed by the City Council in 2009 (Resolution 09-09). As of May 2012, 16 cities in Oregon (Albany, Ashland, Beaverton, Bend, Corvallis, Eugene, Forest Grove, Gladstone, Gresham, Hillsboro, Lake Oswego, Lincoln City, Milwaukie, Oregon City, Portland, and Vernonia) and 34 cities in Washington state, including Vancouver and Washougal in Clark County, have signed on to the U.S. Mayor’s Climate Protection Agreement. Under the Agreement, participating cities commit to take following three actions:

- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol⁴ – 7% reduction from 1990 levels by 2012;
- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns; and
- ; and
- Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system.

In 2007, with City Council approval (Resolution 07-21), the City became a member of ICLEI-Local Governments for Sustainability (ICLEI), a membership association of local governments committed to advancing climate protection and sustainable development, and joined its Cities for Climate Protection Campaign, a voluntary program that provides support and guidance to member communities who are working toward goals and strategies established by the community. Joining ICLEI and participating in this program was an outgrowth of the City’s support for the U.S. Mayor’s Climate Protection Agreement.

Since 2007, the City has conducted two GHG emissions inventories for City operations (for 2008 and 2000). Targets and strategies were identified to reduce energy use, decrease fuel consumption, increase recycling and decrease overall solid waste, and conserve water, all actions that will overall emissions from City operations. These are several of the actions

³ <http://www.usmayors.org/climateprotection/revise/>

⁴ The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC), an international treaty aimed at fighting global warming, and was adopted in 1997. More information about the Kyoto Protocol and the UNFCCC can be found here: http://unfccc.int/essential_background/items/6031.php.

identified in the City's Sustainability Plan⁵ for City operations (adopted by the City Council in 2007, Resolution 07-60).

The City's Sustainability Advisory Board (SAB), formed by City Council in 2008, identified a community-wide GHG inventory as a first step to better understand the community's carbon footprint and establish a baseline from which to identify the most effective strategies for reducing emissions while meeting multiple community benefits and objectives. However, funding was not immediately available to start this work or develop a community climate action plan. The Board then decided to work toward integrating sustainability and climate action into the Comprehensive Plan as a more holistic strategy and opportunity.

In August 2009, the City received a \$157,900 allocation from the U.S. Department of Energy's Energy Efficiency and Conservation Block Grant (EECBG) program⁶. The purpose of the EECBG program is to assist eligible entities in creating and implementing strategies to:

- Reduce fossil fuel emissions in a manner that is environmentally sustainable and, to the maximum extent practicable, maximizes benefits for local and regional communities;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the building sector, the transportation sector, and other appropriate sectors; and
- Create or retain jobs.

Based on the Energy Efficiency and Conservation Strategy prepared as a requirement of the grant program (approved by City Council, Resolution 09-65), in early 2010 final approval was granted to the City to use EECBG funds to implement the following projects:

- Establish an Energy and Emissions Management System for City Facilities;
- Conduct Education and Outreach;
- Retrofit Outdoor Lighting at City Facilities;
- Conduct a Community Greenhouse Gas Emissions Inventory;
- Fund an Energy Management Pilot for the Lake Oswego School District;
- Participate in Clackamas County Energy Efficiency on Main Street Program (rebates for energy efficiency upgrades for main street businesses); and
- Participate in Clean Energy Works of Oregon (incentives and on-bill financing mechanism for energy efficiency retrofits to single-family homes).

Existing Conditions

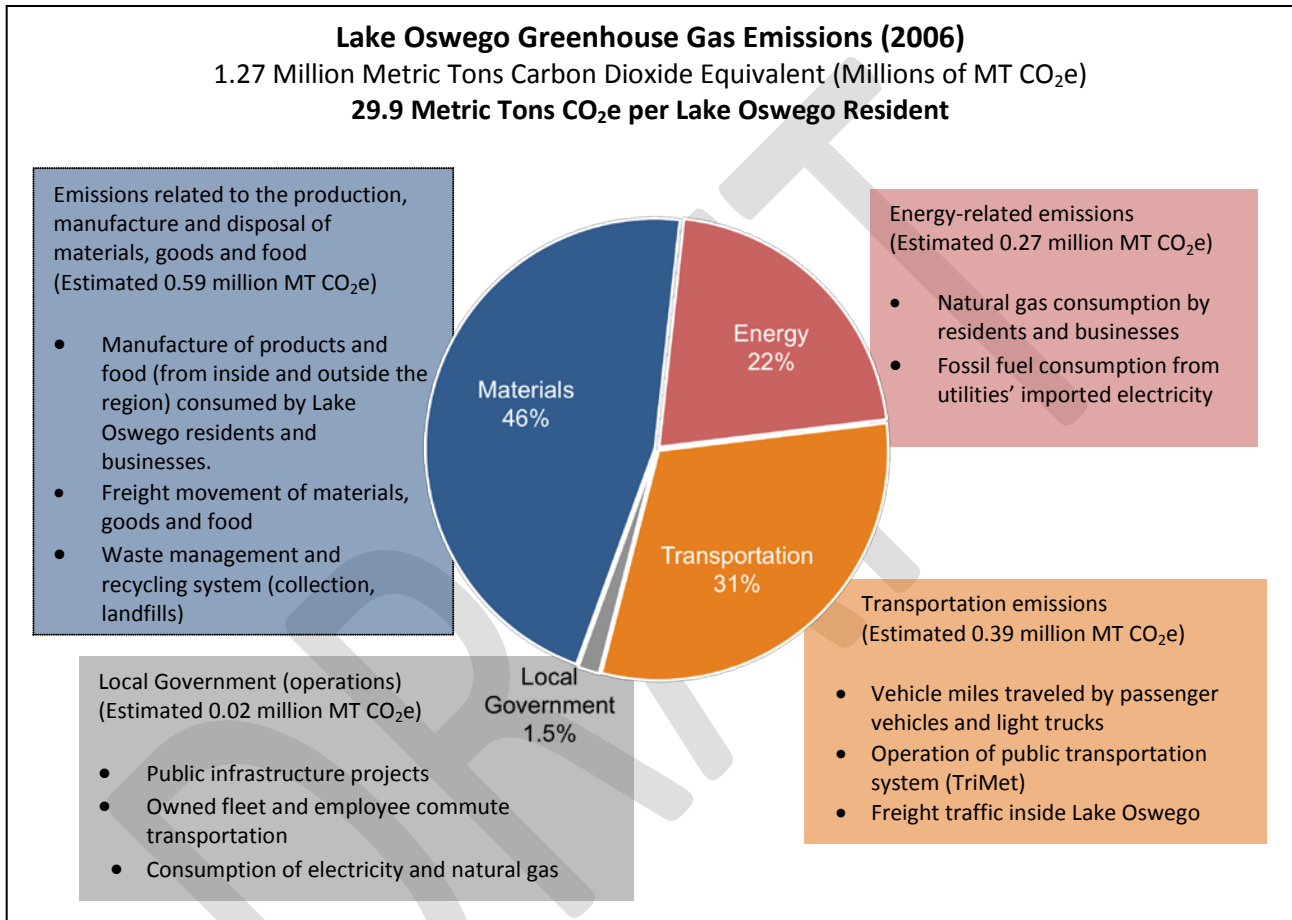
In 2012, Lake Oswego developed a community GHG emissions inventory and identified climate action opportunities for the community of Lake Oswego, entitled *Community Greenhouse Gas Inventory for Lake Oswego*, included as Appendix A (Good Company, February 2012). The Community GHG Inventory was conducted to establish the baseline carbon footprint of the community to identify actions for the highest-leverage areas for change for both short- and long-term GHG reductions. A brief summary of the Community GHG Inventory findings follow.

⁵ More information about the City Sustainability Plan and operational GHG emissions inventories can be found on the City's website: http://www.ci.oswego.or.us/plan/Sustainability/Sustainability_Plan.htm.

⁶ More information about the EECBG can be found at: <http://www.ci.oswego.or.us/plan/Sustainability/EECBG/EECBG.htm>.

The chart below summarizes, at the highest level, the GHG emissions from the activities of citizens, businesses, and local government within the City of Lake Oswego urban service boundary. These emissions are in some cases:

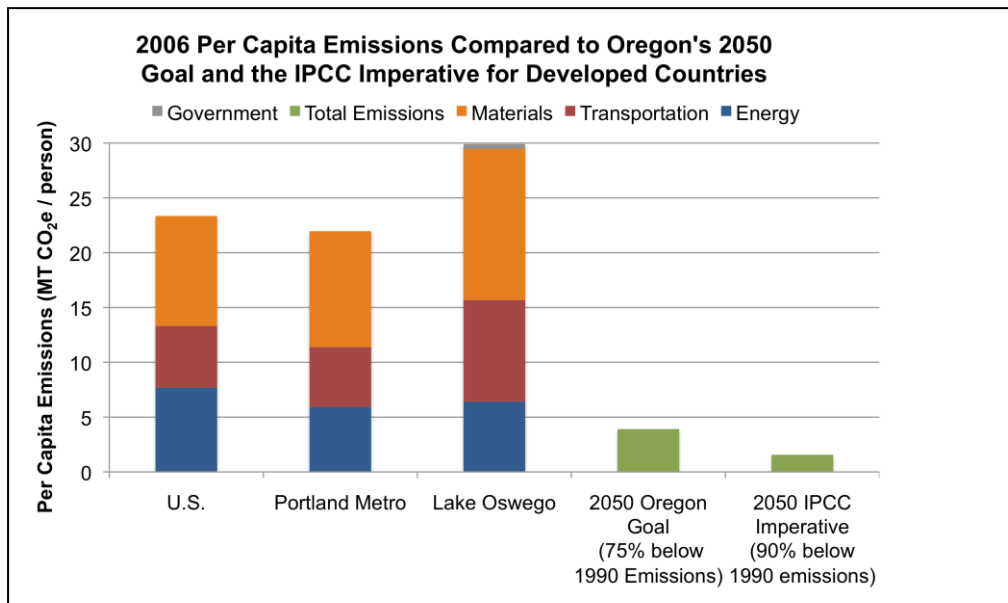
- Direct – such as gasoline or natural gas combustion,
- Indirect – from beyond our city and even regional borders (such as electricity imports), and
- Remote – associated with remote activities that end with final consumption here in the community (such as the production of many goods and much of our food).



The chart below compares 2006 emissions for the United States, the Portland metro area, and Lake Oswego with the GHG emissions goals set by the State of Oregon and the Intergovernmental Panel on Climate Change (IPCC)⁷. The State has set a goal of reducing GHG emissions by 75% by 2050 compared to the 1990 baseline, while the IPCC, comprised of more than 4,000 climate science experts from around the globe, recommends that in order to keep the amount of warming our planet will face to below 2 degrees Celsius, developed countries will need to reduce GHG emissions by 90% below 1990 levels by 2050. Accounting for projected

⁷ The IPCC has identified human activity as the primary cause of the climate change that has occurred over the past few decades and quickened in recent years. The IPCC published the First Assessment Report in 1990. The Fifth Assessment Report is currently under development and will provide an update of knowledge on the scientific, technical, and socio-economic aspects of climate change. For more information, visit <http://www.ipcc.ch/index.htm>.

population changes expected in Oregon by 2050, the green bars at the right on the chart below show where we will need to get to in terms of per capita emissions by mid-century.



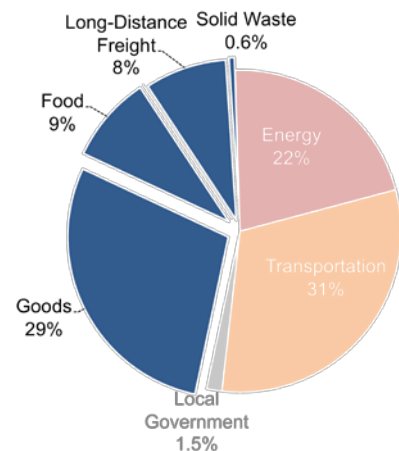
Clearly, we face a significant challenge, but it is one that concurrently presents us with tremendous opportunity to increase the health, prosperity, quality of life, and resilience of our communities. In order to meet these ambitious goals, it will be necessary for a community like Lake Oswego to take action to directly reduce emissions from materials flows, transportation, energy, and local government operations.

By far, the largest component of Lake Oswego’s community GHG emissions (0.59 million MT CO₂e, or just over 46% of the total) is estimated to come from the resource extraction, manufacture and distribution of materials, goods and food for final use and consumption by homes and businesses. A small component of these emissions is also associated with the landfill disposal of food and products at the end of their life. These lifecycle stages – generally out of sight and out of mind – are a large and important part of our carbon footprint.

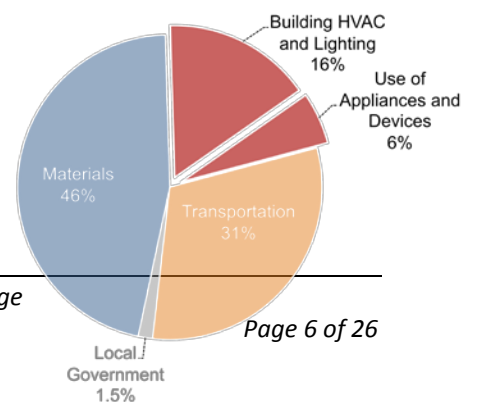
Building energy use (for lighting, heating and cooling) and the operation of appliances (by residences, commercial establishments, and industrial buildings) together account for 22% of Lake Oswego’s community GHG emissions (0.27 million MT CO₂e). Electricity consumption from local government’s operations of streetlights and traffic signals is not included in this slice, but is one of the components of the “Local Government” slice of community GHG emissions.

The residential sector consumes just more than half of the community’s electricity (53%). The commercial sector and local

Lake Oswego Community Greenhouse Gas Emissions with Materials Split



Lake Oswego Community Greenhouse Gas Emissions with Energy Split

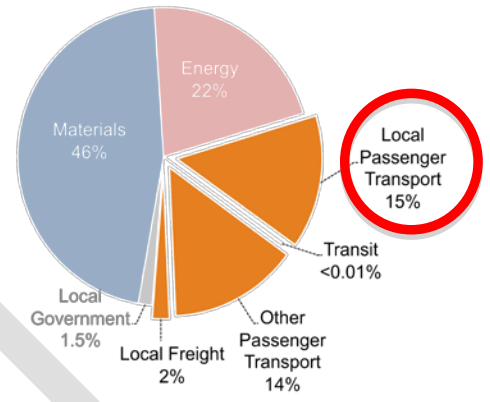


government consume about 44% and 3% respectively. Industry consumes less than 1% of Lake Oswego's electricity. For natural gas, more than 80% of total consumption is by the residential sector. The commercial sector consumes about 19% and the industrial and government sectors consume less than 1% each.

Transportation is responsible for about 31% of the Lake Oswego's greenhouse gas emissions (0.39 million MT CO₂e). These emissions come mainly from on-road vehicles (commercially and individually owned) and air travel, with small shares from rail, marine, transit, and local freight sources.

One impetus for conducting a Community GHG analysis is the State's passage of SB 1059, Oregon's Statewide Transportation Strategy to reduce GHGs from the transportation sector. This regulation indicates that the Portland Metro area will be the first metropolitan planning organization (MPO) to regulate GHG emissions from local passenger transport. The segment labeled "Local Passenger Transport" in the pie chart above is the share of Lake Oswego-area emissions covered by this goal. More discussion of Lake Oswego's compliance with SB 1058 via Metro is included below.

Lake Oswego Community Greenhouse Gas Emissions with Transportation Split



State and Regional Context

While many organizations, plans, and initiatives at the state, regional, and local level are directly or indirectly connected to the goal of reducing community GHG emissions, these connections are rarely made explicit. A companion memo to the Community GHG Inventory, entitled *Understanding the Connections between State, Regional, and Local Planning Efforts Related to Management of Greenhouse Gas Emissions* (Good Company, 2012; included as Appendix B), was developed by the consultant team and City staff to show how these efforts relate to one another and the results of the Community GHG Inventory. A second goal of the Connections memo was to show how these efforts can not only help Lake Oswego address the challenge of climate change, but can simultaneously help the community to achieve numerous benefits while striving to make Lake Oswego's 2035 community vision a reality.

The Connections memo describes in detail the connections among various initiatives and plans at the state, regional, and local levels. Some of these initiatives are related to laws passed by the state legislature and are mandatory. These mandatory initiatives are **bolded** below. Other initiatives are voluntary but represent a commitment made by the state, region, or city government. The plans and initiatives examined in the Connections memo are listed below, followed by a short description of the mandatory initiatives:

State

- Oregon GHG Reduction Strategy and Goals
- **House Bill (HB) 2620, 1.5% for Solar for New Public Buildings Oregon Global Warming Commission Roadmap to 2020**
- **House Bill (HB) 2001, The Jobs and Transportation Act**

- **Senate Bill (SB) 1059, Oregon Sustainable Transportation Initiative**
- Oregon’s Climate Change Adaptation Framework

Region (Portland Metro Regional Government)

- **Portland Metro Implementation of SB 1059 via the Climate Smart Communities Scenarios Project**
- Metro Community GHG Inventory
- Various Community Sustainability and Climate Action Plans
- **Regional Solid Waste Management Plan**
- Willamette Valley Resilience Compact

Local (Lake Oswego City Government)

- **Comprehensive Plan**
 - Community Vision
 - Community Vision Map
- **Transportation System Plan**
- US Mayor’s Climate Protection Agreement
- 2007 Sustainability Plan (for City Operations)
- Local Government Operations GHG Inventory
- Community GHG Inventory and Climate Action Opportunities
- **Natural Hazards Mitigation Plan**

The table below summarizes the relationship between the state-level plans noted above, discussed in detail in the Connections memo, and the Community GHG inventory. The four components of Lake Oswego’s community GHG emissions are found in the columns: emissions from materials management, transportation, energy consumption, and local government operations. The rows of the table are the State plans. The table describes if the plans focus on initiatives to directly or indirectly address emissions from these components.

Oregon State Plans and Initiatives	Relationship to Lake Oswego Community GHG Emissions			
	Materials	Transportation	Energy	Local Government
Oregon GHG Strategy and Reduction Goals	Direct	Direct	Direct	Direct
Oregon Global Warming Commission: Roadmap to 2020	Direct	Direct	Direct	Direct
House Bill 2001: Jobs and Transportation Act	Indirect	Direct	Indirect	Indirect
Senate Bill 1059: Oregon Sustainable Transportation Initiative	Indirect	Direct	Indirect	Indirect
Oregon's Climate Change Adaptation Framework	N/A	N/A	N/A	N/A

A direct relationship is defined as those plans or initiatives that are directly measuring progress towards emissions reductions in those areas. An indirect relationship is defined as those plans or initiatives that promote policies or actions that while not directly focused on emissions reduction activities would have an indirect impact on reducing emissions over time.

Missing from the above table is Oregon HB 2620⁸, which took effect January 1, 2008. Public entities are required to spend 1.5 percent of the total contract price of a public improvement contract for new construction or major renovation of a public building on solar energy technology. Biomass was added as an option to meet this requirement during the last legislative session. HB 2620 applies to all new City-funded building projects as public entities include state agencies, universities, community colleges, school districts and education services districts, and local government.

Oregon GHG Reduction Goals

In 2007, the Oregon Legislature established climate change goals for the state by passing House Bill 3543⁹. The law sets targets for reducing Oregon's greenhouse gas emissions and makes it clear that the state's climate change goals also include preparation for the effects of global warming by state and local governments, businesses, nonprofit organizations, and individual residents. Doing so will prevent and reduce the social, economic, and environmental effects of global warming. The goals call for Oregon to:

- By 2010, arrest the growth of Oregon's greenhouse gas emissions and begin to reduce greenhouse gas emissions.
- By 2020, achieve greenhouse gas levels that are 10 percent below 1990 levels.
- By 2050, achieve greenhouse gas levels that are at least 75 percent below 1990 levels.

Oregon Global Warming Commission: Roadmap to 2020

At the same time that the legislature put Oregon's GHG reduction goals into law, they formed the Oregon Global Warming Commission¹⁰ to monitor progress toward these goals, recommend ways to coordinate state and local efforts to reduce Oregon's GHG emissions, and to develop ways to help governments, businesses, and residents prepare for the effects of climate change.

The Commission's Roadmap to 2020 is the latest comprehensive GHG reduction strategy for Oregon. The Commission's 2011 report to the Legislature¹¹ includes key actions and results from the interim Roadmap to 2020. The main take away is that the general GHG emissions trend through 2010 should be flat, with downward sloping emissions following a few years thereafter. Progress toward Oregon's 2020 and 2050 goals – to reduce greenhouse gas emissions by 10 percent and at least 75 percent below 1990 levels, respectively – remains challenging. Rising to this challenge the Commission initiated a "Roadmap to 2020" project. Six technical committees were convened to work on sector-based strategies for meeting these two emission reduction goals. These committees represented stakeholders and other experts from the energy, land use and transportation, industrial, agricultural, forestry, and materials management sectors.

⁸ <http://www.leg.state.or.us/07reg/measpdf/hb2600.dir/hb2620.en.pdf>

⁹ <http://www.oregon.gov/energy/GBLWRM/HB3543.shtml>

¹⁰ More information about the Oregon Global Warming Commission is available here: <http://www.keeporegoncool.org/>

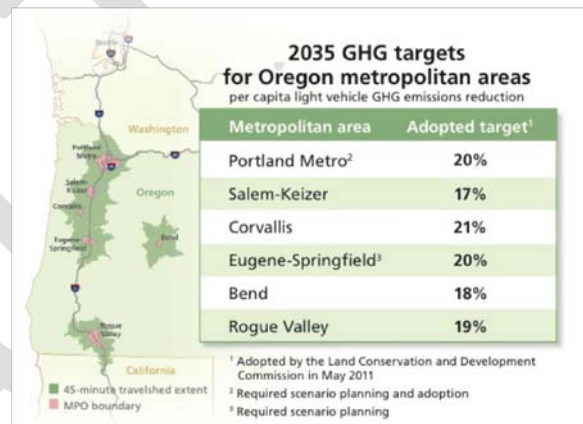
¹¹ <http://www.keeporegoncool.org/sites/default/files/ogwc-standard-documents/2011Report.pdf>

House Bill (HB) 2001 – The Jobs and Transportation Act and Senate Bill (SB) 1059 – Oregon Sustainable Transportation Initiative

In 2009, Oregon passed the Jobs and Transportation Act, legislation simultaneously aimed at meeting GHG reduction goals, increasing energy independence, and improving quality of life and livability. The primary themes included in HB 2001¹² relate to developing methods to enhance accountability for managing environmental protection and stewardship, while developing opportunities for transportation (including multimodal) project funding.

Two key components were: (1) the requirement for the development of a least cost transportation model to be available to the state, metropolitan planning organizations (MPOs), and local governments and (2) the development of transportation plans to reduce motor vehicle GHG emissions. Due to the similarity in focus with Senate Bill 1059, HB 2001's connection to Lake Oswego's community GHG emissions is outlined below.

Building on HB 2001, SB 1059¹³ was passed in 2010 giving the Oregon Department of Transportation and the Department of Land Conservation and Development, along with the MPOs and other state agencies and stakeholders, the authority to adopt rules establishing a statewide strategy to reduce GHG emissions from motor vehicles. The rules were to outline a GHG reduction target for vehicle-related GHG emissions to be met by each MPO by 2035. The graphic at right shows the targets developed in 2011, by MPO boundary¹⁴.



Both HB 2001 and SB 1059 focus on the connection between land use and transportation. The metric used to measure progress for SB 1059 is per capita light vehicle GHG emissions. Therefore, these bills directly focus on reducing emissions from the transportation component a community's carbon footprint, which is the 15% of Lake Oswego's community GHG emissions represented under "Local Passenger Transport" in the Inventory.

While this is a small component of the full GHG picture, these initiatives can have positive indirect impacts on other slices of Lake Oswego's GHG pie. For example, initiatives to promote dense land use to reduce the vehicle miles travelled between destinations can also indirectly promote compact, mixed-use neighborhoods. This kind of compact development can include housing and building types that have been shown to be more energy efficient than detached

¹² <http://www.leg.state.or.us/09reg/measures/hb2000.dir/hb2001.en.html>

¹³ The bill can be found here: http://www.leg.state.or.us/bills_laws/concepts/sen/SB1059.pdf. ODOT's effort is described in detail here: <http://www.oregon.gov/ODOT/TD/OSTI/>.

¹⁴ The graphic describes MPO goals that go beyond reductions that DLCD predicts will result automatically from progress in technologies and fleets. Source: <http://www.oregonmetro.gov/index.cfm/go/by.web/id=36945>.

single-family dwellings¹⁵. This effect would indirectly reduce the Energy slice of Lake Oswego’s community GHG emissions over time.

Compact, mixed-use land use could also reduce emissions in the Materials slice through changes in construction. Multi-family and other attached dwellings generally achieve material efficiencies compared to buildings at lower densities. Another unintentional connection relates to the Government slice in the chart. Again, SB 1059 and HB 2001 do not directly address these emissions, but a large share of local government emissions result from infrastructure. A more compact community would likely mean less infrastructure construction and maintenance per capita, and therefore lower GHG emissions. These connections are neither regulated by nor modeled in current efforts, but they demonstrate the connections among the seemingly separate sources of emissions.

Lake Oswego is located within the boundaries of Metro, the directly elected regional government that serves more than 1.5 million residents in Clackamas, Multnomah, and Washington counties and the 25 cities in the Portland, Oregon, metropolitan area. Metro, as a regional government and the seat of the Metropolitan Planning Organization (MPO), has a regulatory responsibility and various programmatic roles in addressing land use, waste management, and – with the implementation of HB 2001 – long-range planning for reducing carbon emissions from transportation.

The table below serves to summarize the connections between the Metro regional plans discussed below and the four components of the Lake Oswego Community GHG Inventory: emissions from materials management, transportation, energy consumption, and local government operations. The table describes if the plans focus on initiatives to directly or indirectly address emissions from these components.

Metro Regional Plans and Initiatives	Relationship to Lake Oswego Community GHG Emissions			
	Materials	Transportation	Energy	Local Government
Portland Metro Implementation of HB 2001 and SB 1050, Climate Smart Communities Project	Indirect	Direct	Indirect	Indirect
Portland Metro Community Greenhouse Gas Inventory	Direct	Direct	Direct	Direct
Various City and County Sustainability and Climate Action Plans	Direct	Direct	Direct	Direct
Regional Solid Waste Management Plan	Direct	Indirect	Indirect	Indirect
Willamette Valley Resilience Compact	N/A	N/A	N/A	N/A

¹⁵ A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon, Phase 2 report, Department of Environmental Quality, 2010: <http://www.deq.state.or.us/lq/sw/waste prevention/greenbuilding.htm>

Metro Implementation of SB 1059 via the Climate Smart Communities Scenarios Project

Metro is the first regional government in Oregon required to comply with HB 2001 and SB 1059. As described in the newly released *Climate Smart Communities Scenarios Project, Understanding our Land Use and Transportation Choices Phase 1 Findings from January 2012*¹⁶, Portland Metro has specific duties under HB 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.”

The Climate Smart Communities Scenarios Project and the Phase 1 report cited above both respond to HB 2001 and the GHG reduction targets developed for the state MPOs under SB 1059. The regional goal for per capita roadway GHG emissions is a reduction of 70% over current emissions, which would bring emissions down to 1.2 MT CO₂e per person by 2035. Currently, Lake Oswego’s per capita emissions from local passenger transport are about 4 MT CO₂e per person.¹⁷

This Metro report also identifies a number of strategies for passenger vehicle emissions reductions. Any of these strategies are identified as needing to be led at the local community level, such as by the city government of partner jurisdictions like Lake Oswego. These initiatives include strategies addressing community design, pricing, marketing and incentives, roads, fleet and technology. These opportunities are discussed further in the Opportunities section of this report, below.

Regional Solid Waste Management Plan

This long-range plan provides a framework for coordinating the management of solid waste and recycling efforts throughout the Portland Metro region. Approved in 2008, it focuses on the time period of 2008-2018 and includes a state-required waste reduction program and strategies to reduce the amount and toxicity of the waste generated in the region.

These strategies will directly impact the materials component of Lake Oswego’s GHG emissions. More efficient use (including reuse, deconstruction instead of demolition, and other materials management techniques) of goods and materials in the metro area will lead to lower rates of consumption and lower GHG emissions from production of virgin materials. Additionally, reduction of landfilled materials will reduce the amount of methane, a potent greenhouse gas, generated in landfills.

¹⁶ Climate Smart Communities Scenarios Project, “Understanding Our Land Use and Transportation Choices” Phase 1 Findings, January 12, 2012. Available:

<http://rim.oregonmetro.gov/webdrawer/rec/231744/view/Planning%20and%20Development%20-%20Regional%20Tran~g%20Our%20Land%20Use%20and%20Transportation%20Choices%20-%20Phase%201%20Findings%20-%20January%2012,%202012.PDF>

¹⁷ The 70% reduction goal includes fleet and technology changes that generate 50% reduction. The remaining 20% is the Metro region’s responsibility.

3. SUMMARY OF TRENDS, EMERGING ISSUES, CHALLENGES AND OPPORTUNITIES

Trends

Energy

The following summary from the recently released Governor's Ten Year Energy Task Force Report¹⁸ provides an excellent overview of energy trends in Oregon:

Oregon imports 100% of its petroleum, coal and natural gas, leaving our citizens vulnerable to energy price volatility and draining billions of dollars every year from the local economy. In 2010, approximately 85% of the \$14 billion Oregonians spent on energy left the state. That percentage would have been higher without the pioneering Oregon and Pacific Northwest energy policies implemented over the past 25 years.

This early leadership was far-sighted because, despite lack of fossil fuels, Oregon possesses a vast diversity of renewable energy resources. Furthermore, our tradition of energy innovation has positioned us at the forefront of clean energy expertise worldwide. Today, Oregon ranks second in the nation in clean energy leadership. Significantly, even during the recession, clean energy jobs have grown at a significantly faster pace than jobs in general. Oregon's electricity portfolio is led by hydroelectric power, followed by coal and natural gas. Nuclear power plays a modest role, while wind power is small, but growing swiftly.

Regarding transportation energy use in Oregon, according to the Ten Year Energy Task Force Report (March 2012)¹⁹:

Oregon's roads accommodate four million registered vehicles for 2.7 million licensed drivers. Oregonians consume some 1.5 billion gallons of gasoline to drive 39 billion miles every year. That fuel costs Oregonians nearly 7% of their disposable incomes, nearly double what it was ten years ago. Moreover, gasoline prices are projected to rise, so we can expect this trend to continue unless we reconsider our transportation system and habits. Having access to alternative forms of transportation helps reduce energy use, improve air quality, boost public health and ease traffic congestion.

The Oregon Energy Action Plan Task Force is an advisory committee, charged with recommending actions and initiatives to the Governor that the State of Oregon can take to:

- Reduce our dependence on carbon-intensive fuels and foreign oil
- Develop home-grown renewable energy resources
- Mitigate greenhouse gas emissions
- Improve energy efficiency and create rewarding local jobs
- Boost Oregon's economy through investment and innovation

In June 2012, the Governor released the proposed plan, based on the Ten Year Energy Task Force's recommendations, for public input²⁰. Many of the proposed strategies will be implemented at the state level, however several of the strategies will require local government

¹⁸ http://www.oregon.gov/energy/Ten_Year/docs/Oregon_Energy_Task_Force_Report.pdf, page 5.

¹⁹ http://www.oregon.gov/energy/Ten_Year/docs/Oregon_Energy_Task_Force_Report.pdf, page 7.

²⁰ This plan was released as this document went to print (June 5).

involvement to achieve Cutting Edge Communities that are envisioned to: “mobilize entire communities to focus existing private, university, non-profit and federal, state and local investments toward the creation and implementation of locally-adopted and state approved energy action plans that meet the long-term goals of energy independence, reliability, affordability and job creation.”²¹

Nearly all of the energy used in the Portland metro area comes from outside the state, with imported coal and natural gas supplying much of the region’s electricity. Therefore, money spent on non-local energy sources contributes little to our local economy.

Lake Oswego is served by two energy providers: Portland General Electric (PGE) and NW Natural. Transportation energy is derived primarily from fossil fuels in the form of gasoline and diesel. Electric vehicle charging infrastructure is starting to develop in the Portland metro area, including two Level 2 charging stations in downtown Lake Oswego. The following facts provide some details about energy trends in Lake Oswego and Oregon.

Energy Consumption in Lake Oswego:

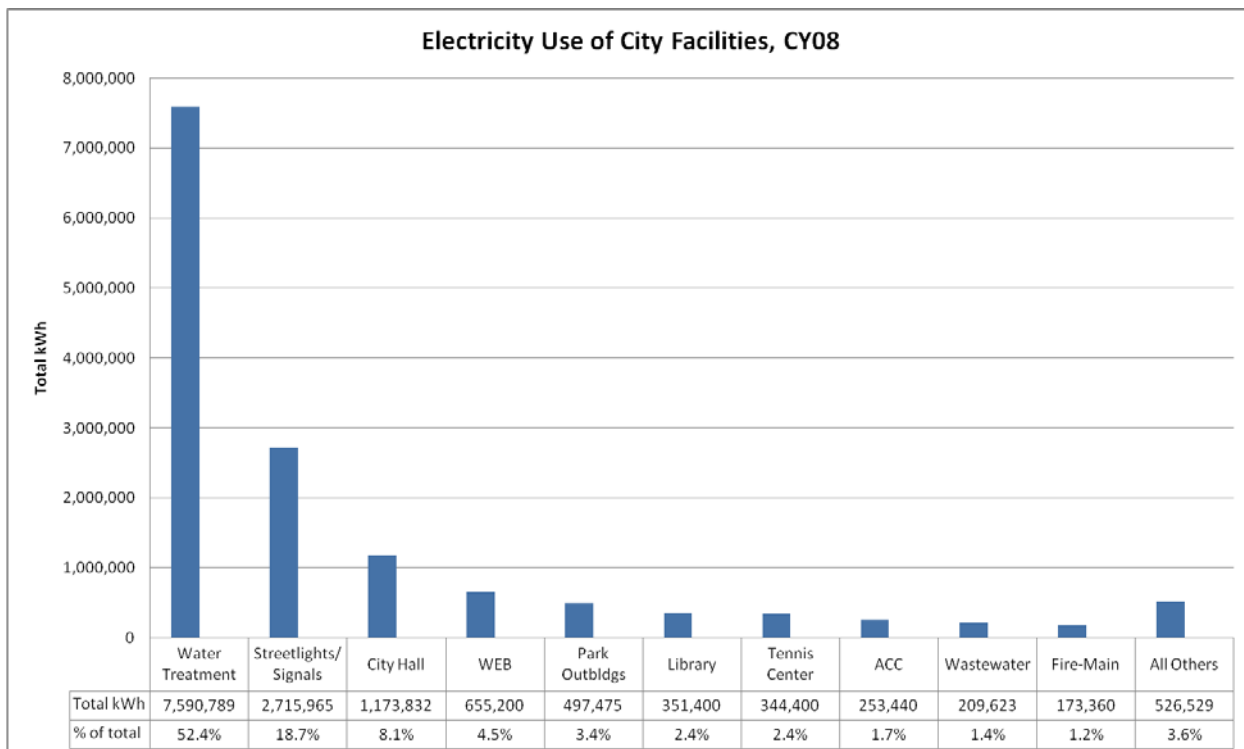
- In 2006, the residential sector consumed just more than half of Lake Oswego’s electricity (53%). The commercial sector and local government consumed about 44% and 3% respectively. Industry consumed less than 1% of Lake Oswego’s electricity.²² For natural gas, more than 80% of total consumption was by the residential sector in Lake Oswego. The commercial sector consumed about 19% and the industrial and government sectors consumed less than 1% each.²³
- In calendar year 2008²⁴, the City used 14,492,013 kWh of electricity for its operations. Drinking water treatment accounted for 52% of the City’s electricity consumption, including withdraw, treatment, and delivery. City buildings accounted for 21% of overall electricity consumption (not including park outbuildings and the Tennis Center), followed by 19% attributed to street signal and streetlights.
- On a related note, 65% of water used in Lake Oswego is by single-family residences. By actively promoting water conservation in Lake Oswego, not only do we protect and preserve key fresh-water resources for habitat and ecosystem functions now and in the future, we also reduce energy and associated GHG emissions.
- Between 2000 and 2008, electricity use (kWh consumed) in City facilities increased by 3.2%, fleet fuel use increased by 10.5%, and natural gas usage more than doubled.

²¹ http://www.oregon.gov/energy/Ten_Year/docs/Oregon_Energy_Task_Force_Report.pdf, page 18

²² For calendar year 2006 from data collected for the Community GHG Inventory.

²³ For calendar year 2006 from data collected for the Community GHG Inventory.

²⁴ *Greenhouse Gas Emissions Inventory for City Operations: January-December 2008*, November 2010



Renewable Energy Use in Lake Oswego:

- In 2011, the City’s Water Treatment Plant (WTP), the largest user of electricity within City operations, purchased 2,346,408 kWh of Clean Wind renewable energy, approximately half the electricity used by the WTP annually, and 17% of the overall electricity used for City operations. Since 2005, the WTP has purchased more than 2.3 million kWh of wind power annually. The price per kWh of Clean Wind energy from PGE is an additional \$.011 per kWh, and will drop to \$.0066 per kWh starting May 30, 2012, reflecting the increased availability of renewable wind power in the western U.S.
- Lake Oswego customers (residential and commercial) purchased 33,554,768 kilowatt-hours (kWh) of renewable power from PGE in the 12 months ending March 2011, more than 9% of the electricity consumed in the community. For this effort, Lake Oswego has been recognized as a Green Power Community since 2009²⁵.

General Energy Trends in Oregon:

- Energy prices continue to rise. While Oregon has relatively low electricity rates compared to other parts of the United States, it is ranked as having some of the most expensive vehicle fuel in the country.²⁶
- Total energy consumption per capita in Oregon has decreased from 360 million British thermal unit (Btu, a common measure of energy) in 1980²⁷ to 279 million Btu in 2009²⁸, ranking 35th among states in the US. The Energy Policy Act of 2005 (EPAAct) requires

²⁵ <http://www.epa.gov/greenpower/communities/communities/lakeoswegoorcommunity.htm>

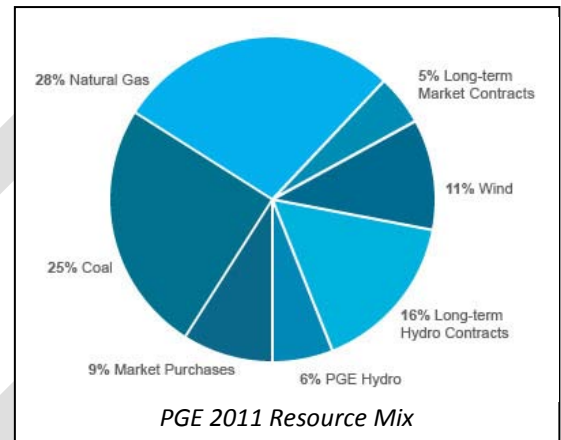
²⁶ http://oregon.gov/ENERGY/docs/reports/legislature/2011/energy_plan_2011-13.pdf

²⁷ http://apps1.eere.energy.gov/states/energy_summary.cfm/state=OR

²⁸ <http://www.eia.gov/state/state-energy-profiles-data.cfm?sid=OR>

states to set an energy conservation goal that is 25% below 1990 consumption. For Oregon, the 2012 EPA Act per capita goal is 261 million Btu²⁹.

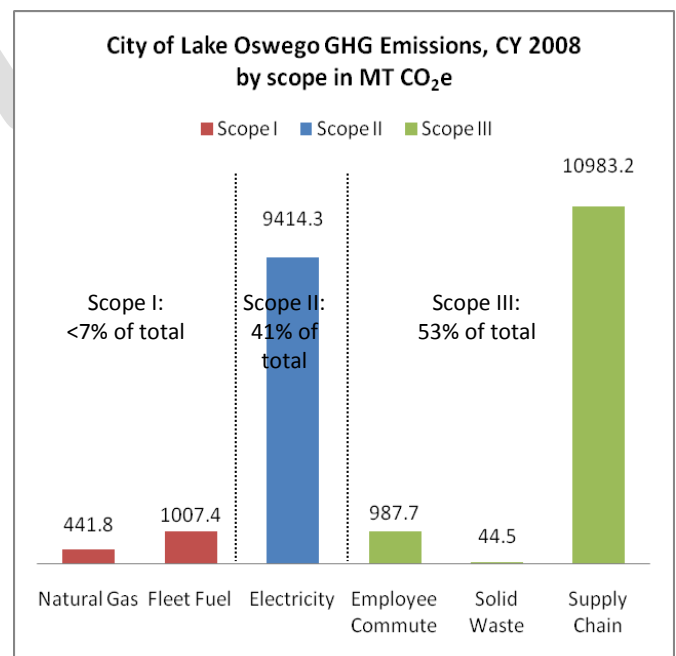
- In 2005, transportation accounted for 30% of all energy consumption in Oregon³⁰, which makes it the largest energy-consuming sector of the state economy. Transportation energy consumption data is not available just for Lake Oswego. The associated GHG emissions included in the Community GHG Inventory were based on average vehicle miles traveled by Lake Oswego residents in 2006 using the GreenSTEP model.
- Less than half of our electricity supply comes from hydropower, commonly believed to be the main source of electricity in the Pacific Northwest. Instead, imported coal and natural gas supply the majority of the city's electricity.
- PGE relies on six different sources to produce energy for its customers, with some of its electric power coming from generating plants owned by PGE, and some from other suppliers³¹.
- The state's only coal-fired generator, Boardman Plant, is set to be shut down by 2020³². Boardman provides about 15 percent of the power PGE delivers to its customers. However, on the current trajectory, the state will continue to import significant amounts of electricity generated from coal.
- Oregon contains significant renewable energy resources from biomass and wind. As of 2005, the state ranks 21st among states with electricity production from biomass and ranks 23rd in wind energy potential.³³



Greenhouse Gas Emissions

The results from the Community GHG Inventory are summarized above under the Existing Conditions section of this report. Since this is the first Community GHG Inventory conducted for Lake Oswego, it is too soon to see trends in community emissions.

For City operations, two GHG emissions inventories have been conducted: the first for 2000 and the second for 2008. The chart to the right and on the next page provide an overview of the emissions from City operations for 2008, which closely mirror the Community's emissions



²⁹ http://apps1.eere.energy.gov/states/energy_summary.cfm/state=OR

³⁰ http://apps1.eere.energy.gov/states/energy_summary.cfm/state=OR

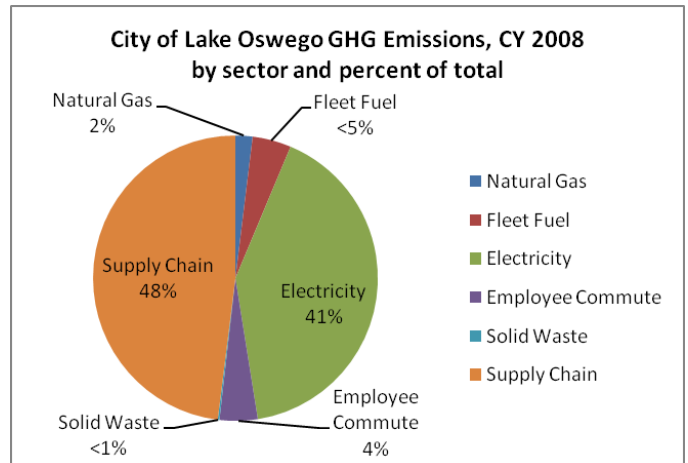
³¹ http://www.portlandgeneral.com/our_company/corporate_info/how_we_generate_energy.aspx

³² http://www.portlandgeneral.com/community_environment/initiatives/boardman_plant_air_emissions.aspx?initiatives

³³ http://apps1.eere.energy.gov/states/energy_summary.cfm/state=OR

in terms of sectors, with the supply chain making up 48% of emissions.

In terms of the supply chain emissions, in 2008, the City spent \$26,198,241 on materials, services, and capital outlay expenditures. These expenditures, when viewed through the lens of embodied greenhouse gas emissions, account for roughly 10,983 MT CO₂e. Contracted professional services and wastewater treatment services account for the majority of these emissions.



The two operational inventories were conducted using different methodologies; the 2008 inventory used a consumption-based approach similar to the Community Inventory. Since two different methodologies were used for the City operations inventory, it is hard to compare results. However, trends in utility usage suggest that emissions from the City operations have increased steadily since 2000. Over this time period, electricity use (kWh consumed) in City facilities has increased by 3.2%, fleet fuel use has increased by 10.5%, and natural gas usage has more than doubled. These three factors comprise the majority of the City's Scope I and Scope II emissions and suggest that greenhouse gas emissions from City operations are climbing.

Land Quality–Materials Management

As noted above, 46% of the Lake Oswego community's GHG emissions and 48% of City operational emissions are related to the materials (goods, foods, supplies, and materials, etc.) that we consume and services we use. Reducing consumption and waste through materials and land management practices will go a long way toward reducing GHG emissions.

The amount of GHG reductions from recovery is significant. Recycling and energy recovery, in particular, are important tools to reduce greenhouse gas emissions. When materials are recovered, industry can create new products with significantly less energy and lower greenhouse gas emissions compared to using virgin materials.

The following facts from the Oregon Department of Environmental Quality³⁴ provide an overview of materials management trends in Oregon:

- In 2010, the state of Oregon recovered 2,170,243 tons of material or 50 percent of the municipal post-consumer waste stream in 2010. This rate is 1.7 percent higher than the 48.3 percent rate of 2009. The increase in recovered tons is 4.2 percent, the first increase since 2005 when recovered tons began to drop, and represents the achievement of a significant goal.
- 2010 recovery includes materials recycled, burned for energy (including tires, fuels, oil-based paint, used oil, wood waste, and some yard debris), and composted (including yard debris, food waste, and some wood waste). By category, 62.7 percent of the

³⁴ Source: <http://www.deq.state.or.us/lq/pubs/docs/sw/2010MRWGRatesReport.pdf>

material recovered in Oregon was recycled, 16.3 percent was burned for energy, and 21.0 percent was composted.

- 2010 waste generation equates to 2,442 pounds per person per year, compared to 2,441 pounds per person per year in 2009; 2010 saw a tiny increase (0.05 percent) over 2009. This reflects previous trends and shows that for four years in a row, Oregon has essentially met its goal of no increase in per capita waste generation.
- Continued low levels of waste generation correspond with the current economic situation. In hard times, people tend to buy (and discard) less material. However, for parts of the equation, recovery and disposal, disposal fell while recovery rose in 2010.
- The calculated energy savings for 2010 from recycling and energy recovery was approximately 32 trillion BTU – the equivalent of 258,000,000 gallons of gasoline, or roughly 3.0 percent of total energy used (2010) by all sectors of the economy in Oregon.
- Greenhouse gas reductions in 2010 from recycling, composting and energy recovery was approximately 3 million metric tons of carbon dioxide equivalents – the equal to tailpipe emissions from 620,000 “average” passenger cars, or roughly 4.3 percent of all greenhouse gas emissions statewide (2010).
- The amount of greenhouse gas reductions from material recovery – and particularly recycling – continues to be significant. Recycling cardboard produced the greatest benefit, with emissions reductions of nearly 1.1 million metric tons of CO₂ equivalent, followed by other paper, with more than 600,000 metric tons, and scrap metal and aluminum with more than 500,000 metric tons of CO₂ equivalent each.

Some recycling recovery facts relevant to Lake Oswego follow:

- The City, as required by Metro, implemented Business Recycling Requirements in 2009. This new regional requirement was established in part to better capture paper fibers in the recycling stream. Per the DEQ, papers, including cardboard, showed large drops correlating to the steep fall in recycling markets that occurred in late 2008 and into the first part of 2009. In 2010, papers showed a small increase in recovery tons of 1.7 percent.
- Electronics showed a 16 percent increase in total tons recovered in 2010. The increase is due to the Oregon E-Cycles program and the electronics landfill ban. The City and our recycling and solid waste partners, Allied Waste and Clackamas County Recycle at Work, actively promote this program. Two e-waste collection sites are located in Lake Oswego providing free and convenient disposal of e-waste. Additionally, in 2011, the City held its first community-wide clean up day netting a very high volume of electronics and other materials for recycling. A second clean-up day is scheduled for 2012. The City has also coordinated a community block foam recycling event every January for the past several years, providing a convenient and cost effective way for residents to recycle foam.
- The amount of recovered organic material (food, yard, and wood wastes) increased 3 percent in 2010. The largest increase was for food waste at nearly 80 percent, reflecting the increase in the number of food waste collection programs available in Oregon. Allied Waste Services began offering food waste collection service for commercial customers in Lake Oswego two years ago. About 10 businesses are participating, and efforts are under way to increase participation. One issue that has been identified is lack of space at some commercial properties for an additional container.

Additionally, regional changes to how collected materials are processed have led to an increase in recovery of construction and demolition debris. According to Metro³⁵:

- Contractors dispose of approximately 250,000 tons—or 95,000 drop box loads of construction and demolition debris every year. About 50 percent of this waste could be reused, recycled, or burned for energy.
- In 2008, 261,600 tons of construction and demolition waste were recovered, down almost 10 percent from the 289,000 tons in 2007. About two-thirds of this total was source separated by the generator, while the remaining one-third was mixed with waste and later recovered by the processor. The downturn was mostly due to the depressed new construction.
- Building material reuse continues to be the preferred way of managing construction debris. In a recent survey of the region's used building material retailers, they reported handling approximately 10,700 tons of mostly residential used building materials in 2008, up 30 percent from the previous year.
- In 2008, curbside recycling increased 6 percent. Over 2,000 more tons of paper and containers and 12,000 tons of yard debris were collected in 2008 than in 2007.
- In 2008, Lake Oswego moved to a two-bin recycling system with wheeled carts to capture almost 78 percent of commingled recyclables from curbside programs, which was up from 66 percent in 2005, on average. A study conducted by Metro in 2008 showed that Lake Oswego residents were doing an excellent job recycling, with just a total contamination of 3.1 found in the roll carts, better than the regional average.

Emerging Issues and Challenges

Renewable energy will be the fastest-growing source of energy throughout the world over the next 28 years, helping to meet a projected 49% increase in world energy use, according to U.S. Department of Energy's Energy Information Administration (EIA). The EIA released the highlights of its *International Energy Outlook 2010* on May 25, 2010, and the reference case, sometimes referred to as the "business-as-usual" case, forecasts continued rapid growth in energy use in developing countries through 2035. China and India accounted for 20% of global energy use in 2007, but the EIA expects their consumption to more than double by 2035, at which time they will account for 30% of world energy use.

In general, the EIA reference case does not forecast a strong shift to clean energy throughout the world. While renewable power generation increases the fastest, at 3% per year, coal-fired power will also continue to increase, at a rate of 2.3% per year. The EIA report sees petroleum and liquid fuels remaining as the world's largest energy source through 2035, while natural gas consumption increases by 1.3% per year. As a result, energy-related carbon dioxide emissions rise from 29.7 billion metric tons in 2007 to 42.4 billion metric tons in 2035, an increase of 43%. And while the reference case expects oil prices to reach \$133 per barrel in 2035, even the EIA's "high oil price" case dampens the energy growth only slightly, yielding a 46% increase by 2035. Energy-related carbon dioxide emissions still end up at 41.1 billion metric tons in 2035, an increase of 38%.

³⁵ <http://www.oregonmetro.gov/index.cfm/go/by.web/id=24920>

Powerful evidence from a variety of sources suggest that global production of oil and natural gas will reach its peak in the next several decades, making these energy sources less available and less affordable than in the past. Added to potential future costs associated with carbon mitigation, rising and volatile oil prices will increasingly affect:

- Transportation of people and freight;
- Population densities (as people seek to reduce their transportation costs and potentially move from lower density communities to better access goods, services, and employment);
- The cost and availability of food (because the American food system is so dependent on fossil fuels for transportation and fertilizer); and
- Efforts to be an equitable community.

As a result of likely rising and volatile oil prices, the regional economy as a whole may undergo significant disruption and volatility, especially in industries that depend on national and global markets. And the costs of rising energy prices are generally not distributed equitably; higher energy prices have the potential to exacerbate social inequities, and tend to increase the number of low-income, vulnerable, and marginalized residents. While facing disproportionate impacts, residents on fixed incomes, such as retirees, have fewer resources to adapt, increasing pressure on social services.

Meanwhile, GHG emissions from human activities continue to collect in the atmosphere, destabilizing the climate. The world's scientific community, having reached consensus on the basic science of climate change, indicates that in order to prevent potentially catastrophic change, humanity must dramatically reduce total greenhouse gas emissions, on the order of 85 percent by 2050, reducing the amount of carbon dioxide in the atmosphere to 350 ppm.

Since 1900, the average temperature in the Pacific Northwest has increased by 1.5 degrees Fahrenheit. During the next century, warming is expected to increase at least three times as quickly. Impacts will include warmer, drier summers; increased heat island effects in urban areas; and wetter winters. River flows will be higher in the spring, when water already is abundant, and lower in the summer flows, when surface water is badly needed for drinking, irrigation, hydropower and salmon. Floodplain elevations may rise, affecting existing and future development patterns and infrastructure investments. More frequent droughts, fires, pest infestations and disease will threaten Oregon's forests. Beaches will be affected by rising sea levels, stronger storms and increased coastal flooding and erosion.

As climate change affects other regions of the U.S., such as the southwest, the Pacific Northwest may see an influx of "climate refugees" seeking communities where energy and water are perceived to be plentiful, further adding to increasingly strained communities. People may choose to migrate to the Northwest from increasingly inhospitable climates elsewhere in the world.

Public health concerns from changing climate, increased severe weather events, and associated natural disasters will need to be planned for. Seniors in particular are at risk of heat stroke, especially in this region, where most homes do not have air conditioning. Rising temperatures may be accompanied by increased incidents of human diseases (such as cholera) and weather-

related mortalities.

Opportunities

Climate change and energy uncertainty represent a threat to Lake Oswego and the metro area's quality of life, but also present an opportunity to create more local jobs, improve personal health, and enrich the quality of life for the community. In particular, redirecting energy dollars to pay for efficiency improvements and non-fossil fuel energy would expand markets for locally produced goods and services and keep money within the community. Buildings and transportation are two obvious places to start because they consume so much energy.

Climate Action Opportunities: Energy

Reducing and transforming energy use in homes and businesses presents a wide range of opportunities and challenges. While we have abundant hydropower in the Northwest, we still rely on coal and natural gas for nearly half of our electricity, and natural gas use is important in many residential, commercial, and industrial settings. Fortunately, a shift toward a more efficient and lower-carbon energy economy presents many cost-saving opportunities that could reduce expenditures on fossil fuels – money that leaves the community– and improve regional energy security.

GHG reduction opportunities for energy include the following:

- Energy efficiency inside buildings: Recent years have brought improvements in the energy performance of virtually every building system, from windows and insulation to lighting and appliances. These savings are greatest when incorporated into new construction, but they also offer significant opportunities in existing buildings through replacements and retrofits with new technologies. The opportunity, however, will require continual effort and even new business models for reaching homeowners, like Clean Energy Works Oregon.³⁶ The City invested a portion of the Energy Efficiency and Conservation Block Grant (EECBG) in the Clean Energy Works Oregon program, offering an additional \$500 cash rebate for eligible Lake Oswego participants. As of spring 2012, all of the funds were disbursed. The City was also able to invest in a similar offering for commercial businesses in Lake Oswego's two Main Street districts using EECBG funds, Clackamas County Energy Efficiency on Main Street program.
- Electricity from renewable sources, by utilities and in the community – Our state's Renewable Portfolio Standard (RPS) will require 25% of our electricity to come from renewable sources by 2025. Participation in PGE's Clean Wind program can accelerate this process through voluntary purchases by homes and businesses; already, 9.4% of electricity purchased by the community³⁷ and 17% by local government comes from Clean Wind, leading to EPA's recognition of Lake Oswego as a Green Power Community. And there are additional opportunities to support the utilities' investments by further transforming residential and commercial buildings with on-site generation. The City currently engages in outreach for solar through the Solarize West Linn-Lake Oswego program.³⁸

³⁶ For more information: <http://www.cleanenergyworksoregon.org/>.

³⁷ Lake Oswego is listed here: <http://www.epa.gov/greenpower/communities/index.htm>.

³⁸ <http://www.solarizewllo.org/>.

- Local code changes and green building incentives – The building code in Oregon is issued and updated by the state, while land use codes are local regulations. However, cities have room to incentivize green building practices through zoning, preferential permitting, the allocation of incentives and assistance involving transit access and parking. The City can also promote, incentivize, remove barriers to, and invest in energy efficiency, green building, smart grids, onsite renewable resources (solar, wind, geothermal, biogas and biomass) and energy generation technologies such as micro-turbines and fuel cells.
- District- and neighborhood-scale energy systems: Removing barriers to and promoting opportunities for community-owned onsite renewable or district energy systems, and other distributed generation sources will increase access to renewable energy in a community with an extensive urban forest canopy.
- Multi-family Dwellings: A shift toward higher density, mixed-use development is associated with reductions in transportation emissions but it also delivers GHG benefits from energy savings through inherent efficiencies such as shared walls, and decreasing heating and cooling loads.³⁹ Also, units in apartment and condominium complexes tend to be smaller, decreasing square footage per occupant and leading to further energy-use reductions.⁴⁰

The scale of potential improvement from renewable sources of electricity is 45-55% of Energy, and 10-12% of total of overall GHG emissions. (This report did not quantify potential savings from transformation of the building stock, but many estimates suggest energy savings of 50-75% over the next few decades.)

GHG Reduction Opportunities for Transportation

Oregon Department of Transportation and Metro have developed a detailed quantitative model of the determinants of GHG emissions from transportation. Metro’s Climate Smart Communities Strategies summarizes the results of this modeling effort for the Metro region. While a detailed review is beyond the scope of this document, the discussion below summarizes the six policy areas (two closely related areas, Fleet and Technology, have been combined):

- Roads – Freeway and arterial capacity; traffic management strategies (such as signal synchronization).
- Pricing – Gas tax, road user fee, pay-as-you-drive insurance, carbon tax.
- Marketing and Incentives – Individualized marketing, employer commute programs; car-sharing.
- Fleet and Technology – Fleet mix (cars vs. light trucks/SUVs); electric vehicle and hybrid market share. The City of Lake Oswego is in the process of installing two publicly available Level II electric vehicle charging stations in downtown Lake Oswego.

³⁹Urban Land Institute, 2003, “The Case for Multi-Family Housing”:

<http://www.uli.org/ResearchAndPublications/Reports/~media/Documents/ResearchAndPublications/Reports/Affordable%20Housing/MultifamilyHousing.ashx>. Given that the baseline population scenario for Lake Oswego includes a significant increase in the share of the population over the age of 65 (rising from 14% to 24% by year 2035), this may be a reasonable local strategy.

⁴⁰ A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon, Phase 2, Version 1.4, September 2010, <http://www.deq.state.or.us/lq/sw/wasteprevention/greenbuilding.htm>.

- Community Design – Complete neighborhoods and mixed-use areas; bicycle travel; parking demand management.

The scale of potential improvement from the above measures is 70-82% reductions in Local Passenger Transportation, which 10.5-12.3% of total. (This range comes from Metro’s modeling efforts in support of the Climate Smart Communities Scenarios.) The scenarios comprise different combinations of the many possible strategies inside the policy areas, therefore resulting in different levels GHG reduction in 2035 and beyond.

Climate Action Opportunities – Materials Flows

There are many action opportunities in better managing our flows of materials – and many actions that save money and improve our lives. The following categories capture many things that the City can do. Many of the items, however, require community buy-in or even proactive involvement, such as actions taken by industry, households and businesses.

GHG Reduction Opportunities for Materials Management in Buildings and Infrastructure

The GHG reduction opportunities below are focused on materials management in buildings and infrastructure, food, consumption patterns and habits, and education and outreach.

In construction of residential and commercial buildings, local infrastructure projects and on-going repair and renovation of the built environment, the community is responsible for the consumption of large volumes of materials, year after year. While this is a significant part of Lake Oswego’s carbon footprint, there are many technology and materials substitution options that can reduce these emissions, often while saving money.

- Material Selection – Promote sustainable construction practices using different materials in construction, such as materials with recycled content, rapidly renewable materials, or materials extracted, processed or manufactured regionally. The Leadership in Energy and Environmental Design (LEED) criteria for new construction has definitions and guidelines for using these kinds of materials in construction.⁴¹
- End-of-Life Efficiencies – Promoting material reuse of high-value items, and deconstruction instead of demolition can be an effective strategy at reducing GHG emissions from producing new, virgin materials. Local government can ensure city code encourages deconstruction as a viable strategy for material reuse. Oregon DEQ estimates that original and replacement materials production accounts for roughly between 15-22% of the GHG emissions associated with a home over its lifetime⁴². This percentage will grow as we achieve increases in energy efficiencies of our buildings.
- Multi-family Dwellings – Encouraging mixed-use development that includes multi-family dwellings can decrease material consumption as this type of construction uses fewer materials than detached dwellings due to shared walls and other efficiencies.

⁴¹ LEED for New Construction and Major Renovations: <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>.

⁴² Oregon DEQ, Phase 2 Report, September 2010, “A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon”: <http://www.deq.state.or.us/lq/pubs/docs/sw/ResidentialBldgLCA.pdf>

- Emerging pavement technologies – New technologies for paving can make a significant impact on cities that are in charge of road maintenance and preservation.⁴³

GHG Reduction Opportunities Related to Food

We all have an important carbon footprint in agriculture, even if we never set foot on a farm. Diet changes, especially reduced consumption of animal products, can lessen this impact substantially.⁴⁴ As a society, we also waste a great deal of food, providing another source of efficiency. Sending organic materials such as food to the landfill can generate methane, a potent greenhouse gas, so looking at alternatives to landfilling organic materials is another opportunity. Strategies for Lake Oswego to address these emissions include:

- Promote lower consumption of carbon-intensive foods: Similar to the Portland and Multnomah County Climate Action Plan,⁴⁵ the City can provide public education about making low-carbon dietary choices to reduce consumption of red meat and dairy products, as well as products transported long-distances by air.
- Choose low-carbon foods for city food purchases: The city purchases food for various community events and could incorporate guidelines for low-carbon food choices into its procurement program.
- Encourage food donation: The City of Lake Oswego can promote participation in Metro's Fork it Over! food donation program to reduce both hunger and food waste throughout the community.
- Compost, not landfill: Encourage food waste recycling through composting. Lake Oswego commercial garbage customers are able to participate in Allied Waste's commercial organics collection program. Encouraging both food donation and composting opportunities will help Lake Oswego meet its waste reduction and recycling recovery rate goals set by Portland Metro.
- Support local farmers: Residents and businesses can support the local economy by purchasing food from local farmers. Buying locally grown products also helps preserve the agricultural land base and can reduce GHG emissions from transporting food. The City can promote opportunities to learn about or participate in local farmers' markets, Community Supported Agriculture programs, or online market development tools such as FoodHub⁴⁶.
- Encourage backyard gardening: The City can promote programs to give citizens the skills to grow their own food, and the knowledge to make healthy consumption choices.

⁴³ Warm-mix asphalt concrete (WMA) can provide many sustainability benefits including decreased energy and GHG emissions from production at lower temperatures, increased ability to use recycled materials, the same or better compaction, less smoke during placement, and enhanced pavement life. The GHG savings come primarily from the fact that WMA is mixed at temperatures 50-100 degrees Fahrenheit cooler than conventional hot-mix asphalt concrete. In 2009, City of Eugene developed a WMA pilot program and due to the success of the pilot, in 2010 they made WMA the standard for street paving. In many cases, Eugene found this product can be less expensive due to lower energy costs.

⁴⁴ Weber, Christopher L. and H. Scott Matthews. "Food-Miles and the Relative Climate Impacts of Food Choices in the United States." *Environmental Science and Technology*, April 16, 2008, p. 3513.

⁴⁵ City of Portland and Multnomah County Climate Action Plan, 2009:

<http://www.portlandonline.com/bps/index.cfm?a=268612&c=49989>

⁴⁶ FoodHub, developed by Ecotrust, is a free online tool to link local growers with commercial food buyers: <http://foodhub.org/>

- Reviewing City codes and policies for barriers to home-based businesses with food sales, processing, and distribution.
- Encouraging a diverse local economy and support of local businesses, producers, and manufacturers.

The scale of potential improvement from diet change (reduction in meat and dairy consumption) is 54-77% of Food, 4.7-6.7% of total. (This range comes from modeling different diet choices using the CoolClimate Household Carbon Footprint Calculator developed by University of California, Berkeley.⁴⁷)

GHG Reduction Opportunities for Waste Management and Waste Reduction

The largest component of community emissions is related to consumption of goods and food, but there are many strategies for reducing emissions through management – and prevention – of wastes of various kinds. Local government can take action on some of these opportunities, but others need to be implemented community-wide by a variety of groups including industry, business, and households:

- Reduce packaging;
- Reduce use of non-packaging paper products;
- Increase recycling of construction and demolition debris;
- Increase recycling rates in City operations and in the community;
- Increase composting of food scraps to 100%;
- Emerging technologies for energy recovery from 25% of the waste stream that is currently landfilled; and
- Additional methane capture (25%) at landfills to generate electricity.

The scale of potential improvement is 10-12% of Materials, and 4-5% of total emissions. (This range comes from modeling done by the US EPA, “Opportunities to Reduce GHG Emissions through Materials and Land Management Practices.”)⁴⁸

Opportunities for Education and Outreach about Consumption and Carbon Footprints

The City of Lake Oswego and local organizations have an opportunity to inform citizens and businesses about the impacts of what they buy and use. The City can connect consumers to information and business resources for making change, including many programs offered by independent sources and other jurisdictions. A few examples:

- Educate about and plan for zero-waste events: the Farmers Market does not allow vendors to sell bottled water and vendors are able to compost pre-consumer food items.
- Promote electronics reuse and recycling through Oregon E-Cycles, a state recycling program for computers, monitors, and TVs.

⁴⁷ CoolClimate Household Carbon Footprint Calculator developed by University of California, Berkeley is available online at <http://coolclimate.berkeley.edu/carboncalculator>

⁴⁸ US EPA, September 2009 available online at http://www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf

- Connect citizens and households to resources such as Metro’s Sustainable Living web site,⁴⁹ a gateway to many resources.
- Encourage local businesses to implement waste reduction strategies and get recognition for their efforts through the Clackamas County Business Recycling Awards Group (BRAG).⁵⁰

All of the above opportunities will also provide increased self-reliance and security in the face of rising energy prices, which will lead to increased energy, transport, and food prices.

In addition to the above identified opportunities, additional general recommendations include:

- Explore opportunities to address policy, code, legislative, and financial barriers to onsite renewables and energy efficiency.
- Incorporate energy and climate considerations into key decision-making, policy, and planning tools.
- Further define the relationship of energy and climate to economic development, housing options, transportation, infrastructure, environment, urban form, and other topics.
- Pursue opportunities to coordinate and regionalize innovative approaches to energy and climate-related challenges and issues, including climate adaptation and resiliency strategies.

⁴⁹ Sustainable Living at Metro’s web site: <http://www.oregonmetro.gov/sustainableliving>.

⁵⁰ Information for the Clackamas County Business Recycling Awards Group (BRAG) is available at <http://www.clackamas.us/transportation/recycling/preventioncom.jsp>