City of Redmond Climate Action Implementation Plan

September 2, 2014

IMPACT redmond

CityofRedmond
WASHINGTON

Pledge

The City of Redmond is committed to a Sustainable future for our citizens and businesses. By adopting this document, the City will commit to:

Engage and coordinate in a regional collaborative approach to anticipate and respond to climate change impacts;

Move forward working on the strategies identified in this document, which provides both background and direction;

Strive to reduce the City's operational carbon footprint as well as the community's carbon footprint;

Lead by example and work with residents and businesses to improve reduction of energy consumption and greenhouse gas emissions without intruding on property rights; and

Work towards addressing climate change impacts at the local and regional level complementary to state and national strategies.

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September 2, 2014

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Mayor John Marchione

City Council Members
- Kimberly Allen
- David Carson
- Tom Flynn
- Hank Margeson
- Hank Myers
- Byron Shutz, Jr.
- John Stilin

Climate Action Implementation Committee
- Mike Bailey, Finance Director, Finance Department
- Cathy Beam, AICP, Principal Planner, Planning Department
- Lori Brown, Human Resources Program Manager, Human Resources Department
- Carolyn Hope, Parks Planning Manager, Parks Department
- Joseph McGrath, Finance Officer, Fire Department
- Erik Scairpon, Police Commander, Police Department
- Jon Spangler, PE, Natural Resources Division Manager, Public Works Department

Contributing Staff
- Stacey Auer, Program Administrator
- Caroline Chapman, Program Coordinator
- Kelsey Johnson, Assistant Planner
- Thara Johnson, Planner
- Sergio Santander, Graphic Designer

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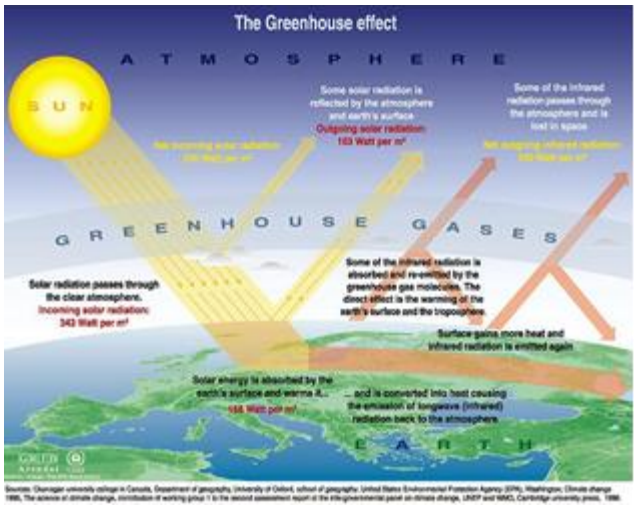


Leading atmospheric scientists predict that climate change will have serious environmental, economic, and public health consequences in the coming decades. Naturally occurring levels of greenhouse gases are necessary to life because they keep the earth's temperature stable and the surface warmer than it otherwise would be. However, the Environmental Protection Agency states that for over the past 200 years burning of fossil fuels and increasing rates of deforestation and development have produced growing amounts of carbon dioxide and other "Greenhouse Gases." This has caused concentrations of heat-trapping greenhouses gases to increase significantly in our atmosphere. These gases trap the sun's energy and thereby heat the earth, preventing heat from escaping to space.

Most scientists believe that:

- Human activities are changing the composition of the earth's atmosphere. Increasing levels of greenhouse gases like carbon dioxide in the atmosphere since preindustrial times are well documented and understood.
- The atmospheric buildup of carbon dioxide and other greenhouse gases is largely the result of human activities such as the burning of fossil fuels.
- The major greenhouse gases emitted by human activities remain in the atmosphere for periods ranging from decades to centuries. It is therefore virtually certain that atmospheric concentrations of greenhouse gases will continue to rise over the next few decades.
- Increasing greenhouse gas concentrations tend to warm the planet.

This change in our atmospheric makeup will cause changes in weather and moisture patterns. This will affect stream flow, groundwater recharge and flooding, and may increase risks of

wildfire, drought, and invasive plant and animal species. Researchers found that climate change has already negatively impacted the Puget Sound Region, with snowpack necessary for summer water supplies and to power hydroelectric dams in Cascade Mountains down by 25%, and increased incidents of wildfires and extreme flooding due to drier summers and wetter winters.[1] Additionally, evolving weather, air and water temperature, humidity, and soil moisture will affect resident and migratory fish and wildlife species and their habitats, and may increase risks to their survival. Climate protection must be inextricably linked with actions to create and maintain jobs, improve community livability and public health, address social equity, and foster strong, resilient natural systems.

Because of the long-time lag between changes in emissions and global climate patterns, the future climate will first reflect the past century of emissions, while ultimately reflecting our choices today.

City of Redmond's Role

As a local government, Redmond is in a position to affect change locally, regionally, and nationally by preparing for climate change and identifying actions that would help lessen our local impact in the production of greenhouse gases. Redmond has an important role to play, with both in developing the fundamental shape of the community, transportation systems, and buildings, and in helping individuals make informed choices about everyday business and personal choices.

This Climate Action Implementation Plan presents a framework for confronting climate change and engaging the community. Staff has analyzed the City of Redmond's greenhouse gas emissions since 2008 to create a baseline of the city's impact. This baseline will help inform strategies as they relate to mobility, buildings and energy, waste and recycling, education and encouragement, and natural resources. Guided by this plan, Redmond will be able to carry out strategies to minimize household, business, and government emissions and prepare for the coming environmental and economic challenges. These efforts will help the entire community thrive now and in the future. These efforts are reflective of the City's core values: accountability, integrity, and commitment.

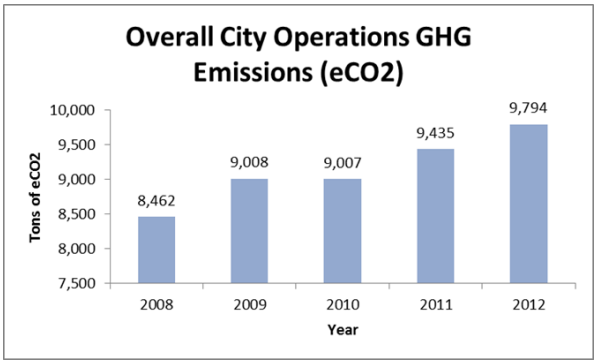
We recognize the cost of inaction could be very high and that inaction represents a missed opportunity for cost savings and improving the economic, environmental, and social sustainability of the community. As an organization, the City of Redmond is hopeful that efforts

[1] Global Climate Change Impacts in the United States, 2009. http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts

to monitor and reduce emissions in our own governmental operations will serve as an example to engage the involvement of the community.

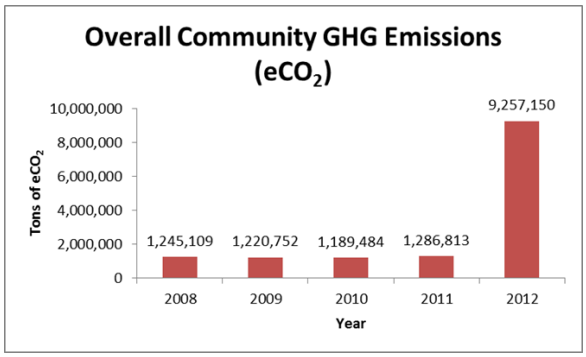
Our response to the threat of climate change presents opportunities to create a more livable, equitable, and economically vibrant community. By using energy more efficiently, harnessing renewable energy to power our buildings, enhancing access to sustainable transportation modes, and recycling our waste, we can keep dollars in our local economy, create new green jobs, and improve community quality of life.

Figure 2, Overall City Operations GHG Emissions Baseline



The City has a series of strategies to address reductions in greenhouse gas emissions and energy consumption for both city operations and the community at large. The strategies are interconnected, but lend themselves to the broader categories of Mobility, Buildings and Energy, Waste and Recycling, Natural Resources, and Education and Encouragement. These categories help focus reduction efforts and keep all the potential strategies organized. The Mobility category explores strategies that will reduce vehicle miles traveled, support more efficient fuels and vehicles, and encourage alternative transportation modes. The energy we use to heat, cool, and operate our buildings accounts for much of the energy we use. As such, the Buildings and Energy category identifies strategies that reduce energy use, save money, and increase the reliance on renewable energy sources. Waste and Recycling strategies target increasing recycling and composting rates that, in turn, will conserve energy, protect natural resources, and reduce harmful greenhouse gas emissions such as methane. Climate change will have an impact on our natural resources as we begin to experience weather extremes. The Natural Resources category focuses on strategies to protect, enhance, and restore natural resources to help make Redmond more resilient to climate change and maintain clean air and water for residents. Lastly, the Education and Encouragement category explores strategies to educate city staff, business leaders, and community members about climate change impacts, and empower and encourage them to act in ways that will reduce their environmental impact.

Figure 3, Overall Community GHG Emissions Baseline



Introduction & Background

Basics of Climate Change

According to the Environmental Protection Agency (EPA),[2] climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from:

- Natural factors, such as changes in the Sun's energy or slow changes in the Earth's orbit around the sun;
- Natural processes within the climate (e.g., changes in ocean circulation);
- Human activities that change the atmosphere's makeup (e.g., burning fossil fuels) and land surface (e.g., cutting down forests, planting trees, building developments in cities and suburbs, etc.).

Atmospheric pollution from greenhouse gases and criteria air pollutants threatens to alter the way the natural environment functions and to affect human health and well-being. In the Pacific Northwest, average annual temperatures are already rising. Reduced snowpack and earlier spring runoffs could result in increasing water shortages and drought conditions. Approximately half of the greenhouse gas emissions in the central Puget Sound come from cars, trucks, and other transportation. A long-term commitment to sustainable growth, clean transportation, and environmentally friendly development practices will reduce greenhouse gas emissions and create healthier communities.[3]

Greenhouse Gases

Greenhouse gases (GHG) are gases in the Earth's atmosphere that trap the Sun's energy and thereby heat the Earth's atmosphere. They include, but are not limited to, carbon dioxide (a byproduct of burning fossil fuels), methane from agricultural sources, and nitrous oxide from industrial sources.

The EPA states that for over the past 200 years, the burning of fossil fuels, such as coal and oil, and deforestation have caused the concentrations of heat-trapping greenhouse gases to

[2] U.S. EPA, April 14, 2011; http://epa.gov/climatechange/basicinfo.html
[3] Vision 2040, Puget Sound Regional Council, September 2010

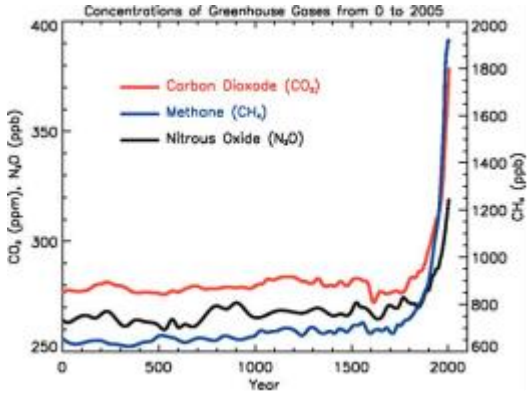
increase significantly in our atmosphere.[4] These gases prevent heat from escaping to space, somewhat like the glass panels of a greenhouse.

Table 1, Greenhouse Gases and Their Sources

Greenhouse Gas	Sources
Carbon Dioxide (CO_2)	▪ Burning fossil fuels ▪ Driving cars ▪ Heating homes and buildings ▪ Deforestation
Nitrous Oxide (N_2O)	▪ Burning fossil fuels ▪ Synthetic fertilizers
Methane (NH_4)	▪ Production and use of natural gas ▪ Animal husbandry ▪ Landfills ▪ Waste water treatment ▪ Agricultural activities

Many greenhouse gases, like water vapor and carbon dioxide (CO_2), occur naturally. Fuel burning and other human activities are adding large amounts of carbon dioxide and other gases to the natural mix at a faster rate than at any other time on record. Other important greenhouse gases produced by human activity include methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Figure 4, Concentrations of Greenhouse Gases 0-2005



Since the Industrial Revolution in 1750, atmospheric concentrations of CO_2, CH_4, and N_2O have increased by 36 percent, 148 percent, and 18 percent respectively.[5] While there are natural fluctuations in atmospheric concentrations of these GHGs, the impact human activity is having on the rate these concentrations are present is much higher than would be expected if only natural forces were at work. Figure 4 looks at the concentrations of these GHGs over time, with historical levels of GHG being measured from ice core sampling.

[4] Ibid
[5] U.S. EPA Frequently Asked Questions About Global Warming and Climate Change: Back to Basics, April 2009

The Intergovernmental Panel on Climate Change (IPCC) reports that most emissions during the past 20 years are due to fossil fuel burning.[6] The rest is mostly due to land use change, especially deforestation. The United States is the world's leading producer of greenhouse gases. The largest sources of greenhouse gas emissions in the United States are electricity generation, transportation, and buildings. In Washington State, nearly 50 percent of the greenhouse gas contributions are transportation related.

Indications of Climate Change

The Intergovernmental Panel on Climate Change (IPCC) has reached a strong consensus regarding the science of climate change. The Earth's temperature is rising, and that rise is caused by carbon dioxide emissions and other greenhouse gases from human activities. According to the National Academy of Sciences, many indications of climate change have been occurring with more and more frequency.

- Glaciers worldwide have been losing mass since the 1970s, with the rate of loss accelerating in roughly the last decade.[7] This retreat is correlated to the man-induced mean increase in air temperature.[8]
- Icecaps in the Arctic and Antarctic are thinning and melting rapidly.
- Sea level has risen about four to ten inches in the last century.
- Intense rainstorms and snowstorms have become about 10% more frequent in the U.S. and southern Canada during the 20th and 21st centuries.
- The worst storms have become more extreme due to Earth's warming temperatures; the amount of rain or snow falling in the heaviest one percent of storms has risen nearly 20% on average in the United States (16% higher in the Northwest and 67% higher in New England).[9]
- Major storms since the 1970s in both the Atlantic and Pacific Oceans have increased in duration and intensity by about 50%, according to Massachusetts Institute of Technology (MIT) research.
- The number of intense hurricanes has been increasing in recent years.

Projections & Impacts of Climate Change

At the current rate, the Earth's global average temperature is projected to rise between 3°F and 7°F by 2100, and it will get even warmer after that.[10] As the climate continues to warm, more changes are expected to occur, and many effects will become more pronounced over time. For

[6] Washington State Department of Ecology, Frequently Asked Questions on Climate Change, Publication No. 08-01-024, August 2008
[7] EPA's 2012 Climate Change Indicators in the U.S., 2nd Edition, 2012
[8] Global Glacier Changes: Facts and Figures, page 28-30, World Glacier Monitoring Service, 2008
[9] "Trends in Precipitation Intensity in the Climate Record," Groisman et al, Journal of Climate, March 14, 2004.
[10] EPA Climate Change Science Facts, April 2010

example, heat waves are expected to become more common, severe, and longer lasting. Some storms are likely to become stronger and more frequent, increasing the chances of flooding and damage in coastal communities.

Climate change will affect different regions, ecosystems, and sectors of the economy in many ways depending not only on the sensitivity of those systems to climate change, but also on their ability to adapt to risks and changing conditions. Throughout history, societies and ecosystems alike have shown remarkable capacity to respond to risks and adapt to different climates and environmental changes. Today, the effects of climate change have already been observed, and the rate of warming has increased in recent decades. For this reason, human-caused climate change represents a serious challenge—one that could require new approaches and ways of thinking to ensure the continued health, welfare, and productivity of society and the natural environment.[11] The impacts of climate change will be seen in the following areas:

- **Health:** Longer, more intense and frequent heat waves may cause more heat-related death and illness. There is virtual certainty of declining air quality in cities since greater heat can also worsen air pollution such as ozone or smog. Climate change health effects are especially serious for the very young, very old, or for those with heart and respiratory problems. Conversely, warmer winter temperatures may reduce the negative impacts from cold weather.

- **Agriculture and Forestry:** The supply and cost of food may change as farmers and the food industry adapt to new climate patterns. In recent years, more frequent, severe droughts in the American West have had a large impact on crop productivity, which is expected to raise prices for many foods. For warming of more than a few degrees, the effects are expected to become increasingly negative, especially for vegetation near the warm end of its suitable range.

- **Water Resources:** In a warming climate, extreme events like floods and droughts are likely to become more frequent. More frequent floods and droughts will affect water quality and availability. For example, increases in drought in some areas may increase the frequency of water shortages and lead to more restrictions on water usage. An overall increase in precipitation may increase water availability in some regions, but also create greater flood potential.

[11] U.S. EPA Frequently Asked Questions About Global Warming and Climate Change: Back to Basics, April 2009

- **Energy:** Warmer temperatures may result in higher energy bills for air conditioners in the summer and lower bills for heating in the winter. Energy usage is also connected to water needs. Energy is needed for irrigation, which will most likely increase due to climate change. Also, energy is generated by hydropower in some regions, which will also be impacted by changing precipitation patterns.

- **Wildlife:** Warmer temperatures and precipitation changes will likely affect the habitats and migratory patterns of many types of wildlife. The range and distribution of many species will change, and some species that cannot move or adapt may face extinction.

- **Recreational Opportunities:** Some outdoor activities may benefit from longer periods of warm weather. However, many other outdoor activities could be compromised by increased beach erosion, increased heat waves, decreased snowfall, retreating glaciers, reduced biodiversity, and changing wildlife habitat.

- **Coasts:** Rising sea levels may contribute to enhanced coastal erosion, coastal flooding, loss of coastal wetlands, and increased risk of property from storm surges.

Climate Change Impacts in Washington State

Washington State is vulnerable to a warming climate, especially our snow-fed water supplies and nearly 40 communities along our 2,300 miles of shoreline that are threatened by rising sea levels.[12] In the last decade, over ten major disaster declarations were made. The frequency and severity of events like these that occurred are expected to increase:

- Extreme windstorms and heavy rain or snow.
- Droughts with severe impacts on fish, cities, farms, and forests, including increased forest fires.
- Devastating floods like the Lewis County flood in December 2007.
- Intense wildfires burning thousands of acres of forests.
- Coastal erosion and landslides from more frequent and intense storms combined with higher sea levels.

In a 2009 report, researchers found that we are already experiencing negative impacts from climate change locally.[13]

- Regional temperatures have increased 1.5 degrees (could go up 3-10 degrees over the next 100 years).

[12] Washington State Department of Ecology, Frequently Asked Questions On Climate Change, Publication No. 08-01-024, August 2008
[13] Global Climate Change Impacts in the United States, 2009. http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts

- Spring snowpack in the Cascade Mountains is down 25% in the past 40-70 years. Spring snowpack provides water for summer irrigation and to power hydroelectric dams.
- Increased incidences of wildfires and insect outbreaks due to drier, warmer summers.
- Salmon and other cold water species facing stress from the increased temperature of water and the reduced water flow (outcome of reduced snowpack).

For Redmond, this means the potential for increased fire risk, increased water consumption, and increased storm events. The city is semi-dependent upon snowfall for water. Redmond is better off than some cities since we have a prolific aquifer in addition to the Tolt Pipeline water supply. However, with drier summers predicted, water conservation is likely an integral strategy to ensure adequate groundwater supply and in-stream flow for key fish species. Increased storm events have the potential to increase flooding events. Ensuring stormwater infrastructure is appropriately sized to handle extreme events is another critical approach in planning for Redmond's future. The various greenhouse gas emissions reduction strategies outlined later in this report provide a variety of proactive mechanisms and steps Redmond can take to adapt to a changing environment.

Addressing Climate Change

Role of Local Government

Scientific evidence indicates that even if we could halt greenhouse gas emissions today, the world would still experience a warming climate for decades to come. For local governments, that means serious impacts at the community level, many of which are already being felt.

- Extreme heat waves that put the elderly, young, and disadvantaged at risk.[14]
- More frequent severe storms and floods that damage infrastructure like bridges, roads, and culverts, and overwhelm storm sewers.
- Water shortages during more frequent and intense droughts.
- Increased smog and air pollution that exacerbate respiratory illnesses and other medical conditions.[15]
- Intruding sea levels that threaten coastal property and natural habitat, and can contaminate drinking water aquifers.
- Increased transmission of diseases, either waterborne or via insects or rodents.

Local governments have the power to affect the main sources of pollution directly linked to

[14] EPA's 2012 Climate Change Indicators in the U.S., 2nd Edition, 2012
[15] EPA's 2012 Climate Change Indicators in the U.S., 2nd Edition, 2012

climate change: energy use, transportation, and waste. Cities control the day-to-day activities that determine the amount of energy used and waste generated by their community—from land use and zoning decisions to control over building codes and licenses, infrastructure investments, municipal service delivery, and management of parks and recreation areas. A range of actions can be incorporated into these operations to reduce associated global warming emissions. Local governments are uniquely positioned to influence citizen behaviors that directly affect climate change such as transportation options, energy consumption patterns, and general consumer decisions.

What Can Local Governments Do?

A range of effective strategies and actions can help local governments reduce the negative impacts of climate change and maximize any positive impacts. What makes climate adaptation strategies so appealing are their numerous co-benefits: saving money, decreasing energy use, increasing community livability, enhancing public health, vibrant economies, and creating more robust and just communities.

Given the significant role of transportation as the primary source of greenhouse gas emissions in our region, local jurisdictions and transit agencies should advance more efficient and less polluting alternatives to driving alone. Regulatory and incentive approaches should also be explored, including changing zoning regulations to promote more mixed-use and higher-density development. These approaches can create more walkable communities. Local jurisdictions should also encourage alternative energy sources at work and at home. Development practices that retain or restore vegetation and conserve water and energy also can help address issues related to climate change and should be pursued.

Examples of adaptation strategies include:

- Encourage energy efficiency and distributed power generation from multiple renewable resources to reduce potential for grid overload during heat waves, decreasing likelihoods of blackouts;
- Reduce vulnerability to flooding by promoting functional watersheds, including healthy forests and open space;
- Develop neighborhoods and urban areas that enhance access to sustainable transportation modes;
- Counteract urban heat island impacts by planting trees to provide shade and cooling;
- Strengthen infrastructure to address increased flooding, such as larger bridges and culverts and other stormwater conveyance systems;
- Develop building standards that include greater resistance to high winds and flooding; and

- Diversify water supplies and promote conservation actions, such as harvesting rainwater.

Reasons for Local, Regional, and State Governments to be Proactive

There are several fundamental reasons for local, regional, and state governments to be proactive in preparing for climate change impacts.

- **Planning for the future can benefit the present**. In assessing what the future climate holds, governments may find that many projected climate change impacts are in fact more extreme versions of what communities are already experiencing today as a result of present day climate variability and extreme climate events. Climate change, for example, will increase the risk of drought, which all communities experience periodically. Implementing a water conservation program in anticipation of this changing drought risk offers immediate benefits for managing current drought as well as the more frequent and more intense droughts projected in the coming decades.

- **Preparing for climate change is "good government."** Governments across the U.S. and world share a common goal of ensuring safety, health, and welfare of their communities now and in the future. Meeting this goal and maintaining the integrity of essential public services requires that governments anticipate trends and changes that could affect the environment, economy, and community well-being. Because climate change will affect a broad range of community assets and government services, operations and policy areas, preparing for climate change is thus a matter of "good government" and risk management.

- **Localities, regions, and states are on the front lines of climate change impacts, and have a responsibility to respond**. Climate change is a global trend, but one which localities, regions, and states will experience to different degrees and in different ways. Also, by nature, public programs and policy strategies designed at the federal or international level have a limited level of specificity, whereas local, regional, and state governments are in a stronger position to tailor climate change preparedness strategies to their specific circumstances and to the unique set of climate change impacts that they expect to face. Therefore, while higher levels of government can and should provide funding and support for climate change preparedness strategies on the ground, local, regional, and state governments have an equal or even greater responsibility to plan proactively as well.

- **Proactive planning is more efficient and less costly than responding reactively to climate change impacts as they happen.** Taking proactive steps to be flexible and to anticipate and address expected impacts can save money and protect the well-being of communities. For instance, considering the impacts of climate change on water supply and demand in design criteria for a new water source can help ensure that the new source meets future water needs and may be less costly than having to expand it in the future.

- **Thinking strategically can reduce future risks**. Being proactive and strategic in planning for climate change impacts can create opportunities for modifying present-day policies and practices that can increase vulnerability to climate change.

- **Thinking strategically can increase future benefits**. Being proactive can create opportunities for capitalizing on some of the benefits of climate change. Warmer winter temperatures could lead to cost savings from reduced winter road maintenance requirements.

- **Anticipating future changes can add value to today's investments at low additional cost.** Preparing for climate change impacts may provide opportunities to add value to existing capital projects. "Piggybacking" a reclaimed water system onto a planned wastewater facility expansion, for example, reduces marginal cost of adding the reclaimed water system while providing buffering capacity against projected water supply impacts.

Climate Protection Benefits

Many of the strategies suggested to reduce greenhouse gas emissions and address the impacts of climate change will have additional, positive impacts beyond reducing our impact on the environment. Key benefits include:[16]

- **Save Taxpayer Dollars**: Actions that reduce global warming pollution also reduce electricity and fuel use, minimizing energy costs for citizens, businesses, and local governments. In 2005 through ICLEI's Cities for Climate Protection Campaign more than 160 US local governments reported collected savings of over 23 million tons of global warming pollution and $600 million in related energy and fuel costs.

[16] U.S. Mayors Climate Protection Agreement Climate Action Handbook

- **Build the Local Economy and Create Jobs:** Decreased energy costs and the provision of new energy services and technologies (e.g., energy efficiency and renewable energy) give local government and private firms a competitive edge. Demand for energy efficient products and services and for new or alternative energy technologies expands local business and creates local jobs.

- **Improve Air Quality and Public Health**: Reducing global warming pollutants also helps cities comply with federal air quality regulations and preserves federal funding for local projects. These strategies ultimately create less air pollution, which results in fewer air quality-related public health impacts, such as asthma and other respiratory ailments.

- **Improve Community Livability**: Cutting global warming pollution includes measures that also reduce auto dependency and traffic congestion, clear the air, and contribute to more efficient land use patterns and walkable neighborhoods. In combination, these types of measures can help build a more livable community.

- **Create a Legacy of Leadership**: Taking action on climate change provides tangible benefits to citizens today and ensures that future generations will have access to the resources that support healthy, prosperous, and livable communities.

Climate Action Implementation Plan

What is a Climate Action Implementation Plan?

A Climate Action Implementation Plan focuses primarily on reducing greenhouse gas emissions including emissions resulting from both the local government's operations and from the community as a whole. It typically includes an analysis of the opportunities to reduce greenhouse gas emissions resulting from energy use in transportation, solid waste disposal, building, lighting, wastewater treatment, and water delivery. Some local governments also include environmental opportunities beyond reducing energy—such as the development of renewable energy resources, the conservation of natural resources, forestry/urban forestry, agriculture, and green jobs. A Climate Action Implementation Plan often addresses the co-benefits of its initiatives, such as improving air quality and public health or reducing stormwater runoff.

A Climate Action Implementation Plan is different than a Sustainability Plan. A Sustainability Plan typically includes an overarching goal to reduce greenhouse gas emissions, in addition to addressing a set of environmental, economic, and social equity goals. It takes into account the

interrelated issues of climate change, population change, land use, infrastructure, natural resources management, quality of life, public health, and economic development. In this vein, a Climate Action Implementation Plan focuses sustainability efforts that directly impact climate change, and in the future, the scope could be expanded to become a Sustainability Plan.

Legislative Framework

On February 15, 2005, the Kyoto Protocol, the international agreement to address climate disruption, became law for 169 countries and the United States is not among them. For 38 of the countries with the most advanced economies, the Protocol sets binding legal commitments to reduce greenhouse gas emissions on average 5.2% below 1990 levels. If the United States had ratified the Kyoto Protocol, our nation would have been required to reduce greenhouse gas emissions by 7% below 1990 levels by 2012. By not ratifying the Kyoto Protocol, efforts to address climate change were left to state and local agencies.

Federal Government

In June 2013 President Obama released the Nation's Climate Action Plan. This Plan includes a series of actions to reduce greenhouse gas emission from the United States. These actions include:

- Reduce power pollution from power plants;
- Accelerate clean energy leadership;
- Build a 21st century transportation sector;
- Cut energy waste in homes, businesses, and factories;
- Reduce other greenhouse gas emissions; and
- Demonstrate federal leadership.

In addition, there has been a series of executive orders to reduce carbon pollution, prepare the United States for the impacts of climate change, and lead international efforts to address global climate change.

State of Washington

The State of Washington, through Governor Gregoire's Executive Order 07-02 (Climate Change Challenge) has adopted greenhouse gas emission reduction goals for the state:

- Reduce greenhouse gas emissions in the state to 1990 levels by 2020, a reduction of ten million metric tons below 2004 emissions;

- Reduce greenhouse gas emissions in the state to 25% below 1990 levels by 2035, a reduction of 30 million metric tons below 2004 emissions; and
- Reduce greenhouse gas emissions in the state to 50% below 1990 levels by 2050, a reduction of nearly 50 million metric tons below 2004.

These goals are overall statewide reduction goals, across all sectors and sources of emissions. The state has not yet assigned targets for the regions of the state, nor for individual sectors.

In April 2014 Governor Inslee announced executive action to reduce carbon pollution and promote clean energy. Known as Washington State Executive Order 14-04 (Washington Carbon Pollution Reduction and Clean Energy Action), the Order outlines a series of steps to cut carbon pollution in Washington State and advance development and use of clean energy technologies. Highlights of this Order include:

- Reduce carbon emissions through new cap-and-trade program;
- End use of electricity generated by coal;
- Develop clean transportation options and cleaner fuels;
- Accelerate development and deployment of clean energy technology;
- Improve energy efficiency of the places where we work and live; and
- Reduce state government's carbon footprint.

Puget Sound

According to Vision 2040, a long-term commitment to sustainable growth, clean transportation, and environmentally friendly development practices will reduce greenhouse gas emissions and create healthier communities. Vision 2040 sets countywide planning policies, including a set of goals for the environment, and a more specific set of goals addressing climate change. Vision 2040 calls for reducing our contribution to greenhouse gas emissions and preparing for the anticipated impacts of climate change. This includes efforts to maximize energy efficiency and increase renewable energy, reduce greenhouse gas emissions of new vehicles, reduce motor vehicle miles traveled, improve the convenience and safety of nonpolluting transportation modes such as bicycling and walking, protect the natural landscape and vegetation, and increase recycling and reduce waste. These policies include:

- **MPP-En-20:** Address the central Puget Sound region's contribution to climate change by, at a minimum, committing to comply with state initiatives and directives regarding climate change and the reduction of greenhouse gases. Jurisdictions and agencies should work to include an analysis of climate change impacts when conducting an environmental review process under the State Environmental Policy Act.

- **MPP-En-21:** Reduce the rate of energy use per capita, both in building use and in transportation activities.
- **MPP-En-22:** Pursue the development of energy management technology as part of meeting the region's energy needs.
- **MPP-En-23:** Reduce greenhouse gases by expanding use of conservation and alternative energy sources and by reducing vehicle miles traveled by increasing alternatives to driving alone.
- **MPP-En-24**: Take positive actions to reduce carbons, such as increasing the number of trees in urban portions of the region.
- **MPP-En-25**: Anticipate and address the impacts of climate change on regional water sources.

King County

The King County Countywide Planning Policies, which were ratified by the City of Redmond Council, provide countywide policy direction for many issues related to growth management; including a new section on air quality and climate change. These policies include:

- **EN-16**: Plan for land use patterns and transportation systems that minimize air pollution and greenhouse gas emissions including
    - Maintaining or exceeding existing standards for carbon monoxide, ozone, and particulate;
    - Directing growth to Urban Centers and other mixed use/high-density locations that support mass transit, encourage nonmotorized modes of travel, and reduce trip lengths;
    - Facilitating modes of travel other than single occupancy vehicles, including transit, walking, bicycling, and carpooling;
    - Incorporating energy-saving strategies in infrastructure planning and design;
    - Encouraging new development to use low emission construction practices, low or zero net lifetime energy requirements, and "green" building techniques; and
    - Increasing the use of low emission vehicles, such as efficient electric-powered vehicles.

- **EN-17**: Reduce countywide sources of greenhouse gas emissions, compared to a 2007 baseline, by 25% by 2020, 50% by 2030, and 80% by 2050. Assuming 1% annual population growth, these targets translate to per capita emissions of approximately 8.5 metric tons of carbon dioxide equivalent ($MTCO_2e$) by 2020, 5 $MTCO_2e$ by 2030, and 1.4 $MTCO_2e$ by 2050.

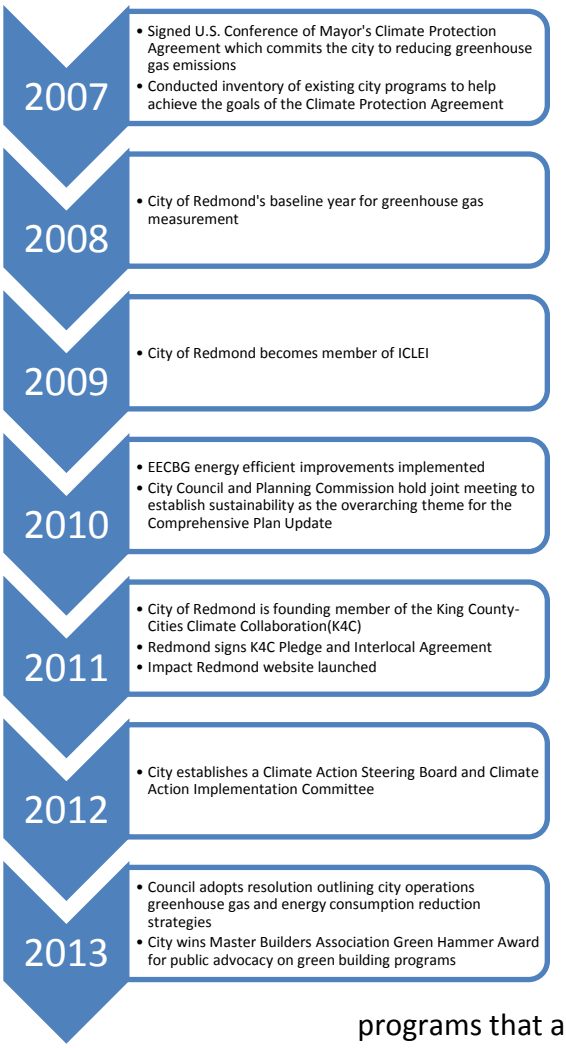
- **EN-18**: Establish a greenhouse gas emissions inventory and measurement framework for the use by all King County jurisdictions to efficiently and effectively measure progress toward countywide targets established pursuant to Policy EN-17.
- **EN-18A**: King County shall assess and report countywide greenhouse gas emissions associated with resident, business, and other local government buildings, on road vehicles and solid waste at least every two years. King County shall also update its comprehensive greenhouse gas emissions inventory that quantifies all direct local sources of greenhouse gas emissions as well as emissions associated with local consumption at least every five years.
- **EN-19**: Promote energy efficiency, conservation methods, and sustainable energy sources to support climate change reduction goals.
- **EN-20**: Plan and implement land use, transportation, and building practices that will greatly reduce consumption of fossil fuels.
- **EN-21**: Formulate and implement climate change adaptation strategies that address the impacts of climate change to public health and safety, the economy, public and private infrastructure, water resources, and habitat.

In 2014 King County Executive Constantine and Mayor Bassett of Mercer Island convened two Elected Official Working Summits on Climate Change. The goal of these meetings was to convene elected officials from King County cities to work towards a collaborative set of Joint County-City Climate Commitments that would help achieve significant reductions in regional and local greenhouse gas emissions. Information presented at the Summits demonstrated that getting to an 80% greenhouse gas emissions reduction target by 2050 is possible. There are diverse strategies that can be packaged together and carried out in phases to get the region on track to achieve deep greenhouse gas reductions.

Redmond's History of Climate Change Efforts

U.S. Conference of Mayors Climate Protection Agreement

A number of U.S. cities (1,060 cities, 34 in Washington including Redmond) have endorsed the U.S. Conference of Mayors Climate Protection Agreement. Participating cities commit to take the following three actions:



1. 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;

2. 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 Protocol—7% reduction from 1990 levels by 2012; and

3. Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system.

The City of Redmond signed the U.S. Conference of Mayors Climate Protection Agreement in 2007. By signing this agreement, the City formally acknowledged its interest and commitment to help implement strategies to reduce greenhouse gas emissions and global warming. As a result, in 2007 city staff conducted an inventory of existing city programs that advanced various aspects of sustainability.

It was discovered the City was actually doing much work that touched upon the three legs of sustainability; however, this work was occurring in an uncoordinated fashion. An ad hoc team was created which took this information and presented it in a comprehensive sustainability context. A Sustainability Agenda and Action Plan were formulated and signed by the Mayor itemizing specific tasks to accomplish. These tasks included establishing benchmarks of carbon emissions (footprint) and measuring system, promoting an anti-idling of vehicles campaign, diesel vehicle retrofits, improving mileage for city vehicles, expanding the Commute Trip Reduction program, energy audit for city facilities, conversion of traffic lights to LED lights, developing sustainable building practices, and integrating sustainability into city culture.

Some of these tasks have since been implemented. However, with the change in administration, sustainability work was tabled to focus on the Budgeting by Priorities process. With the recognition through the budgeting process that sustainability (Clean and Green Priority) is of major importance and through Council's direction for a sustainability initiative, staff refocused their efforts.

Community Vision Statement

In 2030 Redmond citizens describe their community as one that is complete, offering a wide range of services, opportunities, and amenities. It's a community that has acted to maintain a balance among the three pillars of sustainability, while accommodating growth and change. As a result, Redmond's high quality of life, cherished natural features, distinct places, and character are enhanced. The community's evolution has successfully woven the small town feel of older, established neighborhoods with the energy and vitality of Redmond's urban centers. The result is a place where people are friendly, often meet others they know, and feel comfortable and connected. It is a place where diversity and innovation are embraced, and action is taken to achieve community objectives. It's a place that is home to people from a variety of ethnic backgrounds, which contribute to the richness of the city's culture.

Green Centennial

In 2009 under the Green Lifestyles/Green Buildings budget offer and Council's initiative, staff reviewed all past sustainability work and conducted meetings with key groups across the organization. Staff evaluated the aspects that limited previous sustainability efforts, such as a lack of a coordinated approach, city commitment, funding, and meaningful baseline data. A framework strategy was developed to address the environmental leg of sustainability called Green Centennial.

This strategy organized the environmental element into four realms: Energy Conservation and Carbon Reduction, Waste Management and Resource Conservation, Sustainable Development and Green Infrastructure, and Ecosystem Conservation and Stewardship. Each realm consisted of related programs, actions and measures to facilitate cooperation and coordination. The City targeted key actions related to Energy Conservation and Carbon Reduction which included determining the city's operational carbon footprint, establishing protocols for measuring CO_2 emissions for development proposals, and applying for an Energy Efficiency and Conservation Block Grant. These tasks have since been completed.

The Council continued to be briefed on actions taken to advance sustainability in 2010 and 2011. In order to better organize these actions and develop a comprehensive framework, staff recommended and Council concurred to develop a Climate Action Implementation Plan.

Comprehensive Plan Update

Shortly thereafter, the City began its state-mandated periodic Comprehensive Plan update. This update revolved around the concept of sustainability, and sustainability became the guiding and organizing principal for the update. At the commencement of the update process,

the City Council and Planning Commission jointly agreed upon sustainability principles which provided an update context and strategy that was implemented throughout the Comprehensive Plan. Sustainability became the lens through which all policies were evaluated.

A new subsection entitled *Climate Change* was added to the Natural Environment element of the Comprehensive Plan and adopted by Council in 2012. Policies in this new section include:

- **NE-124:** Develop a Climate Action Plan, which includes greenhouse gas emissions reductions targets for the city.
- **NE-125:** Achieve greenhouse gas emissions reductions in both municipal operations and the community at large, with attention given to social equity.
- **NE-126**: Include analysis of climate change impacts when conducting environmental review under the State Environmental Policy Act (SEPA).
- **NE-127:** Promote the reduction of greenhouse gases by expanding the use of conservation and alternative energy sources and by reducing vehicle miles traveled by increasing alternatives to driving alone.
- **NE-128:** Take positive actions to reduce carbons, such as increasing the number of trees in the city.
- **NE-129:** Identify and address the impacts of climate change on the City's hydrological systems.

Sustainability Principles

In Redmond a sustainable community means:

- Having a shared community identity that is special and unique, based on Redmond's beautiful natural environment, its vibrant employment areas, and diverse community of residents;
- Having equitable access to goods, services, and employment;
- Having housing voices that are accessible to residents with various incomes, ages, and abilities;
- Valuing environmental quality and supporting choices that minimize impacts to the environment;
- Recognizing the importance of community awareness, education, and engagement; and
- Having a strong local economy.

Around this same time (2011), the City actively engaged regionally on climate change discussions and became a founding member of the King County-Cities Climate Collaboration (K4C). As such, Redmond was one of the first signers of the King County-Cities Climate Pledge and one of the first signers of an Interlocal Agreement between the cities and King County to foster continued regional collaboration on climate change matters.

The City Council and Mayor have acknowledged an interest in and commitment to help implement strategies to reduce city operational greenhouse gas emissions and energy consumption. Council provided initial guidance for the development of a Climate Action Strategy based on staff recommendations focused on opportunities identified through staff's initial work on sustainability.

In 2012 a Climate Action Steering Board made up of the Mayor and Directors Team was established, providing high-level guidance to staff efforts and demonstrating organization-wide commitment. Additionally, a Climate Action Implementation Committee was formed. This interdepartmental staff committee provides recommendations to the Steering Board for consideration, and takes Board guidance as direction for projects and other climate protection actions. There have been numerous briefings with the Council over the years; in May 2013, Resolution No. 1387(AM) was passed which identifies and supports government operations greenhouse gas emissions and energy consumption reduction strategies (see Appendix).

The City realizes there are some real opportunities to affect climate change at the local level and create greater efficiencies in city government, while at the same time providing a resilient community, improving public health and quality of life, fostering economic prosperity, enhancing environmental stewardship, and stimulating innovation.

ICLEI Five Milestones for Climate Mitigation

In 2009 the City became a member of ICLEI-Local Governments for Sustainability. ICLEI is an international association of over 1,000 local governments providing national leadership on climate protection and sustainable development. Being a member, this gave staff access to valuable resources and programs which helped create the impetus to reframe its efforts in becoming a sustainable city. Redmond is using ICLEI's Five Milestones for Climate Mitigation process for guidance to address climate change and realize benefits.

Figure 5, ICLEI Five Milestones for Climate Mitigation Process

Milestone 1: Conduct a Baseline Emissions Inventory and Forecast: A greenhouse gas emissions inventory lays the groundwork for successful climate action and energy savings. This involves a careful measurement and analysis of all GHG sources in order to inform GHG reduction goals, guide the action plan to meet those goals, and to benchmark performance over time. This step includes establishing a forecast year to assist in planning and monitoring progress. The City of Redmond conducted this inventory and forecast, the results of which are in this document.

Milestone 2: Adopt an Emissions Reduction Target for the Forecast: An emissions reduction target is an essential step in the climate action process. Cities can pass a resolution establishing a target for government operations or community. It both fosters political will and creates a framework that guides the planning and implementation of measures. Many local governments choose to set short-, medium-, and long-term targets of varying degrees. Discussion on the City of Redmond's target is in the chapter "GHG Reduction Targets."

Milestone 3: Develop a Climate Action Plan: The local government then develops a Local Climate Action Plan, ideally with robust public input from all stakeholders. The plan details the policies and measures that the local government will take to reduce greenhouse gas emissions and achieve its emissions reduction target. Most plans include a timeline, a description of financing mechanisms, and an assignment of responsibility to departments and staff. In addition to direct greenhouse gas reduction measures, most plans incorporate public awareness and education. This document is the result of Milestone Three.

Milestone 4: Implement Policies and Measures: Milestone Four begins the process of implementing the policies and measures contained in the Climate Action Plan. Typical policies and measures include energy efficiency improvements to municipal buildings and water treatment facilities, streetlight retrofits, public transit improvements, installation of renewable power applications, and fleet management. A discussion on how the City of Redmond will implement the suggested policies is available in the Implementation chapter.

Milestone 5: Monitor and Verify Results: Monitoring and verifying progress on the implementation of measures to reduce or avoid greenhouse gas emissions is an ongoing process. Monitoring begins once measures are implemented and continues for the life of the measures, providing important feedback that can be used to improve the measures over time. A timeline for monitoring results is laid out in the Monitoring and Reporting chapter.

Although Redmond is generally following ICLEI's model outline above, it should be noted that in 2011 the City Council elected not to adopt greenhouse gas emissions targets. Instead the Council promoted a model of continuous improvement and deferred establishing targets. Council also recommended focusing on GHG emissions reduction strategies for city operations, particularly energy efficiency for city facilities, fleet conversion and rightsizing, and environmentally friendly purchasing strategies. However, performance measures related to GHG emissions and energy consumption were included in the Predictable Development Permitting offer in the 2013-2014 adopted city budget. Specifically, these measures are for 2013, no overall increase and in 2014 a 1% reduction in greenhouse gas emissions and energy

consumption for city operations. However, the “GHG Reduction Targets” chapter outlines recommended targets in light of regional GHG emissions reduction targets.

Greenhouse Gas Emissions Inventory

Milestone One

Redmond, through use of ICLEI's Clean Air Climate Protection Software (CACP), began benchmarking its greenhouse gas emissions and energy consumption for city operations and the community for the years 2008, 2009, 2010, 2011, and 2012. This benchmarking process was the first undertaking for the City to establish a baseline from which future measurements can be compared.

City of Redmond Operations

Greenhouse Gas Inventory

Greenhouse Gas (GHG) emissions in city operations for baseline years 2008 through 2011 were established for the following sectors:

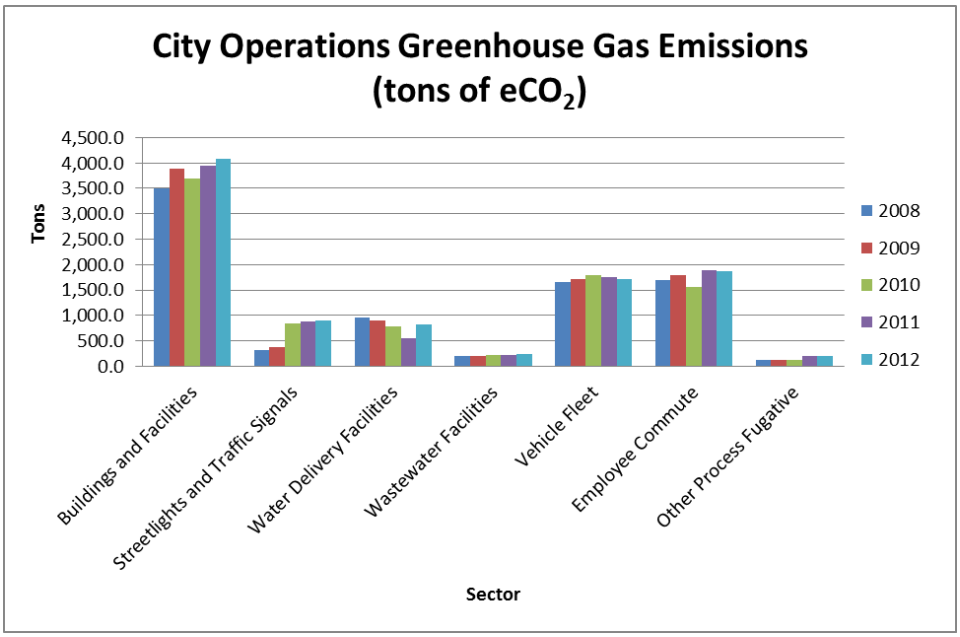
- Buildings and facilities (includes parks);
- Street lights and traffic signals;
- Water delivery facilities;
- Wastewater facilities;
- Vehicle fleet;
- Employee commute; and
- Other process fugitive (i.e., waste, chillers)

Each of these sectors will be explored in more detail later in the document. Buildings and facilities and the street lights and traffic signals data will be explained in the Buildings and Energy section, water delivery facilities and wastewater facilities will be looked at in more detail in the Natural Resources section, and the vehicle fleet and employee commute will be explored in the Mobility section of this document.

Data was gathered from various sources, including Puget Sound Energy for electricity and natural gas consumption, water consumption data from the water utility and Cascade Water Alliance, sewage output from the sewer utility, generator inventory from the Public Works Department, billing records from the Finance Department, fleet data from Public Work's Transman Unit Inventory Report, Wright Runstad's Sustainability Data Sheet for City Hall,

commute trip reduction data, trash generation and recycling data from Waste Management, employee data from Human Resources, and building occupancy and hours of operations data from various city departments. This data was entered into the ICLEI CACP program to generate detailed reports for each sector identified above, including individual city buildings. These reports describe tons of carbon dioxide (CO_2), pounds of nitrous oxide (N_2O), pounds of methane (CH_4), and tons of equivalent carbon dioxide (eCO_2) as well as energy consumption in million metric British thermal units (MMBtu) and cost. Essentially, the CO_2, N_2O, and CH_4 are converted to display in eCO_2 or "equivalent carbon dioxide." Summary data is provided in below. A detailed analysis for these sectors can be found in subsequent pages.

Figure 6, City Operations Greenhouse Gas Emissions



Staff generated comparison data for 2008, 2009, 2010, 2011, and 2012. These five years represent a "business as usual" scenario for the City of Redmond. The equivalent carbon dioxide emissions by each sector of city operations across the five benchmark years are displayed in Figure 6. The eCO_2 emissions remain relatively constant, some sectors slightly increasing while others slightly decreasing. The jump in the streetlights and traffic signals sector in 2010 is the result of more accurate data received from Puget Sound Energy, not necessarily due to a real change in GHG emissions generated.

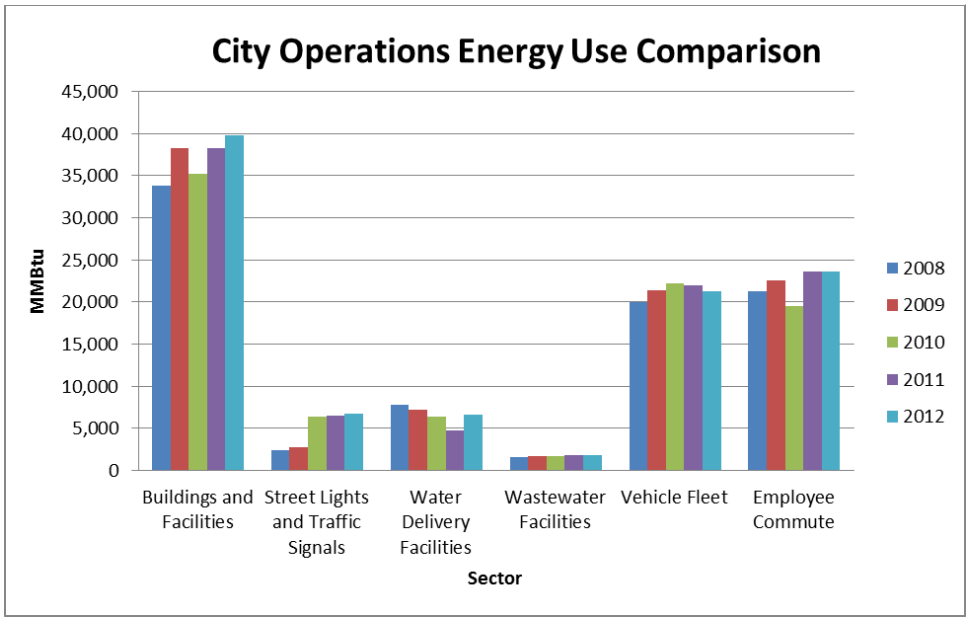
The top three sectors in city operations that generate the most GHG are buildings and facilities, employee commute, and vehicle fleet. The baseline data will help inform which sectors have the most room for improvement. This will help prioritize actions and make strategic decisions on the CAIP.

Energy Consumption

Energy consumption was also analyzed across the sectors for each of the benchmark years. Figure 7 shows energy use by the city across the sectors between 2008 and 2012.

Total energy consumption for each of the five years is comparable—86,938 MMBtu for 2008; 93,936 MMBtu for 2009; 91,396 MMBtu for 2010; 96,982 MMBtu for 2011; and 99,948 MMBtu for 2012.

Figure 7, City Operations Energy Use Comparison by Sector, 2008-2012



GHG emissions tend to parallel energy consumption. Therefore, similar to GHG emissions, the top three energy use sectors, in order, are Buildings and Facilities, Employee Commute, and Vehicle Fleet. Also similar to the GHG emissions data, the jump in energy consumption in the Streetlights and Traffic Signals sector is due to more accurate 2010 data received from Puget Sound Energy.

The total cost to operate these city facilities has increased from $1,745,489 in 2008 to $2,361,566 in 2012. The financial cost for each City Operations sector is laid out in Table 2. This table shows the annual amount spent on energy in each of these sectors and how that has changed over the five benchmark years. Efforts to reduce energy uses will also reduce greenhouse gas emissions and could have a significant impact on energy costs.

Since 2008 the City of Redmond has spent $10,755,167 on energy, or just over two million dollars annually. The greatest expenditure came from the operations of the city's buildings and facilities. On average, the City of Redmond spent $782,660 annually on energy costs in this sector. Detailed reports generated by the ICLEI CACP software disclose GHG emissions, energy

consumption, and energy cost by city building. The data can be further translated down to a scale of output or consumption per 1,000 square feet, per hour of operation, or per occupant.

Table 2, City Operations Energy Costs by Sector, 2008-2012

	2008	2009	2010	2011	2012
Building and Facilities	$602,263	$808,870	$796,541	$819,584	$886,035
Streetlights and Traffic Signals	$559,944	$617,487	$656,596	$692,713	$687,346
Water Delivery Facilities	$174,403	$205,497	$214,143	$183,431	$179,883
Wastewater Facilities	$34,673	$43,089	$42,934	$47,833	$48,631
Vehicle Fleet	$374,206	$518,496	$466,107	$534,791	$559,671
TOTAL	**$1.74 million**	**$2.19 million**	**$2.17 million**	**$2.27 million**	**$2.36 million**

Building comparison data can be an extremely helpful tool when determining which facilities to target for energy audits and/or retrofits. For instance, in 2012 the Public Safety Building (94,975 square feet) generated 839 tons of eCO_2, consumed 6,966 MMBtu of energy, and cost $165,053 to pay for that energy. In comparison in 2012, the city's LEED Certified City Hall (113,068 square feet) generated 101 less tons of eCO_2, 408 less MMBtu of energy, and cost $9,179 less annually. Further analysis reveals that the Public Safety Building generates 8.8 tons eCO_2, consumes 73.3 MMBtus, and costs $1,696 per 1,000 square feet; whereas City Hall generates 6.5 tons of eCO_2, consumes 65.2 MMBtus, and costs $1,343 per 1,000 square feet. This further discussed in the Buildings and Energy section of the Climate Action Implementation Plan. More details on per building energy use are available in Table 12.

The second largest energy cost comes from the city's street lights and traffic signals. Even with relatively low energy consumption of these efficient street lights and signals, the City of Redmond paid nearly $687,000 to Puget Sound Energy in 2012. This high cost despite the low energy consumption may have more to do with the flat rate the City of Redmond pays PSE for street lights than the actual amount of energy used. This cost disparity is addressed in the Buildings and Energy section.

In 2012 the City spent over half a million dollars to fuel and operate the fleet vehicles. This is roughly a 43% increase over 2008, or a difference of $164,000. Over the five years this data was collected, the average cost per gallon of gasoline in Washington fluctuated between $1.61 and $4.25.[17] These fluctuations in price are expected to continue, which makes budgeting for future fuel use difficult. Suggestions to reduce our fuel consumption are addressed in more detail in the Mobility section.

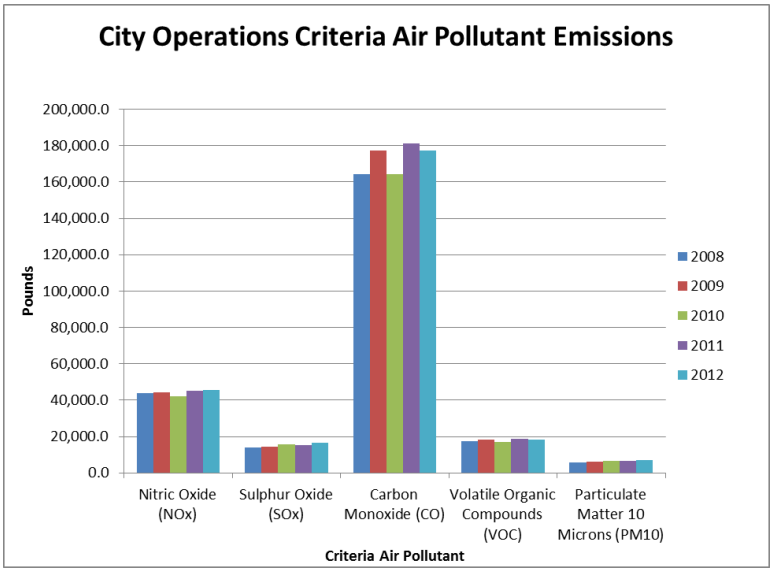
Criteria Air Pollutants

While greenhouse gases have a global effect, contribute to climate change, and can last more than 100 years, criteria air pollutants have a local- to- regional effect on air quality and can dissipate in hours or days. Clean energy measures that reduce criteria air pollutants, therefore, can result in almost immediate local improvements in air quality and human health. Strategies addressed in this Climate Action Implementation Plan to reduce greenhouse gas emissions may also reduce the emissions of these criteria air pollutants, which will in turn improve the local air quality and health of Redmond citizens.

Criteria air pollutants emissions (in pounds)—nitric oxide (NO_x), sulfur oxide (SO_x), carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter ten microns in size (PM10) - were determined for the five benchmark years. Similar to GHG emissions, criteria air pollutants emissions were categorized into the same sectors.

Summary data is provided below. Figure 8 shows a comparison of all five years together by air pollutant.

Figure 8, City Operations Criteria Air Pollutants, 2008-2012



The biggest generator of NO_x is the Buildings and Facilities sector (around 14,675 pounds/year), closely followed by the Vehicle Fleet sector at approximately 12,000 pounds/year. Buildings and Facilities by far produce the greatest amount of SO_x across the sectors, around 9,000 pounds/year. Carbon monoxide is clearly tied to vehicle emissions, and as such, Employee Commute is the biggest sector

[17] http://www.washingtongasprices.com/retail_price_chart.aspx

generator hovering around 102,000 pounds/year, followed by the Vehicle Fleet sector at roughly 62,000 pounds/year. Similarly, VOC emissions are largely produced by Employee Commute (just over 10,000 pounds/year) and Vehicle Fleet (approximately 6,300 pounds/year). Lastly, the largest generator of PM10 is the Building and Facilities sector, at about 3,600 pounds/year. These analyses show where to focus reduction efforts for particular criteria air pollutants.

Carbon monoxide is the most prevalent criteria air pollutant emission of those identified above, generally between 165,000 and 185,000 pounds annually. The biggest two sectors generating these emissions, in order, are Employee Commute and Vehicle Fleet. The next most prevalent criteria air pollutant, which is by several orders of magnitude less, is nitric oxide, followed by volatile organic compounds, sulfur oxide, and lastly particulate matter ten microns in size.

Community

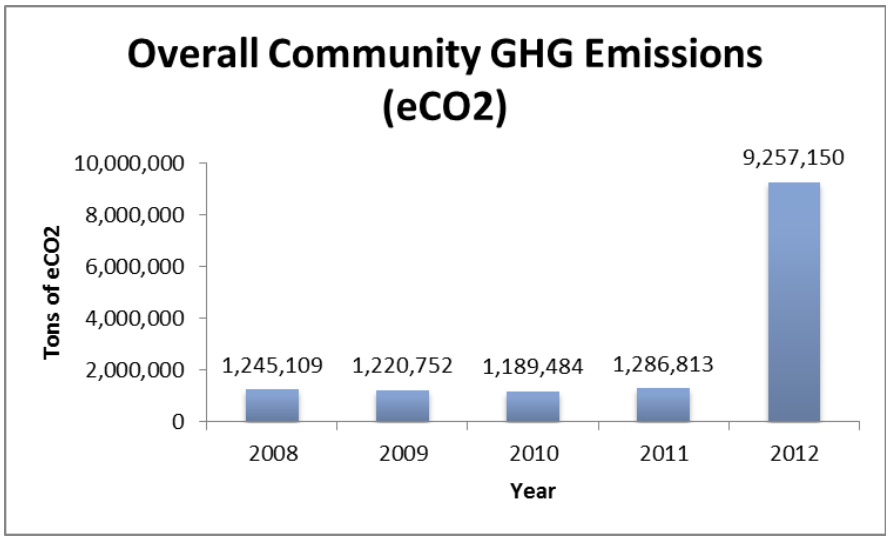
Greenhouse Gas Inventory

Community GHG emissions and criteria air pollutants emissions were generated for baseline years 2008, 2009, 2010, 2011, and 2012. This analysis is split into the following sectors:

- Residential,
- Commercial,
- Industrial,
- Transportation, and
- Waste

Information was gathered from various sources, including: Puget Sound Energy community energy consumption data, U.S. Census Bureau data, WA Department of Commerce data, city business licenses, road length and vehicle trip data from the Transportation Division, Washington State Department of Transportation's (WSDOT) Trip System Annual Traffic Report, and city waste and recycling data from the Natural Resources Division. This data was entered into ICLEI's CACP software to generate detailed reports for each sector of the community. These reports describe tons of carbon dioxide (CO_2), pounds of nitrous oxide (N_2O), pounds of methane (CH_4), and tons of equivalent carbon dioxide (CO_2e or eCO_2), as well as energy consumption in MMBtu. The CO_2, N_2O, and CH_4 are converted to display as CO_2e. Staff generated comparison data for five years—2008 through 2012. This data is provided in Figure 9.

Figure 9, Community Greenhouse Gas Emissions, 2008-2012



The community's total eCO_2 has been slightly dropping over the past few years, approximately 24,000 tons from 2008 to 2009 and approximately 31,000 tons from 2009 to 2010. However, in 2012 more accurate transportation data was available resulting in a dramatic community increase in eCO_2 emissions. This seven-fold increase resulted in 2012 community greenhouse gas emissions of 9,257,150 tons eCO_2.

The largest community sector generating GHG emissions is the Transportation sector. This comes as no surprise since transportation is the largest generator of GHG emissions in Washington State. Waste is the sector generating the least GHG emissions, largely due to the fact that Redmond does not landfill or incinerate in the city. This number would be considerably larger if the waste measurement took into account the lifecycle emissions of waste. The Waste sector may not have a large impact in Redmond, but it will impact regional emissions and should not be ignored. The impact of waste on greenhouse gas emissions will be explored in more detail in the Waste & Recycling action category.

The order of GHG emissions generated from greatest to least in the three remaining community sectors is Commercial, Residential, and Industrial. The Commercial sector generates approximately 2.6 times more GHG emissions than the Residential sector and approximately four times more GHG emissions than the Industrial sector.

Table 3, Average eCO_2 for Commercial and Industrial Businesses

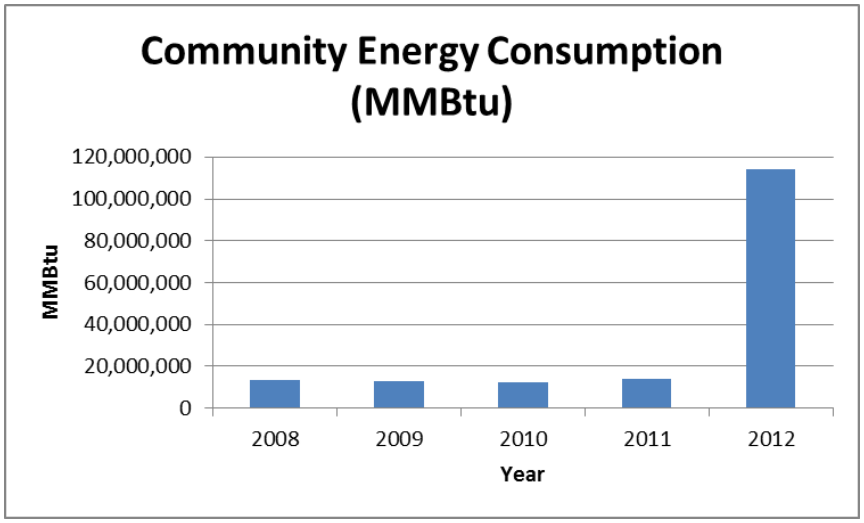
Unit	Commercial	Industrial
Per 1,000 sq. ft.	18.4 tons	11.6 tons
Per Employee	7.4 tons	9.5 tons
Per Establishment	150.7 tons	167.9 tons

Detailed indicator reports for 2012 show Redmond's per capita GHG emissions at 2.7 tons of eCO_2 and per household GHG emissions at 6.3 tons of eCO_2. Commercial and industrial GHG emissions can be equated to eCO_2 per 1,000 square feet, per employee, and per establishment.

Energy Consumption

Energy consumption was also analyzed across the sectors for each of the benchmark years within the community.

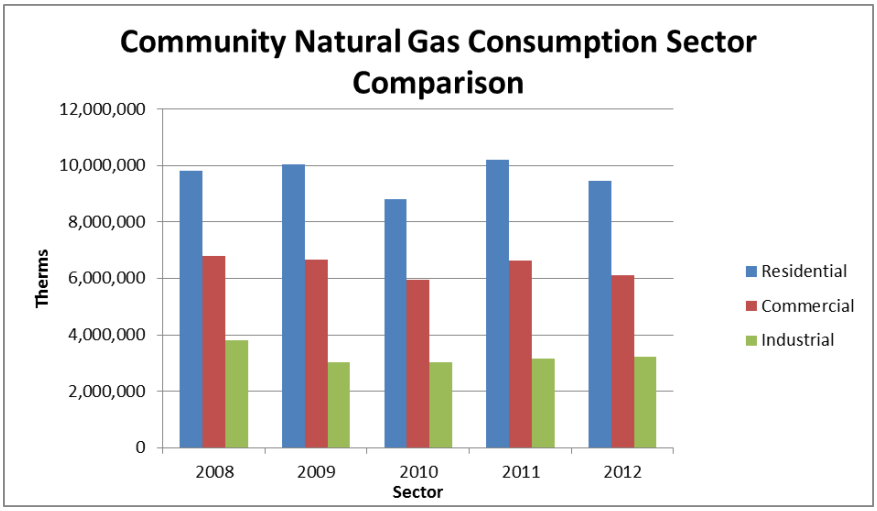
Figure 10, Community Energy Consumption, 2008-2012



Sector comparison data shows commercial users are by far the greatest consumers of electricity, reaching approximately 815,000,000 kWh in 2012. This is several orders of magnitude greater than the Residential and Industrial sectors.

Residential energy consumption dropped off in 2010. It is difficult to attribute this change to any particular reason without detailed investigation. The recorded daily average mean temperature was warmer in the winter months and cooler in the summer months in 2010 than 2009. In 2011 residential electricity and natural gas consumption jumped back up to levels higher than experienced in 2009. It is not due to a decrease in residential energy customers because there were more residences using both electricity and natural gas in 2010 than there were in 2009. However, without

Figure 11, Community Natural Gas Consumption by Sector, 2008-2012



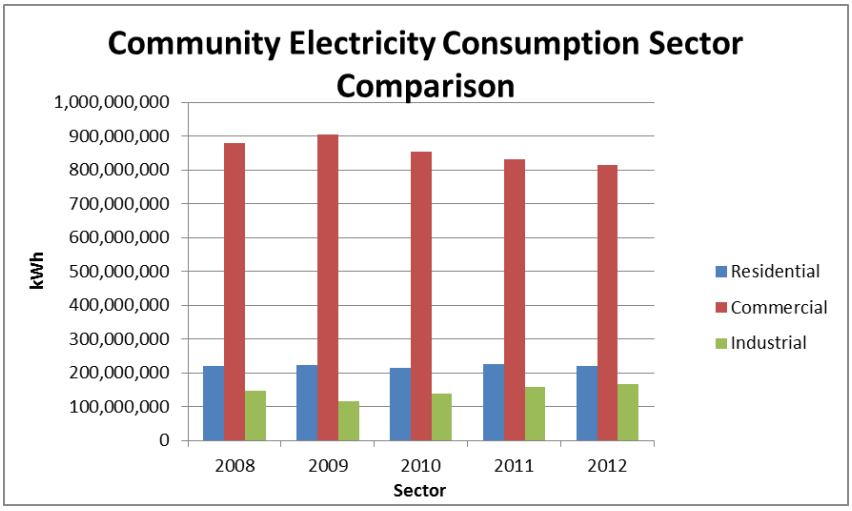
further analysis, one can only speculate the reasons.

Similar to the Residential sector, commercial energy consumption dropped in 2010. This is likely due to a combination of factors including weather conditions. It is interesting that the Commercial sector natural gas consumption increased (very close to 2009 level) while electricity consumption decreased between the years 2010 and 2011. Overall, however, commercial energy consumption has been decreasing since 2009 despite the increase in the number of PSE commercial customers.

Detailed indicator reports estimate energy consumed at a smaller scale for each of the three sectors. For instance, in 2012 the average energy consumed per capita was 30 MMBtu and the average energy consumed per household was 68.4 MMBtu. In 2012 commercial users on average consumed 154.0 MMBtu per 1,000 square feet of space, 62.1 MMBtu per employee, and 1,260.2 MMBtu per establishment. For industrial users in 2012, energy consumption averaged out at 109 MMBtu per 1,000 square feet of space, 89.5 MMBtu per employee, and 1,583.24 MMBtu per establishment.

Unlike both residential and commercial customers, the Industrial sector increased in electricity and natural gas consumption in 2010, 2011, and 2012. There were only a few more industrial electricity customers in 2010 than in 2009 and a few less natural gas customers in 2010 than in 2009. The number of industrial customers has been slightly decreasing over the past three years. Again, without more detailed analysis of the types of industrial users, it is difficult to attribute the electricity consumption increase to a particular reason.

Figure 12, Community Electricity Consumption by Sector, 2008-2012

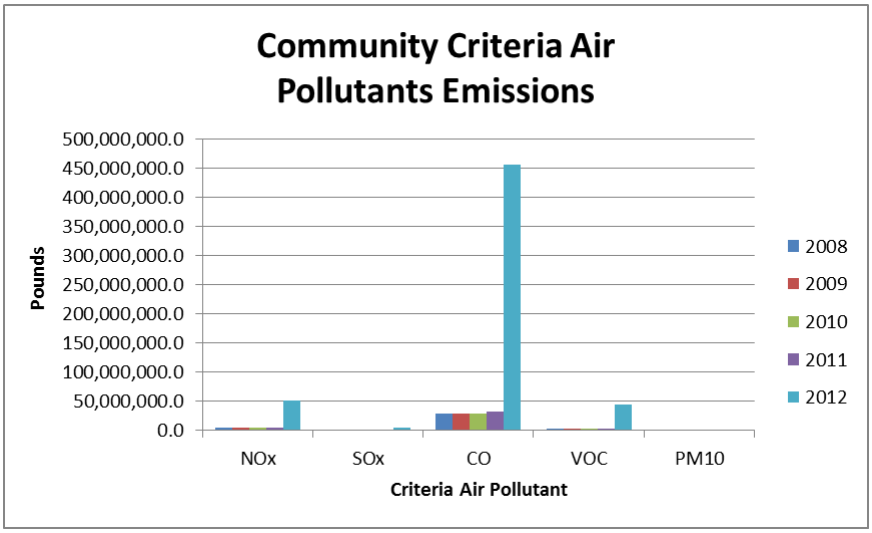


The greatest natural gas user is the Residential sector, reaching approximately 9,500,000 therms in 2012. The Commercial sector is the next largest user followed by the Industrial sector. Note that overall the Industrial sector consumes the least energy from a community-wide perspective.

Overall trends show community electricity and natural gas consumption slightly decreasing or relatively flat from 2008 to 2012. However, the overall community energy consumption in MMBtu has increased. This is because the Waste and Transportation sectors are included, which are not reflected in electricity and natural gas data.

Criteria Air Pollutants

Figure 13, Community Criteria Air Pollutants Emissions, 2008-2012



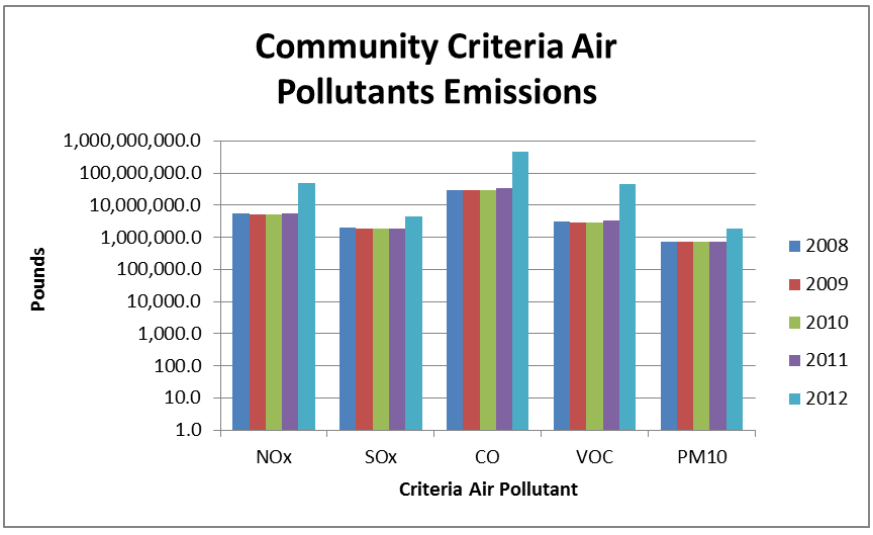
Criteria air pollutants were also determined for the five benchmark years. Criteria air pollutants include nitric oxide (NO_x), sulfur oxide (SO_x), carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter ten microns in size (PM10). These outputs were categorized into the same five community sectors as the GHG emissions.

Summary data is provided in Figure 13.

Between 2008 and 2012, the Transportation sector was by far the largest producer of nitric oxide (NOx), carbon monoxide (CO), and volatile organic compounds (VOC). The Commercial sector was the greatest producer of sulfur oxide (SOx) and particulate matter 10 (PM10).

Carbon monoxide represents the most generated pollutant of the five criteria air pollutants. This is expected

Figure 14, Community Criteria Air Pollutants Emissions, 2008-2012 (logarithmic scale)



due to the Transportation sector's CO production. The next most commonly produced criteria air pollutant, by several orders of magnitude less, is NO_x, followed by VOC, SO_x, and lastly PM10. Incidentally, this is the same order of most prevalent to least prevalent criteria air pollutants emissions production for city operations. Figure 14 above shows the same information on a logarithmic scale.

Key Challenges

Data collection is perhaps the most challenging aspect when determining greenhouse gas emissions. Government protocols are already embedded into the ICLEI CACP software so once data is gathered, it becomes an exercise of detailed data entry and tracking to generate greenhouse gas emissions, energy consumption, and criteria air pollutant emissions reports. The methods the City of Redmond used to obtain the baseline measurements followed best practices research and the most common methods municipalities use to measure GHG emissions.

The type of data needed to determine GHG emissions is not typically centralized by a city. Financial and tracking systems were devised prior to an awareness of carbon footprinting and the need to extract key information. This key data is also decentralized so various sources need to be contacted for the information; and at that, the data often needs to be manipulated into a form acceptable for input into the CACP software. This makes for a cumbersome process. Detailed notes are entered into the CACP data screens to track methodologies and sources. This is extremely important to help determine sudden unexplained changes and anomalies.

Another key message to keep in mind is that the information produced provides a crude baseline to begin the discussion on how to approach reducing greenhouse gas emissions. The whole point of this exercise is to provide a rough baseline; and as long as future data is entered in the same method using the best available data, it will provide a useful tool for measuring success on GHG emissions reduction, energy consumption reduction, and criteria air pollutant emissions reduction.

Forecasts & Projections

City of Redmond Operations

Greenhouse Gas Emissions & Energy Consumption

A business-as-usual scenario was used to forecast greenhouse gas emissions and energy consumption for City operations. Trending off of the past five years of data, a simple forecast model was employed to estimate these amounts. This linear regression analysis is a very crude model since the City only has five years of data, and it is nearly impossible to predict a 95% confidence interval with refined accuracy. As additional years' data is collected, the trending can be reanalyzed. However, the business-as-usual forecast as it is presented will help plan for the future and anticipate changes in the community.

Table 4, Percent Change in City Operations Emissions, 2008-2012

Measure	2008	2009	% Change[1]	2010	% Change[2]	2011	% Change[3]	2012	% Change[4]
eCO_2 (tons)	8,462.2	9,007.5	6.4%	9,006.5	0.0%	9,435.0	4.5%	9,794.0	3.7%
NO_x (lbs.)	44,031.1	44,288.4	0.6%	43,286.3	-2.3%	45,350.8	4.6%	45,462.0	0.2%
SO_x (lbs.)	13,786.8	14,573.6	5.7%	15,532.1	6.6%	15,429.9	-0.7%	16,541.0	7.2%
CO (lbs.)	164,419.9	177,058.0	7.7%	164,479.4	-7.1%	181,341.2	9.3%	177,308.0	-2.3%
VOC (lbs.)	17,269.0	18,455.7	6.9%	17,061.6	-7.6%	18,696.3	8.7%	18,177.0	-2.9%
PM10 Output (lbs.)	5,853.6	6,106.1	4.3%	6,449.8	5.6%	6,430.8	-0.3%	6,852.0	6.1%
Energy (MMBtu)	86,966.0	93,936.0	8.0%	91,396.0	-2.7%	96,982.0	5.8%	99,948.0	3.0%
Energy Cost ($)	$1,745,489.00	$2,210,141.00	26.6%	$2,176,322.00	-1.5%	$2,278,352.00	4.5%	$2,361,567.00	3.5%

[1] Between 2008 & 2009, [2] Between 2009 & 2010, [3] Between 2010 & 2011, [4] Between 2011 & 2012

Table 5, Percent Change in City Operations Emissions Summary, 2008-2012

Measure	% Change (2008-Present)
eCO_2 (tons)	13.6%
NO_x (lbs.)	3.1%
SO_x (lbs.)	16.7%
CO (lbs.)	7.3%
VOC (lbs.)	5.0%
PM 10 Output (lbs.)	14.6%
Energy (MMBtu)	13.0%
Energy Cost ($)	26.1%

Tables 4 and 5 illustrate the city operational annual and overall percent change of greenhouse gas emissions, criteria air pollutants, energy consumption, and energy cost over the five benchmark years: 2008-2012. Although there have been some years where certain measures have decreased, and there was notably no increase in greenhouse gas emission from 2009 to 2010, the overall percent change of GHG and energy consumption has increased by 13.6% and 13% respectively. The cost of energy has increased the most, 26.1%, since 2008.

Figures 15 through 18 show existing and trending projections of greenhouse gas emissions and energy consumption for city operations.

The graphic in Figure 15 shows the five benchmark years' datapoints for greenhouse gas emissions measured in equivalent tons of carbon dioxide (CO_2). The second line is the best fitting line using linear regression analysis.

Figure 15, City Operations Greenhouse Gas Emissions

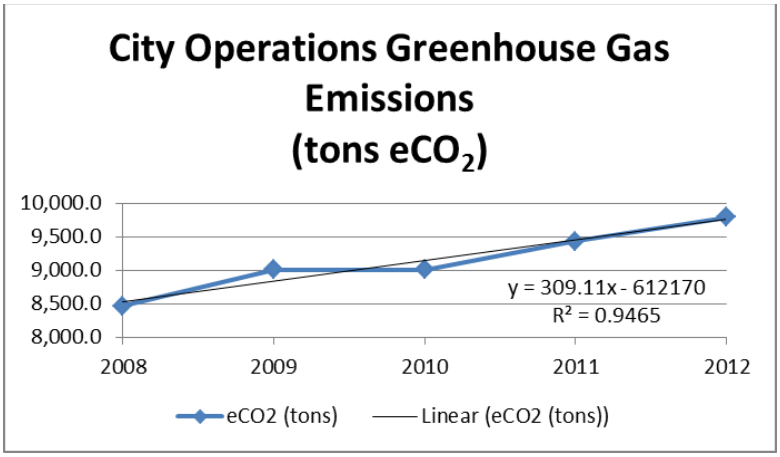


Figure 16 shows projected trending of anticipated city operations greenhouse gas emissions. This upward trend represents a business as usual scenario moving into the future. If the City is serious about reducing its operational carbon footprint, strategic steps need to be implemented to stop, reverse, or slow down this trend. Note, however, that it is very difficult to predict with precise accuracy and future trends based off only five data sets.

Figure 16, Projected City Operations Greenhouse Gas Emissions

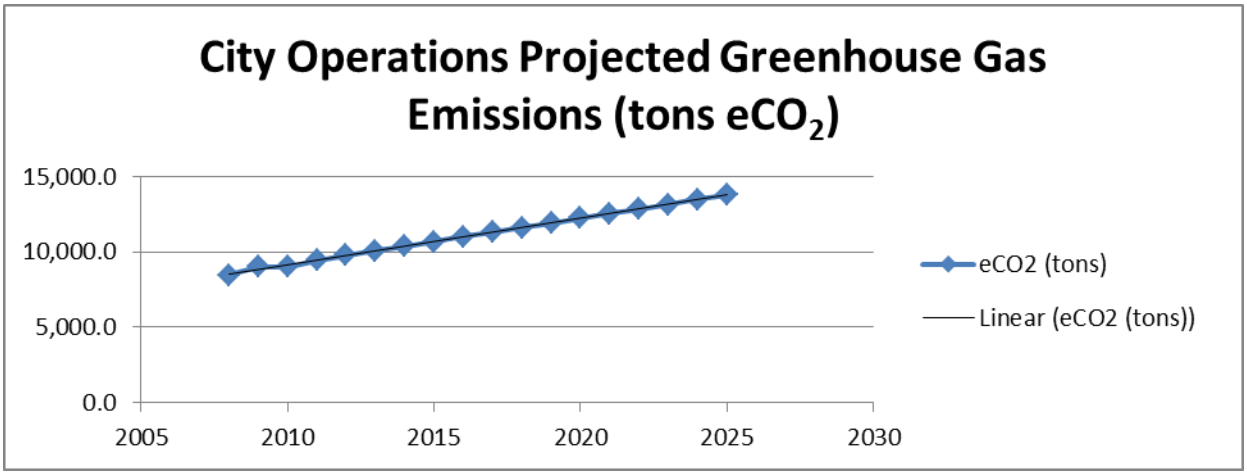


Figure 17 illustrates the five benchmark years' datapoints for city operations energy consumption measured in Million Metric British Thermal Units. The second line is the best fitting line using linear regression analysis, which shows a slow but steady increase.

Figure 17, City Operations Energy Consumption

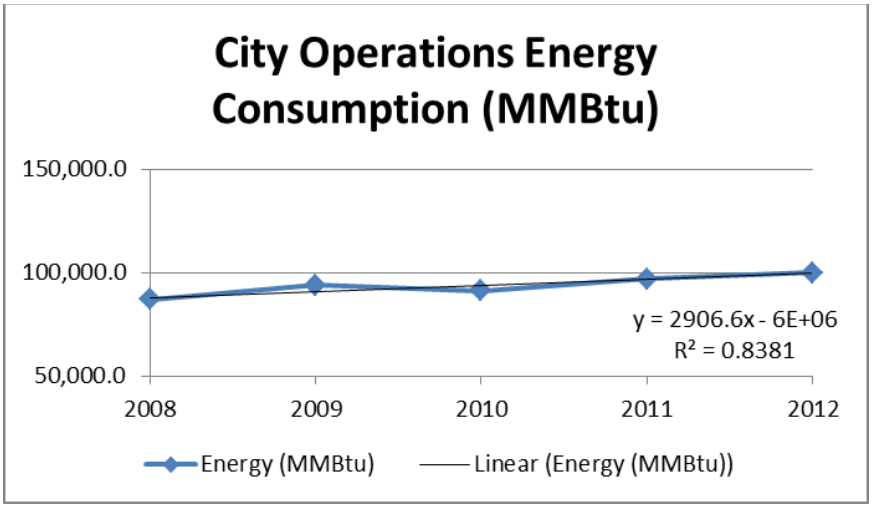
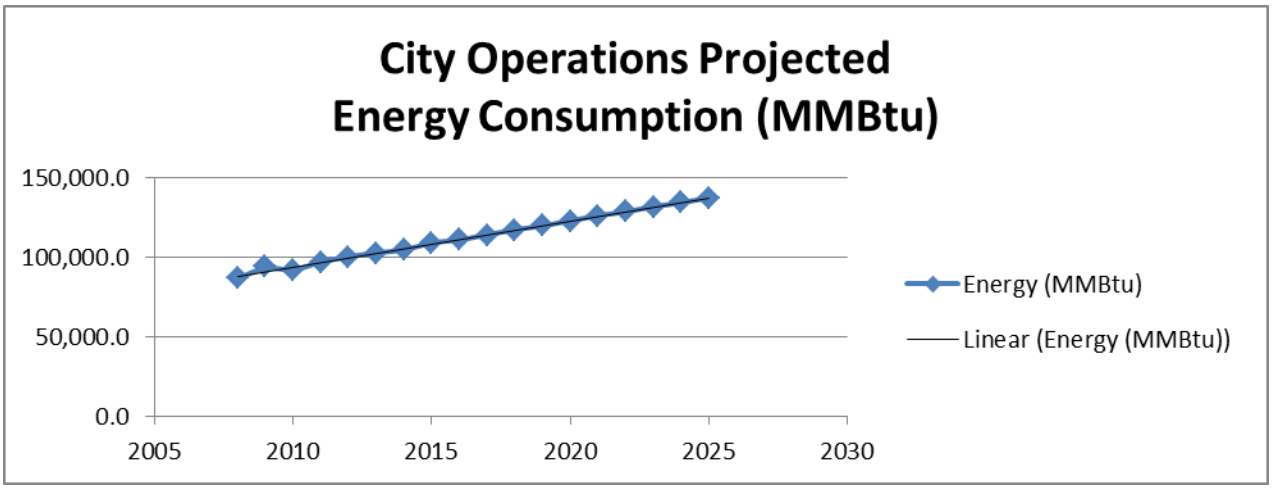


Figure 18 shows projected trending of anticipated city operations energy consumption. This upward trend represents a business as usual scenario. If the City is committed to reducing its operational energy consumption, strategic steps need to be implemented to stop, reverse, or slow down this trend. In addition, reduced energy consumption can have a significant financial savings for the City.

Figure 18, Projected City Operations Energy Consumption



Community

Greenhouse Gas Emissions & Energy Consumption

Table 6 and Table 7 illustrate how greenhouse gas emissions and energy use has changed in Redmond between 2008 and 2012. The overall percent change in these categories has for the

most part increased. The only areas where emissions have been reduced in the community are with SOx and PM10 emissions.

Table 6, Percent Change in Community Greenhouse Gas Emissions, 2008-2012

Measure	2008	2009	% Change[1]	2010	% Change[2]	2011	% Change[3]	2012	% Change[4]
eCO_2 (tons)	1,245,069.2	1,220,751.9	-2.0%	1,189,484.0	-2.6%	1,296,813.0	9.0%	9,257,150.3	613.8%
NO_x (lbs.)	5,531,685.6	5,304,759.0	-4.1%	5,122,502.7	-3.4%	5,621,884.0	9.7%	50,844,076.4	804.4%
SO_x (lbs.)	1,953,556.6	1,929,023.1	-1.3%	1,876,994.1	-2.7%	1,918,652.0	2.2%	4,650,287.9	142.4%
CO (lbs.)	29,715,889.8	28,830,867.5	-3.0%	28,689,995.1	-0.5%	33,354,666.0	16.3%	455,574,840.1	1265.9%
VOC (lbs.)	3,031,417.6	2,916,759.1	-3.8%	2,877,348.4	-1.4%	3,334,844.0	15.9%	44,695,295.0	1240.3%
PM 10 Output (lbs.)	759,059.7	749,112.0	-1.3%	725,351.4	-3.2%	740,505.0	2.1%	1,897,585.0	156.3%
Energy (MMBtu)	13,156,725.0	12,855,638.0	-2.3%	12,507,057.0	-2.7%	13,883,909.0	11.0%	113,992,979.0	721.0%

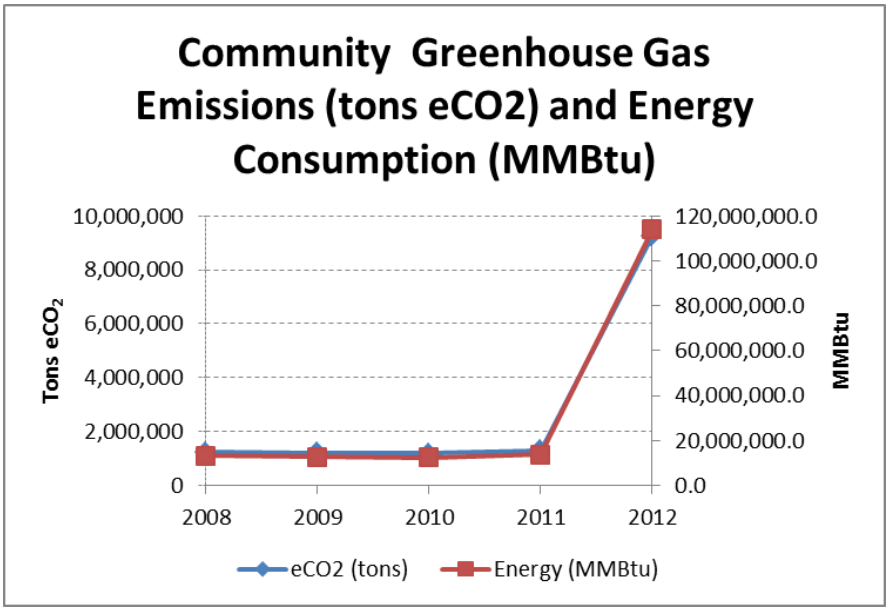
[1] Between 2008 & 2009, [2] Between 2009 & 2010, [3] Between 2010 & 2011, [4] Between 2011 & 2012

Table 7, Percent Change in Community Emissions Summary, 2008-2012

eCO_2 (tons)	643.5%
NO_x (lbs.)	819.1%
SO_x (lbs.)	138.0%
CO (lbs.)	1433.1%
VOC (lbs.)	1374.4%
PM 10 Output (lbs.)	150.0%
Energy (MMBtu)	766.4%

Figure 19 illustrates the close relationship between greenhouse gas emissions and energy consumption. This close relationship is why the Climate Action Implementation Plan will focus on energy consumption and energy conservation strategies. The relationship between energy and GHG emissions assists in making projections and further reinforces the connection between our energy usage and the impact it has on our carbon footprint.

Figure 19, Community Greenhouse Gas Emissions and Energy Consumption, 2008-2012



Projected trending and forecasting of community greenhouse gas emissions and energy consumption were not performed because the new transportation information has logarithmically skewed the data. A linear regression analysis would provide inaccurate information.

GHG Reduction Targets

Milestone Two

As briefly noted earlier, the Council deliberated the merits of adopting greenhouse gas emission reduction targets for both city operations and the community in 2011. They noted and discussed various goals, including those set out by the Mayors Climate Protection Agreement, the State of Washington, the Western Climate Initiative, ICLEI, Better Buildings Campaign, and Architecture 2030 Challenge.

Table 8, Climate Action Plan Greenhouse Gas Reduction Goals

Climate Action Plan	GHG Reduction Goal
Mayors Climate Protection Agreement	7% below 1990 levels by 2012
State of Washington (Executive Order 07-02)	1990 levels by 2020, 25% below 1990 levels by 2035, and 50% below 1990 levels by 2050
Western Climate Initiative	15% below 2005 levels by 2020
ICLEI	80% reduction by 2050
Better Buildings Campaign	20% reduction below baseline
Architecture 2030	Fossil fuel reduction for new buildings increased to 70% in 2015, 80% in 2020, 90% in 2025, and carbon neutral in 2030

Council additionally reviewed targets set by local jurisdictions that are laid out in Table 9.

Table 9, Local Climate Action Plan Greenhouse Gas Reduction Goals

Jurisdiction	GHG Reduction Goal
Kirkland	10% below 2005 levels by 2012, 20% by 2020, and 80% below by 2050
Issaquah	80% below 2007 levels by 2050
Mercer Island	80% below 2007 levels by 2050
Sammamish	3% below 2007 levels by 2012
Bothell	7% below 1990 levels by 2012
Shoreline	25% below 2007 levels by 2020, 50% by 2030, and 80% by 2050
Bellevue	7% below 1990 levels by 2012

There was discussion of aiming for carbon neutrality in 2062, Redmond's sesquicentennial. Under the continuous improvement model, this would translate to an approximate 2% decrease in GHG emissions every year. Additionally, the idea of setting short-, medium-, and long-term goals was debated.

Table 10, GHG Reduction Targets Discussed by City Council in 2011

Approach	Targets
Equal Steps with Multiple Targets	▪ 20% below 2008 levels by 2022 ▪ 40% below 2008 levels by 2032 ▪ 100% below 2008 levels by 2062
Small to Large Steps with Short-, Medium-, and Long-Term Targets	▪ 25% below 2008 levels by 2020 ▪ 50% below 2008 levels by 2041 ▪ 100% below 2008 levels by 2062
Large To Small Steps with Short-, Medium-, and Long-Term Targets	▪ 50% below 2008 levels by 2020 ▪ 75% below 2008 levels by 2041 ▪ 100% below 2008 levels by 2062

At that time, the Council ultimately decided to commit to improved greenhouse gas emissions reduction and energy consumption reduction, not by setting a goal, but rather by a model of continuous improvement. This discussion included concentrating on city operations greenhouse gas emissions reduction strategies (including energy reduction strategies) to show the City's commitment and leadership by example.

However, performance measures in the Predictable Development Permitting offer of the 2013-2014 City Operating Budget include greenhouse gas and energy consumption measures. Specifically, for 2013 no overall increase and in 2014 a 1% reduction in greenhouse gas emissions and energy consumption for city operations.

Given the regional K4C work, elected officials climate summits, and the Growth Management Planning Council's countywide GHG emissions reduction targets currently under discussion, it is timely for Redmond to adopt targets. The regional targets align rather closely with Council's initial target discussion. The countywide targets are: 25% below 2007 levels by 2020, 50% below 2007 levels by 2030, and 80% below 2007 levels by 2050.

Redmond will strive to achieve these regional targets reinforcing the City's regional commitment and willingness to reduce GHG emissions and energy consumption consistent with adopted policies in the City's Comprehensive Plan.

GHG Reduction Strategies

Milestone Three

Strategies to reduce greenhouse gas emissions are interconnected, but lend themselves to some broader categories. Not coincidentally, many of these categories are aligned with the sources of emissions in the community and across City of Redmond Operation sectors. The categories help focus reduction efforts and keep all the potential strategies organized and understandable. Categories listed below are similar to categories found in many other municipal climate action plans and will be used throughout the Redmond Climate Action Implementation Plan.

Action Categories

Mobility: Transportation is the number one source of greenhouse gas emissions in Redmond. The Mobility category looks at strategies that will reduce vehicle miles traveled, support more efficient fuels and vehicles, and encourage alternative transportation modes.

Objectives:

- Reduce vehicle miles traveled by community members and city employees.
- Increase fuel efficiency in the City fleet vehicles and utilize fleet vehicles in more efficient manner.
- Increase the use of low carbon modes of transportation such as bicycling, walking, and transit through facility improvements and community-based encouragement activities.

Buildings & Energy: Our built environment is the second largest source of greenhouse gas emissions. The energy we use to heat, cool, and operate our buildings accounts for much of the energy we use as a governmental organization and the community. This category will explore strategies that reduce energy use, save money, and increase the reliance on renewable energy sources.

Objectives:

- Reduce the total energy use in all city facilities through increased operational efficiency and conservation efforts.

- Assist businesses and residents in ways to operate more efficiently to reduce energy use and save money.
- Increase the use of renewable energy sources within Redmond.

Waste & Recycling: This category addresses ways the city and community can reduce waste production. Increasing our recycling and composting rates will conserve energy, protect natural resources, and reduce harmful GHG emissions such as methane.

Objectives:

- Increase recycling and composting rates in single, and multifamily homes, and businesses.
- Reduce the amount of waste that is produced through purchasing and utilizing new technology.

Natural Resources: Climate change will have an impact on our natural environments as we begin to experience increased weather extremes. By working to protect, enhance, and restore the natural resources, we will make Redmond more resilient to change and maintain clean water and air for residents.

Objectives:

- Protect and enhance Redmond's urban forest and wetlands.
- Utilize green infrastructure to enhance city services.
- Prepare natural areas to adapt to changing climate impacts.

Education & Encouragement: The success of the Climate Action Implementation Plan will depend upon city staff, business leaders, and community members changing some behaviors. This category explores strategies to educate people about climate change impacts and empower and encourage them to act in ways that will reduce their environmental impact.

Objectives:

- Increase awareness around the connection between personal actions and greenhouse gas emissions.
- Encourage residents and City of Redmond employees to reduce their environmental impact through targeted events.

- Motivate individuals, businesses, and groups to take action and reduce their impact on climate change.

Strategy Considerations

City staff generated a package of actions to reduce the city's greenhouse gas emissions, reduce the city's energy consumption, and realize financial energy savings. These actions are based upon several factors:

- **Current Emissions:** Will the proposal focus on the current main sources of greenhouse gas emissions?
- **Support:** How likely is the proposal to be adopted city or community wide? Is it politically feasible? Is there community support? Is it consistent with the City's priorities and readiness to implement?
- **Depth/Breadth of Implementation:** Will it impact a large portion of the targeted population?
- **Greenhouse Gas Reduction Potential:** Are these strategies capable of reducing GHG emissions in a significant way? Do they have a track record for success locally or in other communities?
- **Cost Effectiveness:** Does this focus on technologies and practices that offer net cost savings? What is the return on investment for these strategies? Are there costs or savings over five years?
- **Cost of Business As Usual:** If nothing is done, what will the cost of adaptation be in the future?
- **Existing Capacity:** What is the current institutional capacity to take on the proposal? Are there opportunities to combine the proposal with existing programs or departments?
- **Enforceability and Measurability:** Can the program be enforced? Are there ways to measure the impact this program will have on GHGs?
- **Timeframe:** What is the timeframe for the project? How long will it take to see the impacts of the proposal?
- **Funding:** What is the availability of funding?
- **Anticipated Benefits:** Are there expected benefits other than GHG emissions reductions, such as reduced local air pollution due to less driving, cost savings associated with increased energy efficiency in buildings, public health benefits, among others?

Additional Climate Action Implementation Plan Benefits

Many of the proposed strategies to reduce our impact on climate change within the above categories will have benefits beyond lowering GHG emissions. These additional benefits can be

grouped into a few important categories. These benefits will be identified within each of the strategies if they are relevant.

Community Resilience: 	Resilience is about good planning to keep communities strong. Resilient communities can withstand or bounce back from economic crisis, energy uncertainty, and natural disasters. Resiliency is an especially important concept when discussing climate change mitigation and adaptation.
Public Health/ Quality of Life: 	Climate change is very much a public health issue, since it will bring more heat waves and exacerbate air pollution. Climate solutions, therefore, protect the public health of community members, particularly vulnerable populations such as children and the elderly. Specific mitigation-related policy actions will lead to health benefits such as cleaner air to breathe, healthier food to eat, and more pedestrian- and bicycle-friendly communities for the entire community.
Economic Prosperity: 	There are enormous opportunities when a city moves away from dirty fuels of the past. Many proposed strategies will end up saving taxpayer dollars through municipal energy efficiency initiatives or creating local jobs through clean energy products.
Sustainability/ Triple Bottom Line: 	Sustainability links environment, equity, and economy or can be described by the business term triple bottom line—people, planet, profits. Climate action is about doing the right thing for the people of your community (protecting them from climate impacts), the planet (doing your part to fight global warming), and local business (creating economic opportunities through climate initiatives).
Stewardship: 	Wise stewardship of the earth and its resources will be a natural outcome of many climate change strategies. Protecting Redmond's irreplaceable natural resources for present and future generations will be addressed through climate change solutions.
Innovation: 	Actions to prevent climate change can be characterized as being about new thinking, new technologies, planning ahead, forward-thinking, balanced alternatives, efficiency, prudence, and caring.

The following sections contain proposed strategies, in table format, for each action category. The information in the table is self-explanatory. The "GHG Impact" is a relative measure of low, moderate, or high. Refer to the chart below for cost measurement.

Cost Legend	
-	Cost savings opportunity
- -	Moderate cost savings opportunity
- - -	Large cost savings opportunity
+/-	Initial cost, with lifecycle savings
+	Implementation cost to achieve desired GHG reduction
+ +	Moderate implementation cost to achieve desired GHG reduction
+ + +	Large implementation cost to achieve desired GHG reduction

Mobility

Overview

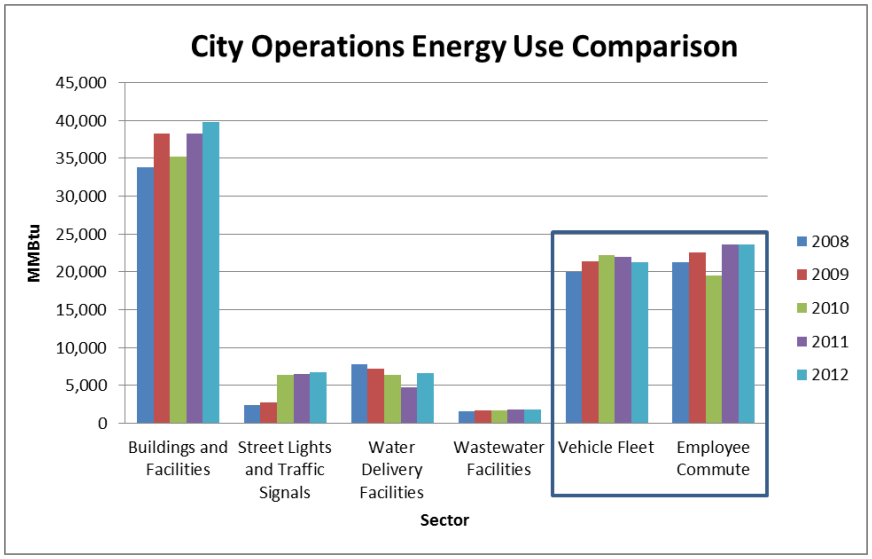
Transportation is the fastest growing source of U.S. greenhouse gas emissions, accounting for 47% of the net increase in total U.S. emissions since 1990. In King County, emissions from the Transportation sector made up 48% of all greenhouse gas emissions and 47% of the City of Redmond's operational energy use.

This section will explore strategies to reduce greenhouse gas emissions that are related to Mobility.

City Operations Mobility Emissions

GHG emissions at the city from the vehicle fleet and employee commute make up the majority of the operational CO_2 emissions and 47% of the energy use across all sectors, surpassing the impact of Buildings and Facilities (Figure 20). Strategies to reduce emissions in these two areas will go a long way in reducing the city's impact on climate change.

Figure 20, City Operations Sector Energy Consumption, 2008-2012



The amount of money the City has spent on the vehicle fleet has been broken down by regular, unleaded gasoline and diesel fuel in Figure 21. Over five years (2008-2011), the City spent $1.89 million on fuel costs. In 2012 over half a million dollars were spent on fuel which represents a 43% increase over the dollars spent in 2008. (Table 11)

This increase in cost is related to both an increased use (more gallons) and an increase in the cost of fuel. Reducing miles traveled in the city fleet will reduce GHG emissions and the costs

associated with fuel. The state legislation also passed a fleet conversion bill in 2009 (House Bill 1481). RCW 43.19.648 requires all local municipalities convert their fleet (vessels, vehicles, and construction equipment) to electricity or biofuel, to the extent practicable as determined by the State Department of Commerce, by June 1, 2018. The Department of Commerce will define "to the extent practicable" by June 1, 2015, by adopting rules and clarifying how local governments will be evaluated in determining whether they have met this goal.

Figure 21, City Fleet Fuel Use Consumption, 2008-2012

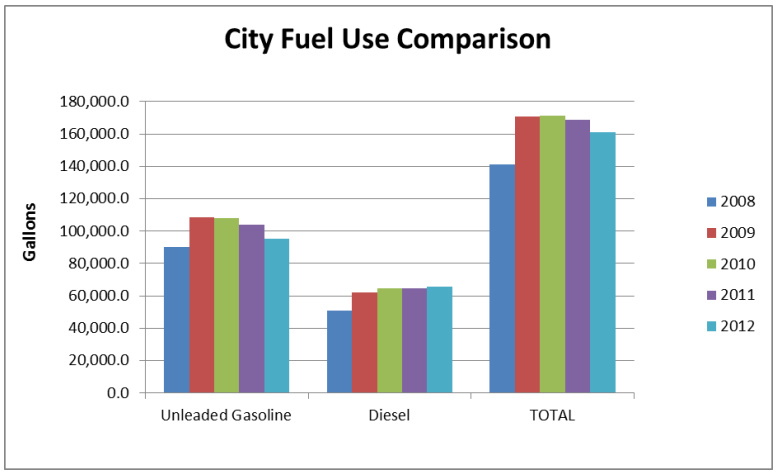


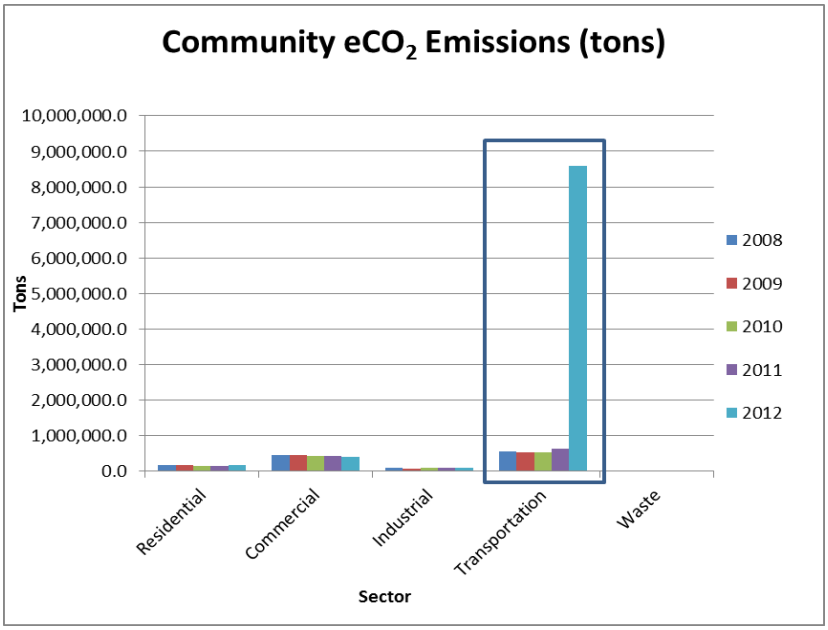
Table 11, Fleet Fuel Costs, 2008-2012

	2008	2009	2010	2011	2012
Unleaded	$234,172.50	$296,600.58	$290,345.95	$287,729.80	$299,350.89
Diesel	$139,907.45	$219,506.20	$175,166.73	$247,061.30	$248,061.30
Total	$383,079.95	$516,106.78	$465,512.08	$534,791.10	$547,397.74

Community Mobility Emissions

Figure 22 shows the Transportation sector as the largest source of GHG emissions within the community. Given the significant role of transportation as the primary source of GHG emissions in our region, local jurisdictions, and transit agencies should advance more efficient and less polluting alternatives to driving alone. Regulatory and incentive approaches should be explored, including promoting mixed-use, and higher density development since these approaches can create more walkable and transit-friendly communities.

Figure 22, Community eCO_2 Emissions by Sector, 2008-2012



Nearly 40% of trips we make in our car are for trips that are less than two miles. Unfortunately, 60% of the pollution created by automobile emissions happens in the first few minutes of operation, before pollution control devices can work effectively. Since "cold starts" create high levels of emissions, shorter car trips are more polluting on a per-mile basis than longer trips. These short trips can easily be swapped for walking, bicycling, or transit which will help to significantly reduce emissions. Strategies to address these short trips are proposed in this section.

In the 2010 U.S. Census Report, 70% of Redmond residents commuted to work alone in their personal vehicle. This many individual commuters has a big impact on local air quality and traffic congestion around Redmond. Even moderate reductions in driving during peak commute times will make it easier and faster for all commuters to get around Redmond. The fewer cars sitting in congestion will also help reduce GHGs and other pollutants, such as carbon monoxide, that are being emitted as cars are idling.

Additional Benefits

Efficiency improvements in this category have a number of benefits beyond reducing carbon emissions. This includes:

- **Financial Savings:** In 2012 the City spent $547,398 fueling the vehicle fleet and over $2.4 million over five years. Dollar savings from reduced fuel use would provide a significant savings for the City, just as it would for other businesses and residents.

- **Reduced Maintenance:** Less driving equates to less wear and tear on the vehicle, providing an additional savings on maintenance.

- **Reduced Congestion:** Traffic congestion has been measured to reduce economic output and contribute to problems that reduce other aspects of quality of life, such as the risk of crashes, reduction in travel reliability, and time delays. According to Redmond's 2011

Community Indicators Report, traffic congestion is on the rise. Programs to reduce travel during peak commute hours, such as telecommute options and incentives for commuters to use public transit, can reduce traffic congestion.

- **Public Health:** Fewer emissions from personal vehicles will reduce local air pollution, which can aggravate asthma and other lung sensitivities. Active transportation modes like walking and bicycling have additional health benefits for those individuals.

- **Increased Options:** By planning for active transportation and providing public transit options, we not only reduce greenhouse gas emissions but provide more options for all residents. This is especially beneficial among populations with limited access to personal vehicles such as elderly, young, and low income residents.

Objectives:

1. Reduce vehicle miles traveled by community members and city employees.
2. Increase fuel efficiency in the city's fleet vehicles and utilize fleet vehicles in more efficient manner.
3. Increase the use of low carbon modes of transportation such as bicycling, walking, and transit through facility improvements and community-based encouragement activities.

Existing Mobility Actions to Reduce GHG Emissions (City of Redmond Operations)

The City has been working to make our transportation system work efficiently and to encourage residents to reduce their vehicle miles traveled (VMT). Below are some of the actions the City has taken to reduce the impact the transportation sector has on GHG emissions in the community.

- Anti-Idling Campaign

  This is a city fleet effort to reduce emissions and conserve fuel due to vehicles idling for long periods of time. The program provided education and outreach to employees and trained inspectors to recognize excessive idling and encourage contractors to minimize idling. This campaign resulted in the addition of a statement to standard city contracts to require contractors to minimize idling on city construction sites. The Parks & Recreation Staff also reminds fleet users to reduce the time spent defrosting a vehicle, which reduces idling and time to "warmup" the vehicle. There are opportunities to further enhance this program.

- Diesel Vehicle Retrofits
  In 2008 new vehicle emission standards were established at the federal level. City fleet vehicles that run on diesel fuel were retrofitted with converters that reduce emissions.

- Fleet Improvements
  The City is exploring ways to minimize fuel usage including methods to increase fleet mileage and decrease carbon emissions, and create a purchasing policy to require that lowest emission vehicles be bought for all new city vehicle purchases. In addition, there is a program to support proper tire inflation including indicator gauges on city fleet vehicles to visually signify proper tire pressure.

- Hybrid Fleet Vehicles:
  The City has begun purchasing hybrid vehicles as vehicle replacements are warranted. The City currently has 29 hybrid vehicles, which represents 21% of the vehicle fleet (exclusive of fire, diesel, and construction equipment).

- Commute Trip Reduction
  This program provides various incentives to reduce driving alone in order to decrease fuel consumption, vehicle emissions, and increase mobility and transportation options. In 2011 the program reduced the employee commute contribution to greenhouse gas emissions by 309,962 pounds of eCO_2, for a savings of $69,145.73.

- Transportation Demand Management
  Similar to Commute Trip Reduction, this program provides incentives to commuters for using alternatives to driving alone and incentives for employers to implement commute trip reduction programs.

- Bus Pass Program
  The City provides bus passes to regular and supplemental employees for both commuting and attending meetings.

- Reduced Number of Commutes by Fire Department
  The Fire Department went from 24- to 48-hour shifts, which cut the amount of commuting done by the staff in half. This greatly reduces the amount of commuting and associated GHG emissions by Fire staff.

- Complete Streets Ordinance
  Redmond adopted the Complete Streets Ordinance in 2007 (Ordinance # 2359). Complete streets are designed and operated to enable safe access for all users. This ordinance works

to provide environmentally friendly transportation and promote a variety of mobility choices.

- Transportation Master Plan (TMP)
  The adoption of the 2013 TMP has shifted how the City invests in transportation infrastructure. Investing more infrastructure that is multimodal means our transportation system can handle the kind of mode shift that we are asking people to make in order to reduce GHG emissions related to transportation. This includes connected sidewalks and bike lanes along with a convenient and reliable network of transit service.

- Bike Parking
  New developments within the city must meet bike parking standards in addition to parking spaces for vehicles.

- Bikes Available to Employees
  The Commuter Assistance Office has bicycles available for employees to use for lunch breaks, exercise, or other trips near City Hall.

Existing Mobility Actions to Reduce GHG Emissions (Community)

- R-Trip (Redmond Trip Resource & Incentive Program)
  R-TRIP is committed to offering information, programs, and incentives to assist Redmond's commuters and residents in choosing alternatives to driving alone. Since its inception R-TRIP has helped reduce CO_2 by 100 million pounds, eliminated 3.9 million vehicle trips, and saved $22 million.

- Electric Vehicle Infrastructure
  There are currently four publicaly available electric vehicle charging stations on the City campus. Nintendo Corporate Headquarters and Microsoft, among other developments, also offer EV charging stations in their parking garages for their employees.

- Car Share Options
  Car sharing encourages a reduction in vehicle miles by shifting the fixed costs of car ownership to cause people think about each time they make a choice between driving and another transportation mode. One Zipcar is publically available at Red160 and is promoted through R-TRIP. Microsoft offers car sharing through a local car rental company.

Proposed Mobility Actions to Reduce GHG Emissions (City of Redmond Operations)

1. Manage the City of Redmond Fleet for Fuel Efficiency to Lower GHG Emissions	
Description	The City of Redmond fleet accounted for 18% of the carbon emissions produced by city operations in 2012 and the cost to fuel the fleet in 2012 was $547,398. Operating the city fleet efficiently will reduce these carbon emissions and be a cost savings for the City. The following are how suggested strategies could improve fleet efficiency. **Evaluate the Size of Fleet** Reducing the size of the fleet to match more closely the need within the city will provide an opportunity to reduce maintenance and use the fleet we have more efficiently. **Alternative Fuels** Research and evaluate alternative fuel vehicles and the conversion to alternative fuels for incorporation into the fleet. Using biodiesel (B_20) in municipal fleet vehicles is a simple and effective way to achieve large reductions in GHG emissions from fleet operations. Natural gas, a fossil fuel comprised mostly of methane, is one of the cleanest burning alternative fuels. It can be used in the form of compressed natural gas (CNG) or liquefied natural gas (LNG) to fuel cars and trucks. LNG is produced at a relatively low cost and is cleaner burning than diesel fuel with significantly lower NOx and particulate emissions. Propane or liquefied petroleum gas (LPG) is a clean-burning fossil fuel that can be used to power internal combustion engines. LPG-fueled vehicles can produce significantly lower amounts of some harmful emissions and the greenhouse gas carbon dioxide (CO_2). **Fuel Efficient Vehicles** When it comes time to replace vehicles in the fleet, standards for purchasing more fuel efficient vehicles, such as hybrid, electric, and smaller vehicles, should be considered. The drive trains of electric vehicles' (EVs') are much more efficient than the drive trains used on standard internal combustion engine vehicles. Hybrid/electric vehicles couple an electric drive with a gasoline engine, are widely available, and are suited for a variety of applications. Automakers are increasingly making hybrid/electric versions of existing models available. One easy way to improve the efficiency of vehicles is simply to use a smaller one. The smallest vehicles that can accomplish a task will usually be the most efficient. When considering a vehicle purchase and replacement, identify whether an SUV or full-size sedan is actually necessary, or whether a compact car can do the same job.
Benefits	Replacing three traditional fleet vehicles with three hybrid cars would save a government agency $37,500 over the life of the vehicle, and reduce CO_2 emissions

	by 102 metric tons (assume ten years). A hybrid car purchased today would save $6,250 in fuel costs over a traditional vehicle in five years. An electric car would save $8,500. EVs can significantly reduce local air pollution. There is no tailpipe and no emissions from the vehicle itself. If EVs are charged from renewable energy, emissions are zero. EVs in the city's fleet can also serve as an educational component to the public and show the city's commitment to sustainability. Using fuel more efficiently reduces greenhouse gas emissions and air pollution. In addition to reducing emissions and saving on fuel costs, smaller vehicles usually have a lower purchase price. Alternative fuels such as biodiesel reduce more greenhouse gas emissions and criteria air pollutants compared to petroleum diesel. Using biodiesel produced locally, from waste cooking oil or from locally grown crops, infuses fuel dollars back into the local economy.
Proposal	▪ Increase the percentage of hybrid, electric vehicles, and alternative fuel vehicles in the city's fleet as vehicles come up for replacement. ▪ Require right-sizing analysis of vehicles prior to purchase to ensure they are not oversized for their intended purpose. ▪ Select the smallest appropriate vehicle to accomplish the task. ▪ Set a target goal for fuel efficiency in vehicle fleet. ▪ Explore smaller configurations for emergency vehicles. ▪ Explore liquid natural gas (LNG) and propane fuel for vehicles which can be equivalent in power compared to gas/diesel, but generate less greenhouse gas emissions. ▪ Purchase biodiesel (B20) for use in city diesel fleet. ▪ Analyze the usage of current fleet to reduce size of fleet.
Metrics	Average MPG of City fleet, Percentage of fuel efficient vehicles in the city's fleet
GHG Impact	Moderate ***Cost*** - -
Impact Areas	

2. Expand & Promote Innovative Travel Demand Management Programs	
Description	The employee commute is the second greatest source of GHG emissions for the City, making up 19% of total emissions. Approximately 75% of city employees commute to work in single occupancy vehicles. Expanding and promoting programs that reduce the number of single occupancy vehicle trips will reduce GHG emissions and provide flexibility for employees. Programs could include further expanding and supporting employee flex schedules, telecommuting, and

	initiatives like a parking cash-out program. **Expand Participation in Commuter Assistance Office (CAO)Programs** Leveraging the work of the CAO to include more participants will reduce the number of city employees commuting to work in personal vehicles. The infrastructure of the program is already in place, work can be focused on expanding the reach of the program with city staff. **Telecommuting & Flex Schedules** Employees whose job function does not require them to be on site have the option of working remotely a portion of their work week. Flex hours allow some workers to work longer hours on fewer days, decreasing the number of commutes within a week. Studies have shown that telecommuting and flex hours do not negatively impact worker productivity. Within the City of Redmond, there is an opportunity to encourage and formalize some employee schedules to expand participation among city staff. **Parking Cash-Out** Parking cash-out is a powerful mechanism for reducing single occupancy automobile commuting and increasing commuter choice. In essence, parking cash-out is an employee transportation benefit that offers workers the option of giving up their employer-provided parking space in exchange for its equivalent monetary value.
Benefits	Reduced greenhouse gas emissions related to the employee commute, more choices for employees, reduced single occupancy vehicle travel, reduced congestion, and improved local air quality.
Proposal	▪ Consider more innovative and strategic approaches to transportation demand management. ▪ Where applicable, encourage departments and employees to take advantage of telecommute and flex workweek options.
Metrics	Number of employees formally enrolled in telecommute program, Percent growth in Commute Trip Reduction programs, GHG emissions from employee commute.
GHG Impact	High ***Cost*** +
Impact Areas	

3. Expand Anti-Idling Campaign	
Description	Vehicle idiling is detrimental to the car engine and wastes gas while unnecessarily emitting greenhouse gases. There is a long-held misconception that idling is better for the car than turning on and off the vehicle and that vehicles should be run for a few minutes before driving to warm the engine. The truth is modern cars do not need long warmup times, and the “break-even” time for benefits of turning a vehicle on and off is 10 seconds. An anti-idling campaign would help educate drivers on the misconceptions around idling and help break the habit of

	leaving the car running. It would also educate maintenance staff regarding anti-idling of small equipment, such as mowers and blowers.		
Benefits	Reducing the amount of time vehicles are spending idling will improve local air quality, save fuel and fuel costs, reduce GHG emissions, and extend the life of the vehicle. Over an entire vehicle fleet and, over more time, these savings add up to a big impact. Reducing the amount of time small equipment idles will also reduce GHG emissions, save fuel and fuel cost.		
Proposal	Expand and promote an anti-idling campaign, which includes both fleet and small equipment, within the city.		
Metrics	Gallons of gasoline consumed per year, survey gauging awareness before and after campaign.		
GHG Impact	Moderate	***Cost***	- -
Impact Areas			

Proposed Mobility Actions to Reduce GHG Emissions (Community)

1. Focus on Maintaining & Enhancing Multimodal Transit Services and Related Facilities	
Description	Multimodal transportation options include alternative to driving personal vehicles. These options typically include transit, carpooling, biking, and walking. Sound Transit is working to extend light rail to the Eastside over the coming years. Light rail is a form of mass transit that will connect the Eastside to Seattle, reducing reliance on personal vehicles.
Benefits	Light rail will provide a variety of transportation options for all citizens, reducing reliance on personal vehicles, traffic congestion, and greenhouse gas emissions. A study by Fehr & Peers expects that light rail connecting our growing Downtown and Overlake areas will save nearly 10 million gallons of gasoline, or 46 gallons per person, per year. Multimodal options provide choices to citizens and could meet the broad range of travel needs for the community.
Proposal	▪ Air quality improvements occur with multimodal transportation as it increases the use of more efficient travel and environmentally friendly options to driving in an automobile. ▪ Support the extension of light rail into Redmond. ▪ Implement policy and regulatory changes, if necessary, to provide transit related facilities to residents and businesses.
Metrics	Miles of Light Rail in the City of Redmond, ridership numbers.

GHG Impact	Large	***Cost***	Significant Investment, partnership opportunities
Impact Areas			

2. Expand & Implement Innovative Transportation Demand Management Programs			
Description	Redmond's Transportation Demand Management (TDM) programs work to reduce trips made by single occupancy vehicles. The implementation of R-TRIP has resulted in significant greenhouse gas emission reductions. Programs like this are instrumental in reducing GHG emissions related to the Transportation sector. There are opportunities to expand TDM programs to residents and businesses in the community. For instance, the "Metro In Motion" program with King County Metro Transit is partnering with local communities to encourage residents to use healthier travel options like the bus, carpooling, bicycling, and walking. Metro shows residents prefer faster travel alternatives that save time and money. Parking cash-out is a powerful mechanism for reducing single occupancy automobile commuting and increasing commuter choice. In essence, parking cash-out is an employee transportation benefit that offers workers the option of giving up their employer-provided parking space in exchange for its equivalent monetary value.		
Benefits	Reduce single occupancy vehicle travel, reduced congestion, improved local air quality, reduced GHG emissions from vehicles. Working with an established program, such as Metro in Motion, encourages more environmentally friendly transportation options with city residents, which will reduce carbon emissions from transportation and provide cost savings for participants.		
Proposal	▪ Work with Metro in Motion and R-Trip to create a targeted transportation campaign in Redmond neighborhoods. ▪ Implement a Parking Cash-out program with larger, local businesses.		
Metrics	Number of cash-out programs in local businesses, Number of participants, GHG reductions from transportation mode shift.		
GHG Impact	Large	***Cost***	Staff time to expand current programming
Impact Areas			

3. Improve Safe, Alternative Transportation Options with Local Schools	
Description	Up to 25% of morning rush hour traffic can be school related. Picking up and dropping off students at local schools causes traffic congestion, local air pollution,

	and GHG emissions. With many students living within two miles of their school, there are numerous opportunities for alternative transportation such as biking or carpooling. Targeting school zones, students, and families to use alternative transportation and reduce the use of personal vehicles can help reduce GHG emissions, improve health, and reduce traffic congestion. **Safe Routes to School** Safe Routes to School encourages students and parents to walk, bike, and carpool to school. The program utilizes the 5 Es: Education, Encouragement, Engineering, Enforcement, and Evaluation to decrease the number of students being taken to school in the family vehicle. The program has been shown to reduce traffic congestion around schools, reduce local air pollution, and help change family travel behavior. **High School Transportation Focus** By carrying many people with a single vehicle, buses are more efficient than personal automobiles. Alternative transportation programs for high schools provide students with bus passes, information on taking the bus, and encourage alternative modes of transportation to students. **Anti-Idling in School Zones** Diesel particulates from buses and cars are carcinogenic and may contribute to asthma and the congestion around schools during pickup and drop-off hours. Family vehicles idling while waiting for students can contribute to these harmful emissions. An anti-idling campaign will inform drivers to turn off vehicles when they find themselves idling for longer than a designated amount of time. The campaign can be expanded to work with school buses.
Benefits	Biking and walking to school reduces vehicle miles traveled. Schools with good bicycle and pedestrian access have less air pollution from cars dropping off students. Walking or biking to school creates many benefits for the health of children and the community. With the percent of 6-11 year olds who are overweight having increased by a factor of three in the past 30 years, walking to school provides much needed exercise. Reducing vehicle miles traveled by encouraging people to switch to riding the bus reduces emissions. Bus passes can increase mobility for students, helping them attend social activities as well as school and jobs. Limiting idling reduces fuel costs, greenhouse gas emissions, and particulate air pollutant emissions.
Proposal	▪ Work with the Lake Washington School District to establish a Safe Routes to School program. ▪ Work with the Lake Washington School District and King County Metro to improve access to public transportation, carpooling, and active transportation options. ▪ Expand anti-idling campaign from the city to community groups like the Lake

	Washington School District.		
Metrics	Percent of students choosing to walk or bike, Number of schools with Walk + Bike Days or encouragement programs, Number of bus passes given to schools, Anti-idling campaign awareness.		
GHG Impact	Large	***Cost***	Moderate investment, partnership opportunities
Impact Areas			

4. Expand Electric Vehicle (EV) Charging Station Infrastructure			
Description	Installing Electric Vehicle infrastructure will allow for owners of EVs to charge their vehicles throughout the city, and reduce the amount of fossil fuels being burned. Publicaly available charging stations are another way of showing the city supports clean energy, and reduces the barriers to owning an electric vehicle locally. Additionally requiring EV-ready developments will make EV charging more accessible to residents and businesses.		
Benefits	In an area with a relatively low carbon electric grid, like Washington, an EV can significantly reduce emissions. If EVs are charged from renewable energy, emissions are zero. EVs can significantly reduce local air pollution.		
Proposal	▪ Expand EV charging stations in City of Redmond parks and other public spaces. ▪ Require EV-ready developments.		
Metrics	Number of charging stations, Energy use from EV stations.		
GHG Impact	Moderate	***Cost***	Grant opportunities, moderate investments
Impact Areas			

Buildings & Energy

Overview

Energy used to heat, cool, light, and operate our workplaces and homes make up one of the largest sources of greenhouse gas emissions in Redmond. In Washington State, nearly 35 percent of the greenhouse gas contributions are related to our buildings. This section will explore strategies that reduce energy use, save money, and increase the reliance on renewable energy sources.

City Operations

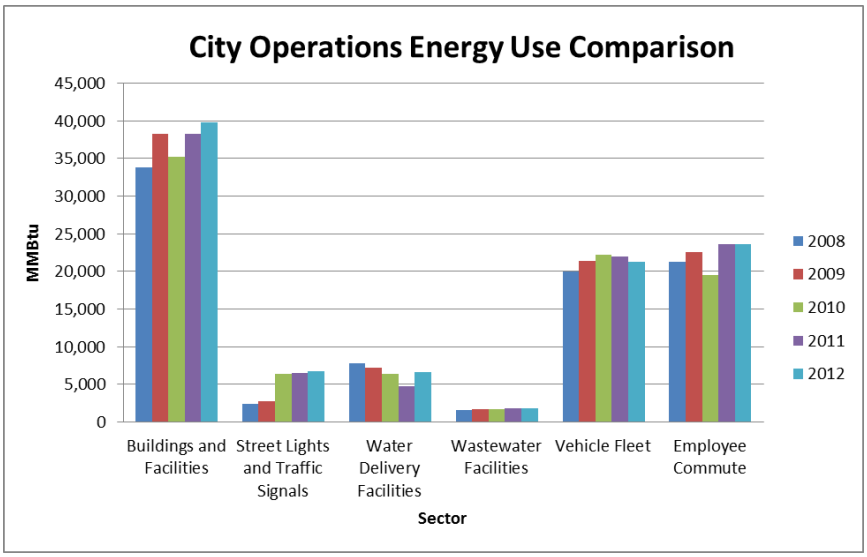
The buildings and facilities the City operates are the second largest source of GHG emissions. Not surprisingly, this is also the category that uses the most energy. The carbon emissions from our buildings and facilities have increased by about 14% between 2008 and 2012 (3,498 tons to 4,072 tons of eCO_2). The cost to power city buildings and facilities was $886,035 in 2012, which has increased by 26% since 2008. This cost increase can be explained by both increased energy use (up 13% since 2008) and the increased cost of energy. The overall cost per year for buildings and facilities is laid out in Table 12.

Table 112, City Buildings and Facilities Energy Costs, 2008-2012

Energy Cost	2008	2009	2010	2011	2012	Total
Buildings and Facilities	$602,263	$808,870	$796,541	$819,584	$886,035	$3,913,293

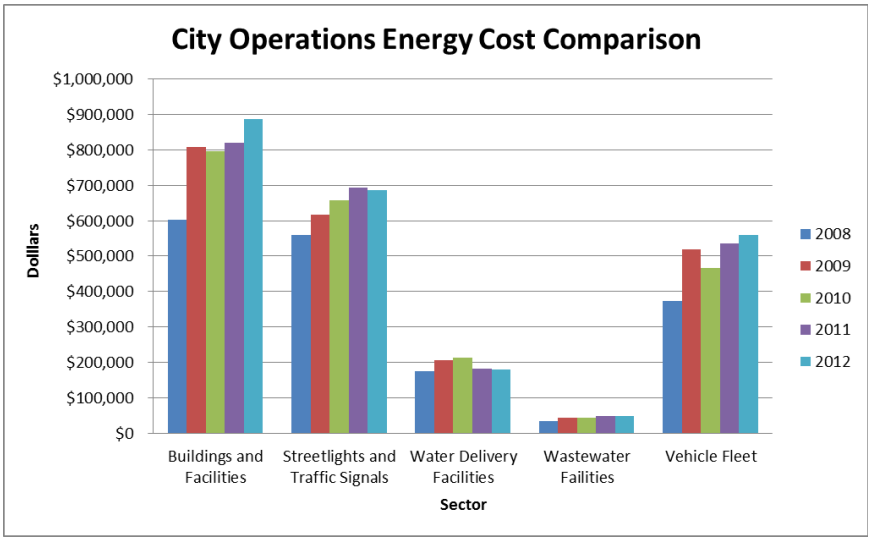
Figure 23 and Figure 24 illustrate the energy consumption and associated costs for each area of the city's operations. Energy use and the average cost of this energy are closely aligned, with the exception of street lights and traffic signals. Here the cost of the energy to operate the street lights is higher than would be expected based on trends with energy use. This cost difference will be addressed in the Strategies section.

Figure 23, City Operations Energy Consumption Comparison, 2008-2012



Looking more closely at building energy use, greenhouse gas emissions, and costs, in 2012 the Senior Center generated 266 tons of eCO_2, consumed 2,939 MMBtus of energy, and cost $55,787 to pay for that energy. The data can be further translated down to a scale of output or consumption per 1,000 square feet, per hour of operation, or per occupant. Building comparison data can be an extremely helpful tool when determining which facilities to target for energy audits and/or retrofits. For instance, the Senior Center costs $2.53 per square foot in energy costs to operate. By contrast, City Hall costs $1.34 per square foot in energy costs to operate. If the Senior Center operated as efficiently as City Hall, the City would realize $26,180 annually in energy savings alone.

Figure 24, City Operations Energy Costs Comparison, 2008-2012



As Table 13 shows, there are vast differences in the operating costs per 1,000 square feet of our city facilities. By this measure, Fire Station 11 is the least efficient building, while Fire Station 14 is the most efficient. The Public Safety Building is the most expensive building to operate annually. This table could help provide guidance on prioritizing facility upgrades and strategies to save the City money. Simple comparisons, however, cannot be made between buildings. Analysis needs to take into account building function and hours of operation, among other things.

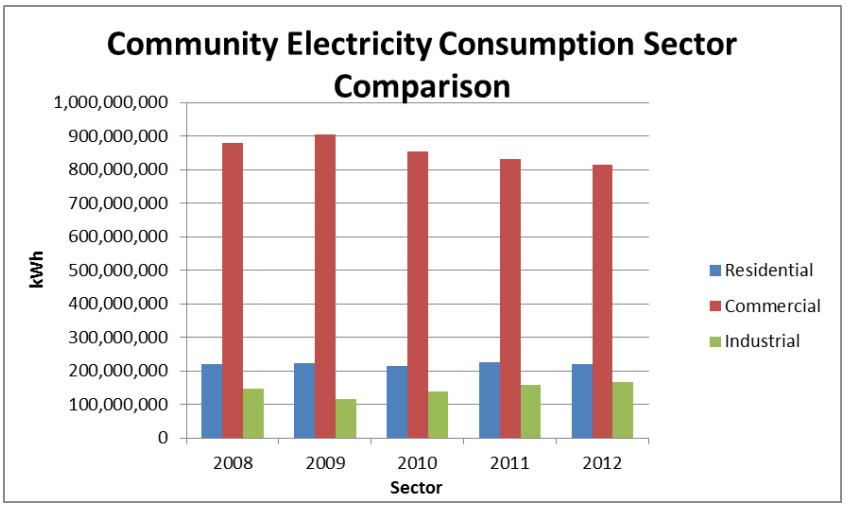
Table 13, Average eCO_2 Emissions and Annual Operating Costs of City Facilities, 2008-2012 (Station 17, 2013 data only)

City Facility	Tons of eCO_2	Tons of eCO_2 per 1,000 Sq. Ft.	Annual Operating Cost	Operating Cost per 1,000 Sq. Ft.
City Hall	726	6.4	$148,862	$1,316
Fire Station 11	150	12.6	$34,032	$2,837
Fire Station 12	67	9.4	$11,465	$1,607
Fire Station 13	72	9.3	$12,401	$1,608
Fire Station 14	35	3.7	$19,049	$838
Fire Station 16	130	8.5	$25,198	$1,655
Fire Station 17	126	6.5	$23,950	$1,235
Fire Station 18	72	9.3	$12,401	$1,608
MOC	252	11.4	$52,986	$2,382
Old Redmond School House	321	4.5	$64,653	$1,550
Public Safety Building	852	9.0	$163,212	$1,718
Redmond Senior Center	245	11.1	$52,135	$2,369
Teen Center	50	4.5	$64,653	$1,550

Community Energy Use

Community energy consumption has been calculated in the Commercial, Residential, and Industrial sectors. Overall trends show community electricity and natural gas consumption relatively flat, with some sectors slightly increasing while other sectors slightly declining over the five benchmark years. Sector comparison data shows commercial users are by far the greatest

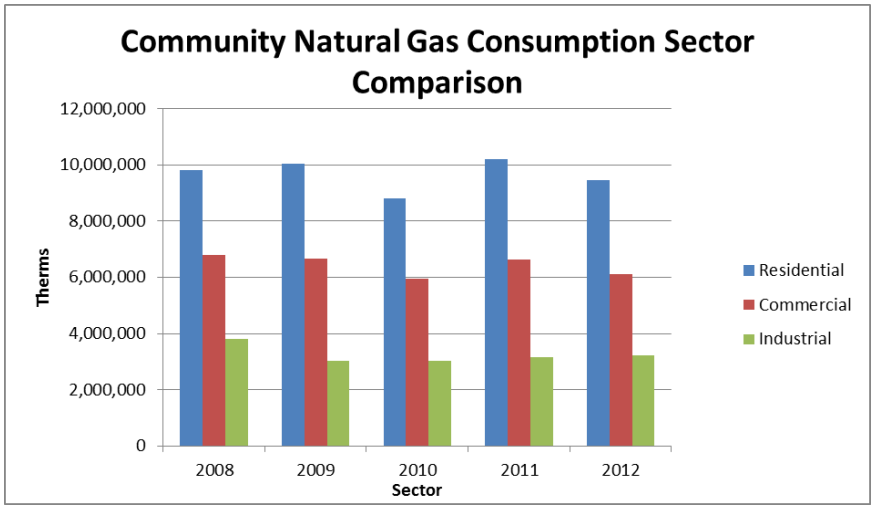
Figure 25, Community Electricity Consumption by Sector, 2008-2012



consumers of electricity, reaching approximately 830,000,000 kWh in 2012 (Figure 25). This is several orders of magnitude greater than the Residential and Industrial sectors. However, Residential sector use of natural gas exceeds that of Commercial and Industrial sectors (Figure 26).

Sixty percent of Redmond's housing stock was built before 1990 according to the 2010 Census. Older structures tend to be less energy efficient than homes that are built today. For instance in California homes built before 1983 account for 70 percent of the greenhouse gas emissions related to single-family energy consumption. Over the next few decades, most of the energy consumed by buildings will be used by the existing building stock. In Redmond the average household's energy use equates to 6.2 tons of eCO_2. This has remained relatively constant since 2008. This energy waste can come from older appliances, home heating and cooling systems, electrical work, window quality, and insulation. Energy use can be reduced through retrofitting our existing buildings and encouraging higher efficiency standards in new developments that will be built in Redmond.

Figure 26, Community Natural Gas Consumption, 2008-2012



In 2012 the average commercial per employee eCO_2 emissions was 7.4 tons and 62.1 MMBtus. The average industrial per employee eCO_2 emissions was 9.5 tons and 89.5 MMBtus. Strategies to improve energy efficiency in the Commercial and Industrial sectors would have a significant impact on reducing Redmond's GHG emissions.

Additional Benefits

Reducing energy use and making buildings and facilities operate more efficiently has benefits beyond greenhouse gas reductions.

- **Cost Savings:** The City currently spends an average of $780,000 annually on electricity and natural gas for buildings. The LEED certified City Hall operates more efficiently than the traditionally built Public Safety Building, saving the City $353 in energy costs per 1,000 square feet annually.

- **Health:** Studies point to the positive impact green buildings are having on their occupants. This comes from improved indoor air quality, which may lead to reductions in absenteeism and work hours lost to asthma, respiratory allergies, and stress.

- **Real Estate Values:** Efficient, green buildings perform better on the real estate market when compared to "traditional buildings." They have been shown to average higher occupancy levels, lease rates, and sale prices than non-green buildings. This was true even through the recent economic recession.[18]

- **Innovation & Investment**: Demand for energy efficient products and services and for new or alternative energy technologies expands local business and creates local jobs. Northwest SEED has led Solarize campaigns that have installed over one megawatt of solar on rooftops across Washington State since the program was launched in 2011.

- **Predictability**: Certified green building programs, such as LEED, allow for maintenance and operational predictability, which can be budgeted into the city's operational budget, thereby reducing cost spikes.

Objectives

1. Reduce the total energy use in all city facilities through increased operational efficiency and conservation efforts.
2. Assist businesses and homes in ways to operate more efficiently to reduce energy use and save money.
3. Increase the use of renewable energy sources within Redmond.

Existing Buildings and Energy Actions to Reduce Greenhouse Gases (City of Redmond Operations)

- Light Emitting Diode (LED) Lights for Traffic Signals
  The City changed out conventional traffic lights with LED lights for all traffic signals within the city, thereby reducing energy consumed and greenhouse gas emissions. This LED transition will save the City about 1.8 million kWh per year, or $153,000 every year and one million pounds of CO_2 if charged by energy usage.

- Higher Density, Mixed Use Development in Downtown Cores
  Focusing development in Downtown and Overlake will provide residents with easy access to

[18] High Performance Green Building: What's it Worth? http://legacy.cascadiagbc.org/news/GBValueStudy.pdf

jobs and services, which will reduce the vehicle miles they need to travel. These developments also prevent the development of sprawling land use patterns and allows for more efficient use of city infrastructure and services. Demand for homes in walkable locations is on the rise, which supports this type of development.

- Energy Efficiency Conservation Block Grant
  As part of this federal program, Redmond received $272,000, with allocations to municipal facility upgrades/energy retrofits ($107,557), LED street light conversion ($10,000), a residential energy use outreach partnership with PSE and C-7 ($58,500), and Impact Redmond and R-Trip website development and upgrades ($75,000). Specific facility upgrades included the Old Redmond Schoolhouse Energy Efficiency Upgrades which retrofitted 375 lighting fixtures in addition to installing digital controls. The Public Safety Building Boiler Upgrade Retrofit included 67 lighting fixtures and replacing two cast-iron boilers with high efficiency gas boilers. The LED Streetlight Case Study replaced 12 sodium vapor luminary streetlights with LED fixtures.

- LED Lights for Crosswalks
  The City swapped out the conventional bulbs in its countdown crosswalk signals with LED lights, thereby reducing energy consumed and greenhouse gas emissions. These LED lights are 13 times more efficient than the traditional displays and will require reduced maintenance costs.

- Leadership in Energy and Environmental Design (LEED) Silver and Energy Star Certified City Hall
  LEED and ENERGY STAR buildings conserve electricity, water and other resources, resulting in reduced energy consumption, greenhouse gas emissions, and water consumption over traditional buildings. The LEED certified City Hall is one of the most efficient buildings the City operates.

- Re-Energize Your Lighting Employee Event
  The City organized an event in collaboration with Puget Sound Energy and Techniart to provide energy efficient lighting to city employees at deep discounts. In all, the sale of 3,895 energy efficient units will reduce CO_2 by 3,011,026 pounds, amounting to $267,690 saved in utility bills.

- GHG Verification Form for Building Permit Submittal
  Staff developed this form to track actual greenhouse gas emissions from development projects. This enables staff to evaluate information submitted during the entitlement phase

and SEPA disclosure and compare it to actual emissions base on more specific information submitted with building permits.

- Energy Efficient Fire Station 17
  The first fire station built in Redmond in many years was built to last for 50 years. It has a number of energy efficient measures throughout the building, and uses ENERGY STAR appliances.

- Electric Parks Maintenance Equipment
  The Parks Department has purchased some electric powered equipment—a utility vehicle and blower. The electric utility vehicle is located at Grass Lawn Park and is used for picking up litter, park patrols, and general transportation around the park. The electric blower is used by the facility and maintenance crew. The blower is used to blow off hard surfaces and picnic shelters. The electric motor is very quiet and allows the crew to use it early in the morning in residential areas.

- Sports Field Lighting
  The City remotely turns on lights for scheduled activities rather than having lights constantly on. The City can also turn off lights remotely if the scheduled event is cancelled and the city is notified.

- Server Minimization and Virtualization
  New technology and management has allowed Information Services (IS) staff to reduce the number of servers that are operated. Colocating the Police Department servers with the other city servers has further reduced the server demand. These efforts have reduced energy use by one third, with servers going from using 90% capacity to 60% capacity, a savings of about 13K watts. This savings means the City will not need to expand or build new facilities to house more servers and that IS can offer more services and use less power due to advancements in technology.

- Decrease Cooling Load of Servers
  By having a hot/cold aisle in the data center, all the heat is pushed to one area to allow it to cool more efficiently. This has reduced use of air conditioning by half. IS went from two five-ton air conditioning units to one.

- Liquid Crystal Display (LCD) Monitors
  All monitors in the city have been replaced with LCD monitors. Monitors use approximately five watts of energy; older models were using 20-25 watts. Additionally, IS has set preferences for the monitor to go into sleep mode after 15 minutes.

Existing Buildings and Energy Actions to Reduce Greenhouse Gases (Community)

- Puget Sound Energy Green Power Purchasing
  Green energy purchases allow a business or home to purchase energy created from renewable energy sources such as solar, wind, and biomass generation, without having to generate that energy themselves. PSE owns the renewable generation sources or purchases electricity from those who do, and sells green electricity to customers who sign up for it. The more green electricity customers buy, the more the utility must produce.

- Home Energy Reports
  This is a joint program between Redmond, Kirkland, Issaquah, Sammamish, Bellevue, Mercer Island, and Renton (seven cities commonly referred to as C-7). This project involves sending individual residents information about their energy use in comparison with similar households, for the purpose of reducing energy demand with their utility statement. This is coupled with O-Power's "Energy Insider" online platform access for those targeted homes.

- Green Buildings
  The City has regulations to incentivize green buildings through the Zoning Code. Additionally, administrative permitting processes have been modified to provide streamlined permitting for green buildings. There are appxoximately 1,260 certified green buildings in Redmond, which includes LEED, ENERGY STAR, and King County Built Green. Additionally, the first Certified LEED Gold Grocery Store in the U.S. is PCC on Avondale Road.

- Comprehensive Plan Energy Section
  An Energy section was added to the Utilities element of the Comprehensive Plan. These policies promote energy conservation and alternative energy. One policy specifically states that Redmond should work with energy providers to increase the development and use of renewable and less carbon-intensive sources, as well as work to minimize energy consumption.

- Green Building Nonattainment Fee
  A resolution was adopted to add a fee to the Building Permit Fee Schedule that is imposed when projects propose to be built green and receive priority review, but do not ultimately meet the City's green building criteria. This fee applies to all green building.

- Eastside Green Business Challenge
  This is a free program for local businesses and seven Eastside cities that helps participants improve their "triple bottom line," which includes profitability, environmental impact, and social impact. The program is run by Eastside Sustainable Business Alliance. A similar program launched in Chicago saved businesses $5 million in aggregate and averted the emissions of 50,000 metric tons of carbon dioxide. In 2012 there were 71 businesses participating in the challenge from Bellevue, Issaquah, Kirkland, Mercer Island, Redmond, Renton, and Sammamish.

- Electrical Code Changes
  The City amended the National Electric Code to require construction of new single-family residences with necessary conduit and junction box to dedicate for electric vehicle charging equipment. This provides an efficient convenience to homeowners who own electric vehicles.

- Alternative Energy
  The Zoning Code was amended to treat solar panel height and wind turbine height similar to height for other functional building elements. The process for their approval is designed to be streamlined and permits are issued over the counter.

- Energize Your Lighting Community Event
  The City organized an event in collaboration with Puget Sound Energy and Techniart to provide energy efficient lighting to city residents at deep discounts. In all, the sale of 3,895 energy efficient units will reduce CO_2 by 3,011,026 pounds, amounting to $267,690 saved over the lifetime of the bulb.

Proposed Buildings and Energy Actions to Reduce Greenhouse Gases (City of Redmond Operations)

1. Renegotiate Puget Sound Energy Flat Rate Contract	
Description	Many of the city's street lights and traffic signals are a flat rate, which means these rates do not reflect the energy efficient measures the City has taken.

	Redmond has retrofitted all traffic signals and pedestrian crosswalk signs with LED lighting, saving significantly on energy consumption. However, the City is not realizing the financial savings.		
Benefits	Renegotiating rates to more accurately reflect actual energy use will reduce the city's cost, and see a reduction in energy usage. Combined, the LED traffic signals and pedestrian signals represent a savings of about 1.8 kWh and $153,000 annually. This savings would cover the costs of purchasing 75% of the city's energy from PSE's Green Power Program (or to provide seed funding for a "Revolving Energy Fund").		
Proposal	Renegotiate with PSE for energy efficient flat rates for traffic signals and street lights so energy efficiency measures can be realized.		
Metrics	Energy saved (kWh), GHG emissions reduced, Cost savings		
GHG Impact	Low	***Cost***	- - -
Impact Areas			

2. Implement Energy Efficiency Programs for City Facilities	
Description	City buildings and facilities accounted for roughly 42% of the city's CO_2 emissions in 2012. Energy used to heat, cool, and light the building contributes to the majority of energy use. Improving efficiency of the equipment used for operating city facilities reduces emissions and saves climatization costs. Some strategies to improve energy efficiency in city facilities include: **Energy Audits** Energy audits conducted by energy efficiency professionals can help the City create a plan for what can be done to reduce energy, save money, and operate more efficiently. These can be implemented when replacing the facilities at the end of their useful life or the next time they are due for upgrades. The Public Safety Building, Fire Station 11, and Old Redmond School House have been mentioned by staff as being inefficient. **Energy Efficiency Upgrades** Upgrading to the most efficient chillers, boilers, heating, ventilation, and air conditioning units can maximize energy savings. Over the next few decades, most of the energy consumed by buildings will be used by the existing building stock. Many measures can be applied to existing buildings to improve their efficiency, including using efficient light bulbs and fixtures, replacing appliances with more energy efficient ones, increasing insulation, replacing windows, and upgrading HVAC systems. **Revolving Energy Fund** A Revolving Energy Fund (REF) is a dedicated source of capital that is used to make energy efficiency or renewable energy improvements. This "loan" is repaid by the

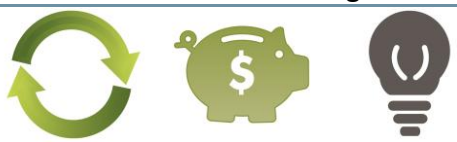
	savings that were provided by the efficiency improvements. Projects typically have a three- to five-year payback period. Once the fund has been recapitalized, it is used to fund additional projects. The seed money for the fund can be established by a municipality in a number of ways, such as maintaining an expired line item, grant funding, or from savings that have been realized through other efficiency efforts. REFs have been used in many jurisdictions with great success.		
Benefits	**Conduct Energy Audits** Having a completed audit and action plan will make the City more eligible for grant funding. The audit will help prioritize actions and identify opportunities for the greatest return on investment for upgrades. An audit can also inform which behaviors can be altered by city staff to reduce energy use. **Revolving Energy Fund** Revolving Energy Funds provide a onetime investment that can be used repeatedly to realize multiple investments in efficiency upgrades that reduce operating expenses, helps realize energy conservation goals, and will finance the installation of energy saving measures. Ann Arbor, Michigan's onetime $280,000 investment has resulted in an annual savings of $85,800 (A three year payback period, with annual savings to grow over time) and reduced eCO_2 by 980 tons every year.[19] **Incorporate Energy Efficiency Upgrades** By implementing suggestions from audits and upgrading to more efficient systems, the City can improve energy efficiency of buildings to help reduce criteria air pollutants and greenhouse gas emissions. These building retrofits can have significant energy and water cost savings for the City. A 10% improvement could save approximately $75,000 a year on electricity costs. These projects can also serve as good public education programs.		
Proposal	▪ Conduct audits of city facilities and provide recommendations for strategic energy efficiency upgrades and operational guidelines. ▪ Implement the suggested energy efficiency upgrades that come from the City Facility Energy Audit reports; as systems come up for replacement, use more efficient technologies. ▪ Establish a Revolving Energy Fund to help finance energy efficiency and green upgrades. Funding could come from savings provided by energy efficiency upgrades.		
Metrics	Energy consumption (kWh, therms) per facility and associated fiscal savings; Number of projects financed.		
GHG Impact	High	***Cost***	+/- - -
Impact Areas			

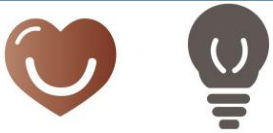
[19] ICLEI Resource Guide: Revolving Energy Fund. Winter 2008.

3. Reduce the Impact of Street Lights and Athletic Field Lighting			
Description	Street lighting is often one of the largest items in the energy budget of a local government. In 2012 the City spent nearly $700,000 to operate its street lights and signals. If there are some hours of the night when street lights are not needed, turning them off can save significant energy and emissions. Cities can save on energy by evaluating the number of hours outdoor lights are currently in use and determining reductions based on elements like daylight savings and individual event needs. Energy required for athletic field lighting could be reduced if the field lighting users can control the number of lights being used depending on the event's need. In conjunction with this measurement, governments should make sure street lamps and lamp fixtures are the most efficient available when they are on. The City of Redmond completed a case study of LED street lights by replacing 12 traditional street lights with LED bulbs. This strategy expands the case study to all street lights in Redmond, lights in city parks, and to both interior and exterior signs that require lighting. Today over 100 million exit signs in use throughout the U.S. consume 30-50 million kWh of energy and cost $1 billion to operate annually. One simple measure that local governments can take to reduce their GHG emissions and achieve energy savings is to install LED exit signs in municipal buildings. Older exit signs are lit by incandescent bulbs and use 40 Watts per sign, while LED signs use 5 Watts or fewer per sign—a savings of 87%.		
Benefits	If these facilities are metered versus flat rate, dollar savings can be realized along with GHG emissions reduction from reduced energy use. Reduced maintenance of street lights and signs, reduced energy consumption, reduced greenhouse gas emissions, cost savings.		
Proposal	▪ Evaluate the use of street lights and outdoor lighting to see where reductions can be made. ▪ Expand the use of LED bulbs to street lights and signs within city boundaries and at city facilities.		
Metrics	Utility bill, Energy consumption rates, Dollars spent.		
GHG Impact	Moderate	***Cost***	+/-
Impact Areas			

4. Implement Technology Solutions to Reduce Energy Demand	
Description	There are opportunities to reduce energy use in the Information Services Division through new technology.

	Innovative Server Cooling Techniques Computer servers at the City require air conditioning to operate efficiently. Server room cooling can consume as much as half of the room's total energy use. In place of using traditional air conditioning units, server room air conditioning units can be primarily cooled by outside air. **Wake-on-LAN** Wake-on-LAN (Local Area Network) allows a computer in a network to be turned on and off remotely. Traditionally, computers on a network tend to remain turned on. This type of program would allow company staff to shut down their computers at night or during nonworking hours. This software allows information services staff to remotely turn on computers for network upgrades or other necessary maintenance. Computers can also be turned off remotely after the work has been completed. **Virtual Desktop** A virtual desktop is a term used with respect to user interfaces to describe ways in which the space of a computer's desktop environment is expanded beyond the physical limits of the screen display area through the use of software. The user's desktop is stored remotely on a server rather than a local PC. In a virtual desktop environment, users access their person desktop remotely over the Internet. Virtual desktops essentially deliver on-demand desktops to users anytime, anywhere, on any device. **Phantom Emissions** Companies continue to become more and more reliant on electronic accessory devices, such as mobile phones, laptops, and tablet computers. One simple way to help eliminate "phantom" emissions is by using power strips in work spaces and offices that can be completely powered down when not in use. Electronic door and gate locks can be operated remotely. This will allow city staff to secure or open park facilities without making a physical trip to the location.
Benefits	Reduced energy demand from more efficient services, thereby reducing greenhouse gas emissions. Wake-on-LAN programs help save energy and subsequently dollars spent by companies on energy consumption. From an information technology perspective, virtual desktops help reduce the time it takes to provision new desktops, and they also help to decrease desktop management and support costs. Experts estimate that maintaining and managing PC hardware and software accounts for 50 to 70 percent of the total cost of ownership (TCO) of a typical PC. Since everything is centrally managed, stored, and secured, virtual desktops eliminate the need to install, update and patch applications, backup files, and scan for viruses on individual client devices. Desktop virtualization also helps to streamline management of software assets. Putting power strips at personal desktops allows employees to take ownership in reducing energy consumption.

	Electronic gate locks save a vehicle trip out to the facility for manual locking/unlocking by city staff, reducing fuel consumption and associated GHG emissions. This improves operational efficiency.		
Proposal	▪ Investigate the potential of using natural air to cool computer servers. ▪ Purchase Wake-on-LAN technology to be used by IS. ▪ Put power strips at personal desktops and educate staff on powering down power strips to save on energy costs. ▪ Explore the use of virtual desktops. ▪ Explore feasibility of electronic door/gate locks that can be managed remotely for parks facilities.		
Metrics	Kilowatt hours saved, Greenhouse gas emissions reduced, Cost savings, Number of vehicle trips saved.		
GHG Impact	Moderate to High	***Cost***	+/-
Impact Areas			

5. Expand Training for Building Code Staff on Energy Efficiency Requirements			
Description	Trained and knowledgeable Building Division staff to answer developers' questions about energy codes and energy efficiency components for development is essential for new, efficient buildings. Staff can also assist people applying for remodels by recommending energy efficient improvements which will lower the customer's operating costs in the long term and sharing information on local, state, and federal energy efficiency and rebate programs.		
Benefits	Internal working knowledge of energy efficiency, improved customer service, and higher compliance on energy efficient development.		
Proposal	Provide training for building division staff on energy efficiency measures and potential grant funding sources.		
Metrics	Number of staff trained in energy efficiency methods.		
GHG Impact	High	***Cost***	-
Impact Areas			

6. Expand Green Purchasing & Procurement Policies	
Description	**Purchase Electricity from Renewable, Low Carbon Power Sources** Green energy purchases allow an institution to use energy from renewable energy sources, such as solar, wind, and biomass generation, without having to generate that energy themselves. Puget Sound Energy offers a green electricity option through

	their Green Power Program. Green energy can be purchased in increments of 160 kWh for $2. Governments can set an example by purchasing green power for a percentage of their operations. An EPA Green Power Community is one in which the local government, businesses, and residents collectively buy green power in amounts that meet or exceed EPA's Green Power Community purchase requirements. This requirement is based on the community's annual electricity usage and ranges between 3% and 20% purchase of green power. This could be offset by increased efficiency in other areas, and would significantly reduce the carbon footprint of the city. **Green Procurement Policies** The City's purchases of office equipment and supplies provides an opportunity to purchase more energy efficient and low impact products. Updating procurement policies to require certified energy efficient products, products with higher recycled content, and more locally produced products will reduce the carbon footprint of city purchases. For instance, ENERGY STAR is a partnership with the Environmental Protection Agency and the environmental industry to voluntarily label products that meet certain energy efficiency criteria. ENERGY STAR certified equipment includes computers, monitors, printers, copiers, refrigerators, vending machines, water coolers, dishwashers, clothes washers, water heaters, and air conditioners. ENERGY STAR also certifies buildings for energy efficiency and provides energy management strategies for businesses and government agencies. **Contractor Sustainable Business Practices** The City works with contractors and consultants on a regular basis. There is an opportunity to require low carbon business strategies in the requests for proposals as a way to encourage reduced GHG emissions.
Benefits	**Green Energy Purchasing** Purchasing electricity from renewable resources rather than fossil fuels reduces GHG emissions, and would therefore reduce a government's carbon footprint. The Green Power Community requirements would include a campaign within the community to purchase green energy which would further reduce the community's greenhouse gas emissions. **Green Procurement & Contractor Policies** More than two billion ENERGY STAR certified products have been purchased nationally since 1992, generating utility bill savings of $14 billion in 2006, saving the amount of energy equivalent to the generation capacity of 70 power plants. For Redmond, ENERGY STAR products could replace less efficient monitors, printers, vending machines, water coolers, and hand dryers which would provide cost and energy savings for the city.
Proposal	▪ Add green power to the energy portfolio for city facilities to lead by example and begin the process to become an EPA Green Power Community. ▪ Make ENERGY STAR equipment a strong criterion when purchasing equipment. Require energy efficient lighting at city facilities, including city parks/sports fields. ▪ Include a Low Carbon or Green Business Practices requirement in Contractor

	Agreements.		
Metrics	Amount of green energy purchased and percentage of green energy in city operational portfolio, Number of PSE Green Power participants in Redmond.		
GHG Impact	High	***Cost***	+
Impact Areas			

7. Require the Development and Redevelopment of City Facilities to Incorporate "Green" Features	
Description	"Green" buildings can be defined in many ways and typically take a holistic approach to environmental performance which includes energy efficiency, water efficiency, building materials, chemical usage, and transportation amenities among others. Green building design views buildings as a complete system in order to maximize health, comfort, and productivity of occupants while minimizing resource use for construction and operation. The most popular green building certification program is Leadership in Energy and Environmental Design (LEED), but there are other programs such as King County Built Green, EPA's ENERGY STAR for Buildings, Green Globes, Living Building Challenge, and Architecture 2030 to name a few. **Green & Reflective Roofing** A green roof uses soil medium and plants on top of an impermeable membrane. A reflective roof is one that reflects the sunlight versus absorbing the heat which is typical of most dark roofing products. Reflective roofs are usually white. Redmond City Hall has reflective roofing as part of its LEED certification. **Alternative Energy Production** Alternative energy such as solar photovoltaic power harnesses sunlight to generate electricity. Solar panels produce maximum power on sunny afternoons, which are times of peak electricity use in most of the U.S. Excess energy can be "sold back" to the energy grid and local utility. Contrary to popular belief, solar power has been shown to be viable in a wide variety of climates that are not thought of as "sunny," such as in the Pacific Northwest. One particularly efficient technology for both heating and cooling is a ground source heat pump. Ground source heat pumps are more efficient than traditional air conditioners or heat pumps because they use the stable underground temperature. The system functions by circulating fluid through a closed loop either in wells or horizontal piping in the ground. It either uses the earth as a source of heat, when operating in heating mode, or as a heat sink, when operating in cooling mode.
Benefits	Improving energy efficiency and reducing the environmental impact of a building can reduce GHG emissions and criteria air pollutants by reducing energy use. Green construction materials help avoid volatile organic compound (VOC) emissions as well. In addition to energy and water cost savings, there are significant paybacks from increased employee productivity and health. These projects can serve as good public

	education and public relations programs. Redmond's City Hall is a certified LEED building, and operates more efficiently than non-LEED buildings. **Green & Reflective Roofing** Green roofs reduce building energy use by insulating the roof and by cooling it through shading and evapotranspiration. They also cool the air surrounding buildings, and green roofs on many buildings throughout a city can reduce the urban heat island effect. This saves on air conditioning of buildings. Green roofs can also help remove air pollution. One hundred square feet of green roof can remove one pound of particulates from the air annually. Another benefit of green roofs is reducing stormwater. Green roofs can hold 25-90% of the water from a storm, depending upon season and climate. They delay runoff and filter water. Additionally, green roofs improve the aesthetic quality of buildings and can provide recreational space and an area for rooftop gardens. Reflective roofs can significantly reduce a building's energy consumption by reducing the heat entering the building through the roof. ENERGY STAR certified reflective roof products reflect at least 65% of sunlight, lowering roof temperature by up to 100 degrees. Reflective roofs mitigate the urban heat island effect, reducing energy required to cool buildings. Researchers estimate that a building with 1,000 square feet of reflective roof area offsets the equivalent of 10 $MTCO_2e$ over the lifetime of the roof.[20] **Alternative Energy** Putting solar panels on city buildings is a good way to increase the visibility of solar energy in the community while providing clean energy for building use. By substituting solar energy for fossil fuel, energy can be produced without generating GHG emissions. Solar energy produces no air pollutants. When used as part of a portfolio of renewable energy and energy efficiency measures to replace fuel generation in the local airshed, solar power can yield significant emissions reductions. In addition, solar panels can reduce the risk of brownouts. Ground source heat pumps can improve comfort by providing better temperature and humidity control. They also reduce maintenance costs and last longer than traditional heating and cooling systems. Because the heat exchange is underground, there is no outside unit subject to vandalism or the elements.
Proposal	▪ Implement policy or resolution to build new city facilities and renovate existing city facilities to green building standards. ▪ Explore potential and feasibility of including solar panels as the City repairs or replaces roofing (or redevelops city facilities). ▪ Evaluate the potential for green and reflective roofs on city facilities when repairing or replacing roofing (or redeveloping city facilities). ▪ Explore installation of ground source heat pumps for city facilities during building

[20] Akbari, H., S. Menon, and A. Rosenfeld. 2008. "Global Cooling: Increasing Solar Reflectance of Urban Areas to Offset CO_2"

	upgrades and for energy efficiency retrofits.		
Metrics	Number of green buildings in City's portfolio, Number of and square footage of green or reflective roofing.		
GHG Impact	High	***Cost***	++
Impact Areas			

Proposed Buildings and Energy Actions to Reduce Greenhouse Gases (Community)

1. Require "Systems Ready" Infrastructure for Alternative Fuel and Alternative Energy Systems			
Description	New development in Redmond can be built to standards that reduce barriers to future installation of energy efficient systems. This would reduce time and cost barriers for residents to install these energy efficient systems themselves, while being cost effective for developers. This could be done with electric vehicle charging stations in garages, electrical wiring and structural supports for solar photovoltaic panels, and solar water heating systems. The additional cost to developers is low at time of development and is a marketing feature for home sales.		
Benefits	More options for energy efficient systems for residents, reduced barriers to energy efficient upgrades in residential developments.		
Proposal	Update development code to require infrastructure for these systems at the time of building.		
Metrics	Adopted codes and policies that require systems ready infrastructure.		
GHG Impact	Moderate	***Cost***	Staff time
Impact Areas			

2. Create Infrastructure for District Energy in Urban Centers	
Description	District Energy refers to an innovative energy service model whereby municipalities, energy providers, and private property owners collectively leverage local, clean energy sources to reduce cost, as well as demand, on traditional energy systems. District Energy systems provide heating and cooling to a large

	number of buildings in the "district." This method has a relatively small environmental footprint compared to traditional heating and cooling methods. District Energy systems produce steam, hot water, or chilled water at a central plant. The steam, hot water, or chilled water is then piped underground to individual buildings for space heating, domestic hot water heating, and air conditioning. The City of Redmond should work with Puget Sound Energy to identify sites where District Energy infrastructure may be feasible.		
Benefits	District Energy eliminates cost and space required to buy and operate individual boilers in buildings, reduces cost to individual buildings to maintain and operate, efficiently captures and reuses waste heat and energy, reduces carbon emissions, and are proven, reliable systems. Benefits include: improved energy efficiency, enhanced environmental protection, fuel flexibility, ease of operation and maintenance, reliability, comfort and convenience for customers, decreased life-cycle costs, decreased building capital costs, and improved architectural design flexibility. Economic drivers for District Energy systems include decreased life-cycle costs, decreased building capital costs, improved energy efficiency, and reliability. Buildings connected to District Energy systems have lower capital costs for their energy equipment because they do not need conventional boilers and chillers. They save valuable up-front costs that can be invested elsewhere, and allow greater flexibility in building space without compromising performance. Rather, building performance is improved as building owners and managers can significantly reduce operating, maintenance, and labor costs. That translates to less financial risk and improved return on investment, plus elimination of principal and interest payments, property taxes associated with operating boiler and chiller installations, insurance and annual maintenance contracts, and costs associated with operating boilers and chillers.		
Proposal	Facilitate ground source District Energy heating and cooling infrastructure in Overlake by providing real estate (streets) to locate distribution system (pipes) during redevelopment.		
Metrics	Number of District Energy systems, Associated greenhouse gas reductions from more efficient system.		
GHG Impact	Large	***Cost***	Moderate
Impact Areas			

3. Establish Homeowner Energy Efficiency Events	
Description	Many measures can be applied to existing buildings to improve their efficiency, including using efficient light bulbs and fixtures, replacing appliances with more energy efficient ones, increasing insulation, replacing windows, and upgrading HVAC systems. Local governments can set an example by making energy efficiency improvements to their own buildings. They can require improvements

	to private buildings when renovations are made. Governments can also encourage energy efficiency improvements by offering low or zero interest loans to building owners for improvements. **Weatherization Programs** A program to help low income earners, weatherization is a win-win opportunity to reduce emissions while saving money for low income residents. A weatherization program can reduce energy costs, creating more income to be spent on necessities while, at the same time, reducing GHG emissions due to decreased energy use. Weatherization programs can be expanded beyond low income homes to the broader community. **Energy Efficiency Events & Promotions** One way to encourage community members to purchase efficient lighting for their homes is to hold promotional light bulb giveaways. Lighting can account for 20% of an electricity bill and swapping out bulbs is seen as the easiest and most efficient way for a household to reduce its electric use. Cities can partner with the ENERGY STAR program in their "Change a Light, Change the World" initiative which encourages families to replace just one incandescent bulb with a compact fluorescent light bulb (CFL). Puget Sound Energy will also host "Re-Energize Your Lighting Events" where energy efficient bulbs are sold at a discount. An effective way for local governments to encourage the use of LED holiday lights is to offer an exchange, trading LED lights for existing strings of incandescent bulbs. In addition to the efficient strings residents can take home, an exchange raises awareness of the benefits of LED lights, encouraging participants and their neighbors to buy additional LED strings on their own. Governments can also use LED lights in public displays, saving energy costs, and setting an example for the community.
Benefits	Improving energy efficiency of buildings can help reduce GHG emissions and criteria air pollutants by reducing energy use. These retrofits will also provide an energy and water cost savings to the owners. These projects can also serve as a good public education program. By making improvements to local housing, weatherization programs can increase property values and improve community pride and aesthetics. Helping low income households save money on bills can help improve residents' quality of life as well as stimulate the local economy by providing residents extra money to spend on education, leisure, or savings. Installing CFLs is one of the simplest and most cost-effective energy saving measures people can take in their homes. CFLs use about 75% less energy than incandescent bulbs. If every home in the U.S. replaced one incandescent bulb with one CFL, the country would save $600 million in energy costs per year, reducing GHG emissions equivalent to removing 800,000 cars from the road. American

	families could save at least $30 in electricity and replacement costs for each bulb they replace. Additionally, CFLs last ten times longer than incandescent bulbs. LED holiday lights use up to 95% less energy than incandescent lights. One string can use 150 Watts or 16kWh over the holiday season, while an LED string will use less than 1 kWh. In addition to saving energy, LEDs last longer, have no glass to break, and reduce the risk of fire.		
Proposal	▪ Work with partners to provide home energy audits to residents in Redmond and support and encourage the implementation improvements that will increase efficiency. Facilitate any necessary city permits. Consider fee waivers or fee reductions for permits necessitated for energy efficient upgrades. ▪ Help facilitate applicants applying for low income weatherization programs by providing technical assistance in filling out applications and facilitating any necessary city permits. Work with partners to provide weatherization services and energy efficient products to low income residents. ▪ Provide or help facilitate low interest loans to residents/businesses for energy efficient building upgrades. ▪ Continue to collaborate with PSE to sponsor "Re-Energize Your Lighting Events" throughout the community. ▪ Work with PSE and city vendors to promote usage of LED holiday lights at the City's annual "Redmond Lights" holiday event.		
Metrics	Number of homes serviced, Energy savings by homes in programs, Number of events, Number of bulbs distributed, Estimated energy savings.		
GHG Impact	Large	***Cost***	Staff time
Impact Areas			

4. Internal Policy Scan for Barriers to Green and Innovative Developments	
Description	Some municipalities have found that efforts to encourage low carbon or "green development" have been inadvertently made difficult due to outdated policies. Evaluating and modifying current codes and policies that may unintentionally limit low carbon developments or energy efficient systems will help to make innovative developments easier. Micro-suites and small apartments are gaining in popularity in cities like San Francisco, New York City, Phoenix, and Dallas as the cost of housing skyrockets. Smaller housing units require less energy to heat and cool and provide less expensive housing options so workers can live closer to job centers. They are typically placed along transit lines or in walkable locations so dependency on personal vehicles is reduced.
Benefits	Consistent, supportive policies that enable low carbon development to occur. Smaller residential units provides diversity of housing options for residents and

	lower energy consumption over traditional housing.		
Proposal	▪ Identify barriers to building green developments and propose changes to policies and regulations to encourage these types of developments. ▪ Formalize a program to incentivize the development of smaller units in Overlake and Downtown.		
Metrics	Codes and regulations that act as barriers to green and innovative development, Changes made to policies and regulations to facilitate green and innovative development, Average square footage of rental units; Estimated energy consumption.		
GHG Impact	Moderate	***Implementation***	Staff time
Impact Areas			

5. Encourage and Promote the Development of Alternative Energy Sources	
Description	Alternative energy sources, such as solar power, ground source and geothermal heating/cooling, and wind power, provide more energy efficient and environmentally friendly sources of energy over traditional "dirty" fuel. Alternative energy also promotes energy independence. Many of the innovative sources typically cost less over the lifetime of the project. **Solar Photovoltaic** Solar photovoltaic power harnesses sunlight to generate electricity. Solar panels produce maximum power on sunny afternoons, which are times of peak electricity use in most of the U.S. Solar panels will also work in overcast or cloudy conditions. Energy generated by local photovoltaic panels can be "sold back" to the energy grid to offset the need to produce energy from fossil fuel sources. Lake Washington School District installed a total of 60 solar panels at Evergreen Junior High, which will produce a maximum of 12-kilowatt hours of power. The system was designed with the intent of producing nearly the same amount of power that is used by the school's nine portable classrooms. Eastlake High School and the Support Services Building are also slated to get solar panels installed. Six solar panels at Redmond High School produce 1,000-kilowatt hours of electricity per year, which supplements the electricity used by the school. Since 2005 the Redmond High School panels have created enough solar electricity to power about 60 homes for one day. **Solar Water Heating** Solar water heating is one of the most efficient and cost-effective forms of renewable energy. Solar hot water is not a new technology. Over the past 10-20 years, solar water heaters have improved in reliability, and systems can now last up to 40 years. Models that operate reliably in below freezing temperatures are available. Offices, schools, and other municipal buildings that use hot water can save money by using solar hot water. Governments can also offer incentives for installation of solar hot water in homes and businesses. Government should also

	ensure codes and regulations allow for solar water heaters, which are often placed on the roof of the building to gain solar access.		
Benefits	By substituting solar energy for fossil fuels, energy and hot water can be produced without generating GHG emissions or local air pollutants. Solar panels reduce the risk of brownouts and help avoid the need for expensive additions for generation and transmission capacity. Residents achieve a reduced energy bill by not paying for the operation of a traditional water heater. These systems have low annual maintenance costs.		
Proposal	▪ Explore community solar programs, like Solarize Washington, to determine the City's role in advancing solar panel usage throughout the community. ▪ Provide materials to residents and businesses on solar hot water heater programs/rebates and facilitate plumbing permits for their installation.		
Metrics	Number of permits for PV panels, Estimated energy savings, Amount of energy "sold back" to the grid		
GHG Impact	Large	***Cost***	Staff time, educational campaign
Impact Areas			

Waste & Recycling

Overview

In King County, about 30% of our waste can be composted through yard waste bins or in backyard composting bins. Another 50% of the waste is made up of materials that are readily collected in curbside recycling bins, such as paper, glass, plastic, and metal. In Redmond, about 35% of the waste generated goes to the landfill. This section will look at ways the community and city operations can reduce waste production. Increasing our recycling and composting rates will conserve energy, protect natural resources, and reduce harmful GHG emissions, especially methane.

Figure 27, Landfill Composition, King County

When organic matter like wood, paper, food, and yard waste is placed in landfills, it decomposes anaerobically producing methane. Methane is a greenhouse gas 21 times as powerful as carbon dioxide. Recycling organic materials like newspapers, paper, and cardboard prevents these emissions and diverts reusable resources from landfills. Using recycled materials to create new products consumes less energy, and therefore less GHG emissions, than production from virgin materials. For instance, creating an aluminum can from virgin materials takes 20 times the energy it takes to create a bottle from recycled aluminum. And yet, three-fifths of aluminum in the United States comes from virgin ore.[21]

The City of Redmond's recycling rates have been on a downward trend since the base year of 2006. However, this may be due to an overall reduction in waste. The pounds of waste per customer, per week have gone from 66 to 55 pounds—a great achievement! However, this amount of waste is equivalent to 4.2 tons of CO_2 per person, per year. In 2011 about 62% of the waste from single-family homes was recycled and composted. By recycling this much, it is about the same as removing 6,000 cars from the road for one year.[22]

Regionally, businesses and multifamily properties in Redmond have lower recycling rates. For multifamily properties rates are lower due to decreased participation which can be caused by a transient population and language barriers, among other issues. Redmond's 2012 multifamily

[21] (Living Well, Living Green in Skagit and Whatcom County, p. 28)
[22] EPA Equivalencies Calculator

recycling rate was 17%. The City of Redmond food recycling program recently expanded to include multifamily properties. In 2012 there were ten multifamily complexes participating in the food recycling program, accounting for over 800 tenants. The City also coordinates with Waste Management to canvass all multifamily complexes in the city (58 complexes in 2012), meeting with property managers and distributing recycling and waste reduction information to tenants.

Business recycling rates can be challenging to calculate as businesses can contract with any vendor for recycling, and they are not required to report their tonnage. For the Redmond businesses that recycle with Waste Management, the recycling rate for 2012 was 36%. The City has an ongoing research and education program focused on commercial recycling. In 2012 program staff visited 45 businesses offering education and technical assistance resulting in an estimated 1,400 cubic yards per year of additional commercial recycling. Redmond does have a robust commercial food waste recycling program with approximately 44% of all businesses that have significant organic waste are participating (150 accounts). In 2012 the amount of food/organics recycled through the commercial organics recycling program was 600,000 pounds for the year (an estimated 652,288 gallons of organic waste, which is a 20% increase over 2011).

Continued education and outreach to the Multifamily and Commercial sectors will result in both increased waste reduction and recycling, leading to a decrease in greenhouse gas emissions.

Fewer harmful greenhouse gas emissions are produced when we prevent waste in the first place. Buying less, looking for products that come with less packaging, and buying more items in bulk can reduce our waste stream and the amount of energy that goes in to the production of those products. If the packaging cannot be avoided, look to see if there are similar products that contain recycled materials, or are packaged with materials that can be recycled or composted. Externally, the City is partnering with other cities and Waste Management to develop community waste reduction productions such as Waste Watchers. Internally, these strategies could be supported with a procurement policy that takes these factors into account before purchase.

Additional Benefits

Increasing recycling rates and reducing our waste stream have additional benefits for the community and City:

- **Fewer Trash Pickups:** Some cities and individuals have found that they can recycle enough to reduce the number of trash pickups they need. The City of Seattle is investigating trash pickups every other week, which will save on the wear and tear on garbage trucks and their associated emissions.

- **Cost Savings:** Businesses and residents can receive dumpsters for food waste and recycling in addition to their trash cans, some free of charge. By recycling and composting more, the size of trash dumpsters can be reduced, resulting in a lower monthly payment.

- **Limit Undesirable Land Uses:** Reducing waste and increasing recycling reduces the need for the creation of additional landfills. Finding space for landfills is often contentious and expensive to undertake. The alternative is expanding waste to landfills across or out of state.

- **Natural Resources:** Reducing the waste we create by purchasing less will help save natural resources that would have been necessary to create that product. Composting will also produce rich organic matter that can be used in landscaping to reduce runoff, conserve water, and eliminate the need for fossil fuel-based pesticides.

Objectives

a. Increase recycling and composting rates in single-family homes, multifamily homes, and businesses.
b. Reduce the amount of waste that is produced through purchasing and utilizing new technology.

Existing Waste and Recycling Actions to Reduce Greenhouse Gases (City of Redmond Operations)

- Reduce Paper Use Through Technology The City has used technology to reduce paper consumption through direct deposit pay for employees, electronic pay stubs, electronic documents, and setting printers to default to two-sided printing. The Parks and Recreation Department's *Recreation Guides* are exclusively online and registration is 100% electronic. Additionally, Fire Department medical incident reports are generated by a tablet (run approximately 4,000 calls per year) and aid cars basic life support reports are also generated electronically (run approximately 4,000 calls per year).

- Recycled Materials Purchasing Policy
  The city's purchasing policy is to prefer recycled materials up to a 10% price premium. The City also sets aside money to purchase recycled materials for capital improvement projects.

- Food Waste Recycling Expansion
  The City expanded food waste recycling to City Hall, the Maintenance and Operations Center (MOC), Public Safety Building, Senior Center, Teen Center, and all city fire stations.

- Styrofoam Recycling
  Block styrofoam recycling is available on the City Hall loading dock.

- Battery Recycling:
  Recycling collection bins are located in select Redmond public buildings, such as City Hall and the library, to provide safe disposal of batteries to residents. Several businesses also provide recycling services to their customers in the Redmond area. Larger batteries, like those found in vehicles, are collected at King County's Wastemobile Events. Recycling batteries saves energy and reduces harmful metals and chemicals from being released into the environment.

Existing Waste and Recycling Actions to Reduce Greenhouse Gases (Community)

- Residential Recycling Program
  The City has an aggressive recycling program. In 2012 Redmond residents recycled roughly 12,000 tons of materials. This means many more materials were recycled than there was trash generated.

- Commercial Recycling Program
  The City has a commercial recycling education and outreach program to help businesses recycle more, reduce waste, and save money. Assistance is provided to businesses on what they can recycle and includes free tools to recycle more and reduce waste.

- Yard and Food Waste
  The City's Commercial Organics Recycling program allows businesses to request up to two 96-gallon food recycling carts—picked up two times a week by Waste Management at no additional charge. This service, geared for those businesses with large amounts of food or other organics in their waste stream, can result in a smaller garbage dumpster. Residents

can add food waste to their yard waste bins at no additional charge. In 2012 residents recycled 7,000 tons of food/yard waste. Multifamily complexes can also apply to be part of the Organics Recycling program at no additional charge. In 2012 there were ten complexes participating in the program, including over 800 tenants.

- EnerGov and Electronic Plans Submittal
  EnerGov is a permitting and land management software intended to improve processes by automating permitting, inspections, business licensing, citizen requests, land use planning, and project review. EnerGov software systems allow developers to submit plans to city staff electronically without the need to submit multiple hard copies to various departments. The program allows city staff to review plans electronically. EnerGov and electronic plans submittal saves resources and reduces GHG emissions and air pollution since developers can submit electronically, thereby reducing the need for paper and vehicle trips to City Hall.

- SIRE
  SIRE is an information management system that helps Redmond be a smarter, greener, and faster government. This system allows for the Council agenda process to be automated from start to finish which reduces processing time, materials, and money associated with paper printing costs.

Proposed Waste and Recycling Strategies to Reduce Greenhouse Gases (City of Redmond Operations)

1. Create a Construction and Demolition Waste Recycling Program	
Description	In Seattle and King County, construction and demolition debris make up about 30 percent of the yearly waste stream at 400,000 tons. De-construction permits are issued to developers independently of their demolition permit to provide the developer time to de-construct buildings, allowing them to recycle or reuse more of the building materials. Eight thousand pounds of waste are typically thrown into the landfill during the construction of a 2,000 square foot home. By working with construction teams to train workers on on-site separation of materials, they can then implement a recycling strategy at little or no additional cost. Green Building programs, such as Leadership in Energy and Environmental Design (LEED) and Built Green, often require meeting certain recycling goals of construction debris.
Benefits	De-construction prior to demolition reduces materials sent to landfills, provides lifecycle energy savings, and reduces greenhouse gas emissions from manufacturing, production, and garbage pickup of building materials. It also provides more time given to developers and can be a significant cost savings. King County estimates that a commercial development project with 600 tons of waste

	could save over $40,000 by recycling materials instead of paying for their disposal at landfills.		
Proposal	Create policies to support and implement a De-Construction Permitting Program for both city and privately initiated projects as a means to discourage construction demolition materials from entering the waste stream.		
Metrics	Percent of waste diverted, Number of companies that went through training.		
GHG Impact	Large	***Cost***	+
Impact Areas			

2. Implement Innovative Technologies to Reduce Impacts from Trash Generation			
Description	Solar-powered trash compactors can hold up to five times more trash than traditional trash cans in public spaces. The solar technology helps compact the trash to save space and reduce the frequency of collection. These products can introduce sidewalk recycling and keep streets clean, free from overflowing trash cans. Waste Management provides a short return on investment and lease options. These have been installed in Grass Lawn Park and can be used at other city parks and facilities.		
Benefits	These products reduce vehicle trips and maintenance costs, provide convenient recycling to the public, and help keep animals out of trash. The City of Philadelphia has reduced trash pickups from 17 times a week to seven, and over ten years that will save them $10 million dollars. Waste Management expects these new trash cans, which are located in Kirkland, to reduce operating costs, fuel use, and GHG emissions by up to 80%. The compactors provided to the City of Kirkland were installed at no cost as part of the solid waste contract with Waste Management.		
Proposal	Work with Waste Management to place solar-powered trash compactors in high pedestrian traffic areas, including city parks.		
Metrics	Number of maintenance trips that have been reduced, Recycling rates.		
GHG Impact	Moderate	***Cost***	- -
Impact Areas			

3. Update City Environmental Procurement Policies	
Description	According to the U.S. Environmental Protection Agency (EPA), "*Environmentally preferable" means products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, product, manufacturing, packaging, distribution, reuse,*

	operation, maintenance, or disposal of the product or service. Currently, the City's Finance Handbook includes a "Recycled Product Procurement Policy" which is the sum of the City's Environmentally Preferable Purchasing (EPP) policy. Though the policy includes several suggested behaviors to procure recycled products, they are indeed suggested and not mandated. In Redmond city government, purchasing authority is centralized, product selection and specification are decentralized. The result is purchasing may, or may not, include consideration of EPP. Currently there is no standardized or mandated consideration of EPP in purchasing decisions citywide.
Benefits	Purchasing environmentally preferred products can result in waste reduction, water conservation, a decrease in greenhouse gas emissions and a reduction in pollution.
Proposal	The City should review the EPP policy such that: ▪ The EPP policy needs to be updated and expanded to go beyond recycled products to include energy conservation, carbon footprint reduction, waste prevention, and water conservation. (King County's EPP policy may serve as a good template.) Gradual implementation may be necessary. ▪ The EPP policy needs to be stronger, such that EPP is truly taken into consideration for all purchases. ▪ EPP needs support in all divisions by upper management, such that staff knows it is a priority; champions of EPP, acting in coordination, need to be located in all divisions. ▪ An outreach and education program needs to be conducted internally such that City staff understand and embrace EPP. ▪ EPP needs to be made easier through identification of environmentally preferred products available for purchase. ▪ The city's vendors need to be made aware of, and incorporate, the city's desire for environmentally preferred products in their bids and offerings to the city.
Metrics	Measurement of EPP, and recognition of successes, needs to be developed and implemented, as well as policy review at regular intervals.
GHG Impact	Moderate to High | ***Cost*** | - -
Impact Areas	

Proposed Waste and Recycling Strategies to Reduce Greenhouse Gases (Community)

1. Set Aggressive Goals for Citywide Recycling & Composting Rates

Description	Redmond has a highly regarded and successful recycling program for single-family residents with one of the highest rates in the region (62%). The City should help continue to educate our citizens to encourage and enhance the behavior to refine their efforts to maximize the rate under current conditions. For example, there is still a significant amount of food that is ending up in the garbage that could be addressed. Since our recycling rate is so high, we are not expecting this to produce a significant improvement in the recycling rate. Emphasis is on solidifying the behavior and on increasing food scraps/organics composting. The multifamily recycling rate is marginal and regionally has not improved even with significant resources concentrated in that area. A new approach is needed regionally. Ultimately this is an important area where the City will focus, with the exception of outreach for new food waste recycling service, offered to complexes that meet criteria for participation, including a successful regular recycling program, and an on-site champion. Commercial recycling rates are more difficult to calculate as businesses can contract with any program for recycling services, but are not required to report amounts recycled. However, city programs continue to encourage waste reduction and recycling among commercial customers. City outreach should concentrate efforts on individual businesses, including assistance finding recycled options for specific commodities. Additionally, the City's Commercial Organics Recycling program includes 44% of all business that have significant organic waste (150 accounts). Efforts in this area will include maintaining the organics route (keeping customers on the route participating correctly and addressing contamination issues) and adding new customers. A high priority for all sectors is to minimize the waste stream. The minimization of the waste stream is the best overall approach for minimizing the environmental impacts and costs of dealing with waste. Citywide and division performance measures have been aligned to support this focus. Outreach will concentrate on the mindset of reducing waste and use specific examples to drive the message and change behavior.
Benefits	Recycling reduces the amount of waste sent to landfills. It conserves natural resources such as time, water, and minerals and prevents pollution by reducing the need to collect new raw materials. Recycling saves energy and reduces greenhouse gas emissions. It helps sustain the environment for future generations.
Proposal	▪ Set an aggressive recycling target rate and work to educate citizens and businesses on ways this can be achieved. ▪ Expand recycling programs in multifamily developments to make it easier for residents to recycle. ▪ Increase composting rates by aggressively providing public outreach and education, in particular targeting restaurants.

Metrics	Change in recycling rates over time.		
GHG Impact	Large	***Cost***	Staff time, educational campaign
Impact Areas			

2. Encourage the Use of Zero or Low Volatile Organic Compound (VOC) Cleaning and Paint Products			
Description	Paints are a source of both indoor and outdoor air pollution. Oil-based and glossy paints and varnishes use VOCs as solvents, which evaporate into the air as the paint dries. Indoors, these VOCs can cause a variety of health problems, while outdoors they contribute to the formation of smog. Emissions can continue for up to six months after painting. In Southern California, paints add more VOC to the air than refineries and gas stations. VOC emissions can be reduced by using low VOC paints, which use water or other solvents to replace VOCs.		
Benefits	Zero and low VOC paints use no or considerably less harmful VOCs than traditional paints, which helps to reduce local emissions.		
Proposal	Explore usage of low or zero VOC paints for city roads and city facilities.		
Metrics	Percentage of city projects using zero or low VOC paints.		
GHG Impact	Small	***Cost***	Staff time
Impact Areas			

3. Implement a Gasoline Lawn Mower Exchange Program			
Description	While gas powered lawn mowers use small amounts of fuel compared to vehicles, their pollution levels are disproportionately large. One mower can produce as much pollution as 43 cars. City governments, like Los Angeles, have implemented an exchange program where residents can recycle their gasoline powered mower for an electric mower at a reduced rate. The City has implemented this quite successfully in the past. The event was funded through water conservation dollars since the mowers were mulching mowers which cut down on watering needs.		
Benefits	Replacing these gasoline powered tools with electric or human powered ones can reduce emissions significantly. Electric or human powered mowers are quieter than gasoline mowers and can perform equally well in most situations.		
Proposal	Explore implementation of a gasoline lawn mower exchange program.		
Metrics	Number of lawn mowers replaced, converted to GHG emissions savings.		
GHG Impact	Small	***Cost***	Staff time

Impact Areas	

Natural Resources

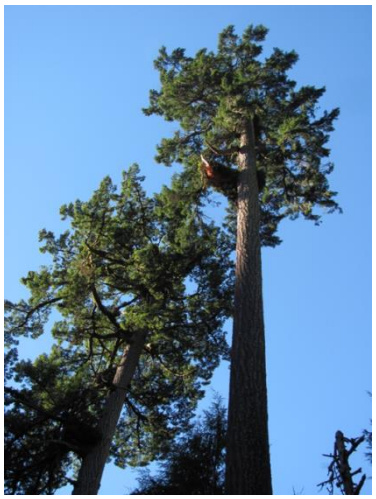
Overview

Climate change will have an impact on our natural environments. Wetter winters, drier summers, and other impacts can disrupt our natural systems. By working to protect, enhance, and restore our natural resources, we will make Redmond more resilient to these changes and provide clean water and air for residents. In Redmond, this means protecting our waterways, urban forests, and open spaces. This section will explore ways to protect the natural environment and help adapt to climate change.

Figure 28, Redmond Stream with Channel Complexity

Our street trees and urban forests are an example of how important these natural systems are to our community. Trees within Redmond offer a number of benefits. They improve our watershed health, provide habitat for wildlife, improve air quality, and enhance the aesthetics in our neighborhoods. Trees can reduce the energy consumed in buildings associated with air conditioning as it provides shade and helps reduce local temperatures. The ability to reduce local temperatures comes from shading paved and dark surfaces like streets and parking lots that absorb and store energy instead of reflecting it. Street trees also store and use rainwater which helps reduce the volume of water runoff. It has been estimated that a single tree can absorb as much as 48 pounds of carbon dioxide per year. With Redmond's 7,802 street trees, that equates to approximately 187 tons of CO_2 sequestered annually.

Figure 29, Tree Canopy



Strategies to protect our natural areas—from wetlands to tree canopy coverage—will help reduce the impact of climate change and adapt to any changes that come from a changing climate. Our efforts within the city should maintain, restore, and enhance our natural systems.

Additional Benefits

Protecting and enhancing our natural areas not only supports climate change adaptation, but provides these additional benefits.

- **Increased property values:** The USDA Forest Service notes that healthy, mature trees add an average of 10% to a property's value. The value of trees on a property has also been acknowledged by real estate developers to improve the salability of the property and to facilitate quicker rental of apartments.

- **Salmon protection:** Shade provided by trees along waterways benefits salmon and other species. The shade keeps the water cool, provides cover through light patterns, provides a source for large and small woody debris recruitment, and increases dissolved oxygen in the water that is necessary for salmon health and survival.

- **Reduced Urban Heat Island Effect:** According to the EPA, the term "heat island" describes developed areas that are hotter than nearby rural areas. Heat islands can increase summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness, and mortality. Vegetation can help mitigate this impact by lowering surface and air temperatures through shade and evapotranspiration. Shaded surfaces, for example, may be 20-45°F cooler than the peak temperatures of unshaded materials. Evapotranspiration, alone or in combination with shading, can help reduce peak summer temperatures by 2-9°F.

- **Ecosystem Services:** Ecosystem services are those benefits people obtain from their ecosystem. Street trees, vegetated bioswales, open space, and wetlands play an important role in watershed services, including water purification, ground water and surface flow regulation, erosion control, and streambank stabilization. Protecting and enhancing our natural areas can reduce the need for expensive infrastructure that would provide the same services as the natural area.

- **Recreation:** Open spaces and urban forests provide for recreational opportunities for residents. Both developed and undeveloped parks in Redmond consist of over 1,300 acres with 26 miles of trails for residents to use.

Objectives

1. Protect and enhance Redmond's urban forest and wetlands.
2. Utilize green infrastructure to enhance city services.
3. Prepare natural areas to adapt to changing climate impacts.

Existing Natural Resources Actions to Reduce Greenhouse Gases (City of Redmond Operations)

- Water Saving Parks Practices
  Mulching in rights-of-way reduces evaporation and maintenance trips by contractors. The City of Redmond Parks Department's annual planting beds are being replaced with drought-tolerant perennials. Irrigation systems are turned off earlier than most cities, and a certain level of dryness is acceptable so water is turned on only when it is needed.

- Low Impact Development
  The low impact development approach imitates the natural movement of water through a site. The City works to encourage and support builders and developers who want to use low impact development techniques. Low impact development techniques have been used on city projects like the 161st and 172nd Avenue Rain Gardens, the Bear Creek Trail, at Grass Lawn Park, Old Redmond Road, City Hall, Overlake Village LID Retrofit Project, and the SR 520 Flyover Ramp Bike Trail.

- Artificial Field Surfacing
  All city-owned soccer, softball and baseball fields have artificial turf. The artificial turf is ecologically friendly, allows year-round play for citizens, reduces water use, and provides cost savings over the life of the product. Since mowing is not required, there are no associated greenhouse gas emissions with lawn mowers or maintenance vehicles. Greenhouse gas emissions are also reduced by the reduction in water service delivery.

- Tree Preservation Policies
  By protecting, preserving, and replacing Redmond trees, the City ensures maintaining a healthy urban forest. Redmond Zoning Code (RZC) 21.72 is in place to protect stands of trees and significant trees to the maximum extent possible in the design of new buildings, roadways, and utilities. The objective is to mitigate the environmental and aesthetic consequences of tree removal in land development through on-site and off-site tree replacement to achieve a goal of no net loss of trees throughout Redmond. It also provides measures to protect trees that may be impacted during construction.

- Maxicom
  The City installs irrigation systems with centralized controls in most city parks and city-owned properties, thereby increasing efficiencies in water usage. The Maxicom system also controls lighting of city parks, thereby assuring efficient electricity consumption and fewer vehicle trips by staff.

Existing Natural Resources Actions to Reduce Greenhouse Gases (Community)

- Water Conservation
  Urban water supplies require energy to transport, treat, and distribute water. Conservation programs can include outreach, education, and indoor and outdoor hardware requirements. The City has worked with Cascade Water Alliance to promote the efficient use of potable water by customers. This program offers toilet, showerhead and irrigation retrofits and rebates, residential water audits, classes and consultants for professional landscapers, and incentive-based water pricing.

- Green Redmond Partnership
  This partnership with Forterra is focused on developing active management of 1,035 acres of forested parkland over the next 20 years. Active management includes the ongoing assessment of this acreage, removal of nonnative, invasive plant materials, and revegetation with native trees and shrubs. The use of citizen and corporate volunteers, contracted resources, and city staff contribute to the success of this program. Maintaining the health of forested areas in Redmond helps to remove CO_2 from the atmosphere, thus reducing the impacts of greenhouse gases in the community. Each year, an acre of Douglas fir trees can absorb 11,308 pounds of carbon monoxide.

- Safe Yard Care Practices
  Educating the public on reducing their fertilizer and pesticide use is not only important for protecting groundwater sources, but also reduces greenhouse gas emissions. Fertilizers and pesticide production is an energy-intensive process using significant amounts of electricity, natural gas, and steam. Using synthetic fertilizer also generates nitrous oxide, a potent greenhouse gas. Reduced pesticide use in parks will indirectly reduce greenhouse gas emissions.

- Tree City USA
  For 13 consecutive years, the City of Redmond has been recognized as a Tree City USA by

the National Arbor Day Foundation. Redmond has received this national award in recognition of its commitment to its trees and urban/community forests. Trees help to remove criteria air pollutants and reduce the impact of GHG emissions.

- Street Tree Program

  The City has a program to plant street trees throughout the city. To date, there are over 7,800 trees in city rights-of-way. On average, one street tree can reduce up to 48 pounds of $C0_2$ every year and can sequester one ton of carbon dioxide by the time it reaches 40 years old. Urban trees have a greater per tree effect on reducing greenhouse gas concentrations than trees in rural forests. This is due to the secondary effects that urban trees have on reducing energy use, by helping reduce the impact of urban heat island.

- Watershed Plan

  The City adopted the Citywide Watershed Management Plan in December 2013. The goal of the plan is to focus resources and efforts into specific watersheds to recover in-stream habitat within decades. This plan is a comprehensive approach to encourage the development of solutions to environmental issues that enable the city to make better choices about how to plan and maintain its stream systems.

Proposed Natural Resources Actions to Reduce Greenhouse Gas Emissions (City of Redmond Operations)

1. Require Sustainable Landscaping at City Parks & Facilities			
Description	Sustainable landscapes are responsive to the environment, regenerative, and can actively contribute to the development of healthy communities.		
Benefits	Sustainable landscapes sequester carbon, clean the air and water, increase energy efficiency, restore habitats, and create value through significant economic, social and environmental benefits. There is a cost savings from reduced maintenance and irrigation.		
Proposal	Promote sustainable landscape design when proposing new or revising existing landscaping at city facilities and parks.		
Metrics	Percent of projects implementing sustainable landscaping.		
GHG Impact	Small	***Cost***	+/-
Impact Areas			

Proposed Natural Resources Actions to Reduce Greenhouse Gases (Community)

1. Establish Targets for Citywide Tree Canopy Coverage			
Description	Properly planted trees with energy savings in mind can reduce the amount of energy (electricity, natural gas, or other fuel) used to cool and heat buildings. This not only reduces associated emissions, but also saves money related to heating and cooling costs. Trees also act to store carbon and mitigate the impact of the heat island effect. As the effects of climate change are being felt, trees play a critical role. They not only offset carbon emissions, but provide ecosystem services such as stormwater retention to help reduce local flooding. The City of Redmond currently partners with volunteer groups for planting events and requires tree planting for streetscape improvements in new developments. There are opportunities to leverage existing work and coordinate efforts to ensure trees are not only retained, but the Redmond tree canopy expands.		
Benefits	The shade from a single well-placed mature tree reduces annual air conditioning use two to eight percent (in the range of 40-300 kWh) and peak cooling demand two to ten percent (as much as 0.15-5 KW). The US Department of Agriculture estimates that the net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day. Evergreen trees can help block winter winds, which will save on heating costs by 10-20%. Trees also reduce stormwater runoff, create a more attractive environment, provide carbon storage, reduce the urban heat island effect and increase property values.		
Proposal	▪ Encourage tree planting on individual lots for energy savings, and add information on strategic landscaping for energy savings in the design code for new developments. ▪ Coordinate with the Arbor Day Foundation or King County Conservation District to distribute seedlings to Redmond residents. ▪ Establish an annual goal for tree planting throughout the city.		
Metrics	Number of trees planted, Greenhouse gas emissions reduced		
GHG Impact	Moderate	***Cost***	Staff time, nominal cost
Impact Areas			

2. Expand Water Conservation Efforts	
Description	On average, each person uses about 80-100 gallons of water per day. The largest use of household water is to flush the toilet, followed by water to take showers and baths. Low flow faucets, shower heads, and toilets are an easy way to reduce the amount of water being used in our community. These products use less water

	than their traditional counterparts and are typically inexpensive to purchase and install. "Gray water" is untreated household wastewater from bathtubs, showers, wash basins, and washing machines that can be recycled for non-potable needs such as toilet flushing or to irrigate green roofs. Gray water systems are becoming more common across the U.S. as recognition of their ecological and cost saving benefits are becoming more widely known. These types of programs may be better suited to new, commercial buildings.		
Benefits	Water pumping, purification, and treatment all require energy. A comprehensive water conservation program reduces greenhouse gas emissions associated with the energy used. Water conservation programs also help maintain water levels in local streams and rivers. Water conservation, energy savings, maintenance of water levels in local streams and rivers, and reduced utility bills for customers are all benefits of gray water systems.		
Proposal	▪ Continue to work on education and encouragement in this area, such as an expanded partnership with Cascade Water Alliance. ▪ Encourage the use of on-site rainwater harvesting with rain barrels or large cisterns. Where appropriate, explore the use of gray water systems and cisterns, and partner with Cascade Water Alliance and the Department of Ecology to do outreach on the benefits of gray water systems.		
Metrics	Volume of water saved.		
GHG Impact	Moderate	***Implementation***	Moderate
Impact Areas			

3. Encourage Local Food Production	
Description	More than 10% of total carbon emissions in the United States are from the food system. Many of these GHG emissions are attributed to the production and distribution of food. The average meal in the U.S. has had food travel an average of 1,800 miles before reaching your plate. By shifting production to smaller, more local systems, this impact can be reduced.
Benefits	It is estimated that 100 square feet can produce $700 worth of produce. Locally produced food, from community gardens or backyards, can reduce the impact of food that has traveled long distances. Community-supported agriculture and farmers markets are supported when residents choose to buy locally. A robust local food system benefits the environment through stewardship and reduced carbon emissions, provides accessibility to fresh food, often provides a cost savings to residents, and will support local economic development.

Proposal	▪ Encourage the development of edible gardens in residential development and multifamily housing; expand the availability of community gardens. ▪ Support the Saturday Market and other local food markets and enterprises.		
Metrics	Number of community garden plots, Availability of fresh, locally grown produce.		
GHG Impact	Small	***Cost***	Low
Impact Areas			

Education & Encouragement

Overview

The success of the Climate Action Implementation Plan will depend upon city staff, business leaders, and community members changing some of their behaviors. This category explores strategies to educate residents about climate change impacts and empower and encourage them to act in ways that will reduce their environmental impact.

Figure 30, Re-Energize Your Lighting Campaign

These actions focus on reducing greenhouse gases indirectly by changing behaviors in city employees, businesses, and residents. Individuals have direct control over GHG emissions related to mobility, the amount of energy buildings use, and waste and recycling. Together these categories make up the majority of GHG emissions in the inventory. Actions to reduce an individual's impact on climate change could include driving less, using more efficient technologies, focusing on conservation, and purchasing power from renewable sources.

To build support for reducing our environmental impact, the City can expand public engagement campaigns to educate and offer solutions that benefit both the environment and the individual. Increasing knowledge about climate change can help move individuals to action. For instance, as awareness of the financial and environmental benefits of green buildings has increased, so has the market demand. Encouraging and rewarding travel behaviors that rely less on single occupancy vehicles has shown marked improvement in reduced fuel consumption and GHG emissions, and these types of programs could be expanded locally.

Additional Benefits

Engaging residents and employees on how they contribute to climate change can have additional benefits for the individuals and the larger community.

- **Cost Savings:** Improving lighting efficiency in a home can reduce utility bills by nearly 20%. This is usually the easiest and lowest cost method for homeowners to undertake. Changing travel behavior to rely less on individual vehicles can save substantially on car maintenance and fuel costs.

- **Improved Health:** Increased air pollutants can aggravate asthma, respiratory infections, and other lung diseases. Working to improve local air quality will lead to fewer incidences of these symptoms. Walking and biking not only removes GHG from entering the atmosphere but increases healthy activity which can reduce the risk of health problems associated with a sedentary lifestyle.

- **Community Building:** These educational and encouragement activities provide an opportunity to work towards a common goal with neighbors and city staff. Many education and encouragement activities can be designed to be fun and community centered.

Objectives

1. Increase awareness around the connection between personal actions and greenhouse gas emissions.
2. Encourage residents and City of Redmond employees to reduce their environmental impact through targeted events.
3. Motivate individuals, businesses, and groups to take action and reduce their impact on climate change.

Existing Education and Encouragement Actions to Reduce Greenhouse Gases (City of Redmond Operations)

- Carbon Footprint
  The City established an initial 2008 baseline carbon footprint for city operations and the community. Additionally, the City has carbon footprinting data for 2009, 2010, 2011, and 2012, and will continue to calculate this for subsequent years.

- King County Cities Climate Collaboration (K4C)
  Redmond is a founding member and signature on both the Climate Collaboration Pledge and Interlocal Agreement with King County. As the name implies, this group collaborates regionally on climate change matters to leverage capacity, share experiences, and exchange

knowledge.

- ICLEI Membership
  The City is a member of ICLEI—Local Governments for Sustainability. This membership provides the City with Clean Air Climate Protection software to determine greenhouse gas emissions. Membership also provides access to numerous software-supported decision tools, documents, and a database containing examples throughout the country on specific climate change and sustainability topics.

Existing Education and Encouragement Actions to Reduce Greenhouse Gases (Community)

- Impact Redmond
  On the Impact Redmond website, residents can pledge to reduce their environmental impact, get ideas on how to reduce their carbon footprint, and read about what other residents and businesses are doing to act more sustainably. By 2012 over 700 residents have pledged to reduce their environmental impact. Those who pledged received a free Eco-Kit, filled with information and tools to help residents reduce their impact.

- Think Redmond
  Think Redmond is the city's buy-local, go-local, be-local campaign. Buying local supports Redmond's local economy, nurtures community pride, helps the environment, reinvests in Redmond, creates and sustains local jobs, strengthens local nonprofits, and provides more choices by driving competition and innovation. When you buy locally you are also traveling shorter distances which helps reduce air pollution, greenhouse gas emissions, and traffic congestion. There are currently 725 participating businesses.

- Impact EcoFair
  This community event occurred during Redmond Derby Days for a few years to promote sustainable practices and green lifestyles. Local green businesses and services educate consumers on their services and ways people can reduce their environmental impact. Carbon offsets were purchased to make this a carbon-neutral community event.

- Greenhouse Gas Emissions Tracking
  The City has established a database that tracks anticipated GHG emissions from proposed developments, including capital projects. This inventory, which captures data off of the State Environmental Policy Act (SEPA) checklist, began in 2008 and remains current.

- Established Pedestrian Zones
  Signs located around Redmond's Downtown Pedestrian District communicate to drivers they are in an area where they can expect higher volumes of people walking. This works to improve safety for pedestrians and shows support from the City that walking is an important and recognized mode of transportation.

- Redmond Bike Bash
  For the past several years, Redmond has held a Bike Bash during Bike-to-Work Day. This event celebrates Redmond bicyclists, promotes bicycling as a mode of transportation, and provides both fun and educational information to cyclists.

- Bicycle Friendly Community: Silver
  Redmond is recognized by The League of American Bicyclists as a silver-level Bicycle Friendly community for the work the City has done making accommodations for bicycling as a viable mode of transportation. Being recognized as a "Bicycle Friendly Community" helps to promote bicycling among residents and commuters, thereby reducing dependence on automobiles.

Proposed Education and Encouragement Actions to Reduce Greenhouse Gases (City of Redmond Operations)

1. Launch Staff Fleet Education Campaign	
Description	Drivers of city fleet vehicles could reduce fuel consumption by turning off the vehicle instead of letting it idle and reducing the time the car is turned on to "warm up." Changing driver behavior and educating drivers on why idling is detrimental to the environment and expensive will help reduce GHG emissions related to the city fleet. Vehicle fleets for most jurisdictions consist of a variety of cars, trucks, heavy equipment, and specialized equipment. Rightsize vehicle selection, as the name implies, is choosing the most efficient vehicle for the job. For instance, a site visit for one person does not require the use of a large sedan or sports utility vehicle. This type of task can easily be accomplished in an energy efficient compact car. In Redmond, for example, the Fire Department uses fire engines for certain tasks (hydrant inspections, etc.) when it may be possible to use a smaller, more efficient vehicle. Other departments may use less efficient vehicles like sports utility vehicles, pickup trucks, and full-size vehicles on trips that could be made with a hybrid or smaller fleet vehicle.
Benefits	A fuel-efficient vehicle not only saves gas but reduces the need for maintenance

	and extends the life of the more expensive, specialized vehicles. Decreasing vehicle idle time results in decreased fuel consumption, fewer greenhouse gas and criteria air pollutant emissions, and financial savings.		
Proposal	▪ Expand an anti-idling campaign for drivers of the city fleet vehicles, including training on how to drive hybrid vehicles in the fleet for maximum efficiency. The program could include reminders as drivers check out vehicles and within the vehicles themselves. ▪ Encourage staff to use the most efficient pool vehicle for the task at hand. Work with the Fire and Police Departments to determine which tasks could be accomplished with more efficient vehicles.		
Metrics	Annual fuel consumption, Fuel cost by department, Average miles per gallon, Awareness survey.		
GHG Impact	Small-Moderate	***Cost***	+/ -
Impact Areas			

2. Implement Employee Energy and Resource Efficiency Education Campaign	
Description	A frequently heard message from employees during department interviews was that many coworkers may not know how their day-to-day actions impact city energy use and climate change. There were many suggestions for how shifting employee behavior in the office could save energy and help the City operate more efficiently. Creating an educational campaign for ways employees can reduce their individual energy expenditures is one way for the City to "walk the talk." There are numerous ways employees can reduce their energy consumption while at work. An awareness and encouragement campaign would educate staff on actions and can motivate change to new, more energy efficient habits which will save the City money and reduce our environmental impact. An energy reduction campaign is a way to raise employee awareness about energy use necessitated by their job. Friendly conservation campaigns by buildings, departments, or divisions are a fun and educational way to engage employees and encourage them to take simple steps to reduce energy consumption.
Benefits	An employee education campaign will raise awareness around energy use in the workplace and lead to ownership over personal behaviors. A change in behavior will help reduce energy use, save money that would go towards operations, and effectively reduce the city's carbon footprint. Employee awareness can help foster positive work habits that in turn reduce energy consumption. Reduced energy consumption translates into fewer dollars spent on energy and reduced greenhouse gas emissions.
Proposal	▪ Implement an employee education and encouragement campaign that educates employees and sets a target on energy efficiency in the workplace developed by staff suggestions.

	▪ Implement an employee energy reduction campaign by building, department, and/or division.		
Metrics	Number of participants, Year-to-year operational energy savings, Before and after staff survey of employee behavior and awareness.		
GHG Impact	High	***Cost***	+/- -
Impact Areas			

3. Provide Financial Savings from Efficiency Improvements Back to Department			
Description	If financial savings from reduced fuel use, reduced consumption of office products, and improved energy efficiency in the department came back to the department, there would be more incentive to participate in efficiency programs. This way the cost savings are directly tied to a larger training budget, maintaining staff levels or other funds to expand the work the department is doing. Financial incentives are a strong motivator for behavioral change. This type of program would clearly tie employee use with financial expenditures.		
Benefits	This approach can provide increased participation in efficiency programs, more ownership over energy use, and flexibility in funding.		
Proposal	Institute a program that allows some of the money that is saved from efficiency efforts to go back to the department to be used at their discretion.		
Metrics	Energy use, Departmental cost savings in fuel, resources (paper, toner, etc.) and electricity.		
GHG Impact	Moderate	***Cost***	+
Impact Areas			

Proposed Education and Encouragement Actions to Reduce Greenhouse Gases (Community)

1. Launch Energy Conservation & Climate Change Awareness Program for Residents	
Description	Residents can enact many simple measures in their homes to save energy, such as installing efficient appliances, improving insulation and sealing leaks, even just turning the thermostat down in cold weather and up in hot weather. Outreach and education programs that offer information about and encourage conservation measures can tap into this potential. A challenge keeps track of personal energy reductions and awards a prize to the highest-saving individual. A challenge can be conducted among city residents. It

	simply requires a way to measure energy use before and during competition. The competitive aspect of an energy efficiency challenge gets people's interest and motivates energy saving. Posting standings in the competition at regular intervals maintains interest. The promise of even modest prizes can motivate significant energy savings. A challenge or awareness program could be done through the Impact Redmond website.		
Benefits	An energy efficiency challenge is an effective way to motivate people to save energy. Reduced energy use saves money and reduces greenhouse gas emissions. A challenge can be used as a community building exercise. Energy efficiency education that reaches a large number of businesses and residents has the potential to facilitate a significant reduction in electricity use.		
Proposal	Implement an energy conservation and climate change awareness program. Partner with others, such as Puget Sound Energy, as appropriate.		
Metrics	Number of participants, Community energy use		
GHG Impact	Large	***Cost***	Staff time
Impact Areas			

2. Establish Green Business Partnerships and Programs	
Description	Green business programs are voluntary programs to encourage businesses to go beyond operational regulations and conduct business in an environmentally friendly manner. Green business programs typically look at pollution reduction, energy savings, and recycling and waste reduction. The businesses receive a checklist of measures, and implement a certain number of them to be certified. The incentive for businesses to participate is good publicity resulting from their efforts and the ability to advertise as a certified green business. There could be a natural partnership with the Eastside Green Business Challenge (see existing efforts above), or with King County's Enviro Star Program, as they have similar energy efficiency goals. King County offers Enviro Star recognition to business owners if they make efforts to incorporate sustainability practices. Puget Sound Energy also offers incentives and rebates to business owners who incorporate energy efficiency to their business. Businesses, particularly small businesses, represent a significant portion of energy use in a community. Businesses can enact many simple measures to save energy. Outreach and educational programs that offer information about and encourage conservation measures can tap into this potential. A green business recognition program can promote and encourage stewardship efforts in the business community. With the majority of community energy use

	coming from the Commercial sector, and the relatively low rates or recycling and composting in the business community, this would focus efforts on those community members who are having a larger impact on the environment.		
Benefits	A green business can support business development and retention efforts. Marketing the program to the public and encouraging them to shop at certified businesses promotes environmental measures and the business participating. Businesses experience energy savings, money savings, reduced emissions, and community involvement. Other benefits include broader participation from the business community to reduce environmental impact, help conserve energy, provide lessons to other businesses, and promote sustainable business practices.		
Proposal	▪ Promote participation in local green business program amongst local businesses. ▪ Create a Green Business Recognition program for Redmond area businesses.		
Metrics	Number of participants, Commercial energy use, Commercial recycling and composting rates.		
GHG Impact	Large	***Cost***	staff time
Impact Areas			

Implementation

Milestone 4

Climate change is a daunting challenge that will require bold action by many. Redmond is taking action to reduce GHG emissions and prepare for the impacts of climate change. Through this work, the City is demonstrating that a sustainable environment goes hand in hand with healthy people, a prosperous economy, and vibrant communities.

This Climate Action Implementation Plan synthesizes and focuses Redmond's efforts to respond to climate change. By setting priorities within the potential strategies and defining performance measures and targets, the plan provides clarity and accountability for elected officials, the public, and city departments and employees. The Climate Action Implementation Plan will inform policy and budget decisions. It will also serve as the framework for biennial reporting.

Next Steps

The preceding chapters illustrate where Redmond's greenhouse gas emissions come from and set forth a series of actions for achieving no increase in these emissions for both city operations and the community at large. Milestone 4 of ICLEI's Climate Mitigation Process looks at ways the municipality will make those efficiency improvements, educational campaigns, and other proposed strategies in the Climate Action Implementation Plan a reality.

Although much effort went into developing the content of these chapters, the component of Redmond's climate action strategy that matters most still lies ahead in implementing the proposed strategies in each of the five categories. Although significant reduction programs are already in place, the actions proposed in the plan surpass the scale of the existing efforts and provide a method for taking a concerted, coordinated effort to reduce emissions.

Implementing the plan and ensuring that it results in real, additional greenhouse gas emissions reductions necessitates new and sustained resources, increased coordination across departments and sectors, as well as a system for evaluating and reporting progress (as laid out in the next section). In short, it requires institutionalizing climate protection efforts throughout the organization and community.

With this document, the City identified strategies across five categories that the City and community can take that have the greatest potential to reduce emissions and adapt to a changing climate. The Climate Action Implementation Plan enumerated in this document is an iterative process, incorporating and building on lessons learned.

Implementing the Climate Action Implementation Plan requires significant investment. However, a concerted effort to reduce GHG emissions will result in cost savings over time by reducing ongoing costs associated with energy consumption. The benefits of saving money on energy and reducing greenhouse gas emissions are in addition to other societal benefits associated with these actions, such as reduced local air pollutants, improved public health due to more active mobility modes, less reliance on fossil fuels, and an increased demand for energy services and green jobs.

Implementing the plan also requires sustained, strategic public investment by the City. Public funding will play an important role in helping to provide the capital projects, education and outreach, services, and incentives that are needed to achieve the plan's goals.

Monitoring & Reporting

Milestone 5

Monitoring Results

It is difficult to quantify whether the sum of the strategies in this plan will achieve its goals; but by monitoring the results and changes in GHG emissions overtime, the City will be able to adapt its policies and approaches. This process of monitoring results is Milestone 5 laid out by the ICLEI Climate Mitigation process. Examining which strategies are having the greatest impact, and which areas need additional work, will help the City of Redmond achieve its goal.

Quantification of emissions reductions is an emerging field, and many factors affect emissions. Despite the challenges, the City of Redmond believes it is important to reduce both the city's operational carbon footprint and the community's carbon footprint.

Every Year

- Conduct comprehensive inventories and assessments of GHG emissions associated with government operations as well as emissions associated with the community. These assessments will help educate the Council and community.
- Report annually to the City Council on: city operational carbon footprint, including energy consumption and energy costs, and community carbon footprint, including energy consumption; and provide a legislative policy level briefing on federal, state, and regional actions.

Every Other Year

Performance will be documented in biennial reports. These reports can coincide with the Budgeting by Priorities process. This assessment and reporting process will ensure that the City will be held accountable to policymakers and the public and will help improve effectiveness. These progress reports to Directors, Council, and citizens would include: avoided emissions from energy efficiency improvements in city buildings, lighting, operations, and information technology; improvements in diversion rates and recycling efforts in the community and city operations; sustainable development in the

community; efforts to make commuting and transportation more efficient in the community and government operations; and city outreach efforts with internal staff and in the community.

Every Five Years

- Produce a Climate Action Implementation Plan Update that monitors progress on each of the efforts and measures the City has committed to in this plan.
- Evaluate and revise actions in this plan and identify new ones as necessary.

During this period, the City will determine whether actions that have not been implemented nonetheless remain effective ways to achieve the objectives of this plan and will develop new actions to be implemented in the subsequent five years. This revision process will include a review and analysis of the opportunities and challenges to achieving the goals of the plan. The update will include analyses of technical, cost effectiveness, efficacy, equity, and funding issues for existing and potential new objectives and strategies. As part of the update, the City will assess whether it is on track to achieve its climate change related goals.

Ten Years

- Reexamine and revise the Climate Action Implementation Plan based on the latest science and the success and challenges of implementing policies and programs.
- Develop a new Climate Action Implementation Plan to meet the challenges of preparing for a changing climate.

Going Forward

With the adoption of this Climate Action Implementation Plan, departments within the City of Redmond can make a coordinated effort to reduce greenhouse gas emissions. This plan will guide efforts undertaken by the City and community to reduce our impact on climate change. The success of these proposed strategies can be evaluated by comparing future emissions against the baseline years of 2008-2012. Monitoring results, as identified above, will give the City of Redmond a better understanding of what is working and what strategies need to be reevaluated.

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