AGENDA ITEM NO. 8a
MEETING DATE: August 5, 2008

TO: City Council

FROM: Doug Baker, City Administrator
dbaker@ci.tumwater.wa.us

Andy Deffobis, Climate Protection Intern
adeffobis@ci.tumwater.wa.us

RE: Climate Protection Program Update

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1) References: (List only those attached)

A. Report: Climate Action Plan

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2) Action Requested / Staff Recommendation:

Make a motion to approve the City of Tumwater Climate Action Plan.

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3) History and Facts Brief:

The climate protection program has been in place at Tumwater since January 2007. The completed Climate Action Plan will serve as a reference for future climate protection actions to be taken by the city.

This version of the Climate Action Plan incorporates feedback received after circulation of the first draft. Changes have been made, where applicable.

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4) Discussion & Alternatives:

- ❑ NA
- ❑
- ❑

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5) Fiscal Notes:

NA

City of Tumwater

Climate Action Plan

July 31, 2008

Letter from the Mayor

Climate change may be the most serious long-term challenge facing our society. There is some positive news, however: this is a problem that is well understood. We know what is causing the observed changes in our climate, and the solutions are also well understood. We currently possess a great deal of the technical know-how we need to advance climate solutions. What we need now is the political will to implement them.

There is no substitute for federal action, but all levels of government have important roles to play. Municipal operations are a great opportunity to set a positive example. There is no one magic solution; instead what we need is a diverse toolkit of smaller solutions that add up to a large overall reduction.

Cities will be the first to feel the consequences of inaction. Consequently, it is appropriate for us to take the lead. We should not view climate change as only a threat. It is also an opportunity to reduce our dependence on insecure energy sources, reduce overall air pollution and save on municipal operating costs in the long run. This list of co-benefits is by no means exhaustive. Most of all, climate change offers us an opportunity to provide leadership for the entire community.

Tumwater's Climate Action Plan creates a framework that puts us on track to reduce our greenhouse gas emissions. The best science recognizes that stringent cuts in greenhouse gas emissions will be necessary to avoid the worst climate impacts, and this plan represents Tumwater's first steps toward addressing this global problem. Chapter One of this document provides a definition of the problem and what others are doing about it. The Emissions Inventory in Chapter Two gives us an idea of where Tumwater is right now. With the forecast in Chapter Three, we know what the emissions are likely to be if we continue with business as usual.

However, Tumwater will not continue with business as usual. Chapter Four sets a reduction target, and Chapters Five and Six outline measures that will be taken in future years to combat climate change. Additionally, Chapter Seven provides guidance for the city to meet its reduction goals in future years.

We already have started on this path. The City currently operates some highly fuel-efficient vehicles, participates in tree planting and recycling, and engages the community in a successful water conservation program. Capital funds have been allocated to projects that will advance Tumwater's climate protection goals, and city officials are also contracting with the Washington State Energy Outreach Office in order to reduce operating costs, energy usage, and greenhouse gas emissions.

If we adhere to this plan and continue to advance climate solutions in the future, we will ensure a better, more sustainable future for successive generations. It's up to us to do our part!

Mayor Ralph Osgood
May 2008

Acknowledgements

Principal development of this document was completed by City of Tumwater Climate Protection Intern, Andrew Deffobis. Andrew was primarily overseen by Tumwater's City Administrator, Doug Baker. The information contained in this document came from a variety of sources, both within and outside of the City.

Several departments in the City of Tumwater contributed data, support, and other materials to this report and overall project, including Development Services, Finance & Administrative Services, Fire Department, Human Resources, Legal Department, Parks & Recreation, Planning & Facilities, Public Works, and Maintenance.

Several outside agencies provided support and/or information for this project, including Puget Sound Energy, ICLEI, Pacific Disposal, LOTT, Williams-Pyro, and the United States Department of Energy, among others.

Tumwater's Mayor, City Council and General Government Committee must also be acknowledged for providing the vision and leadership to create and support the City's Climate Protection Program.

City of Tumwater Climate Action Plan

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Executive Summary

The debate is over. The overwhelming scientific consensus is that human-induced climate change is among the most pressing environmental problems facing this generation and those to come.

The time to act is now. Never in the past 1000 years has the planet warmed at a faster rate than during the 20th century, and the most recent decade has been the warmest ever on record. Allowing this trend to continue could result in decreased agricultural output, increased catastrophic weather events such as forest fires, drought and floods and displacement of entire populations due to rising sea levels. Washington State, with its growing population and abundant natural resources, has much to gain from working to lessen the effects of future climate change.

Tumwater must do its part. Although the United States accounts for a mere 4% of the world's population, it produces 25% of the world's greenhouse gases. Tumwater's municipal operations released 3,141 tons of eCO2 in 2000, 4,451 tons in 2006, and in 2020 are projected to emit 240% more than they did in 2000. However, on December 5, 2006, Tumwater pledged to take action against this destructive trend by passing a resolution to join more than 180 U.S. local governments and 770 local governments worldwide in ICLEI's Cities for Climate Protection® (CCP) Campaign. In so doing, we have committed to ICLEI's Five Milestone Process to combat global warming:

Milestone 1: Conduct a baseline emissions inventory and forecast
Milestone 2: Adopt an emissions reduction target
Milestone 3: Develop a Climate Action Plan for reducing emissions
Milestone 4: Implement policies and measures
Milestone 5: Monitor and verify results

We have committed to reduce our emissions as a City by 7% below our 2000 levels by 2012, and keep them there beyond 2020.

Tumwater's Climate Action Plan

In 2006, Tumwater's City Council decided that it would act to reduce its contributions to global climate change. An intern was hired to complete a greenhouse gas emissions audit, create an emissions forecast, and craft an array of strategies the city could implement to reduce its climate impacts. Once these steps were taken, a Climate Action Plan was created.

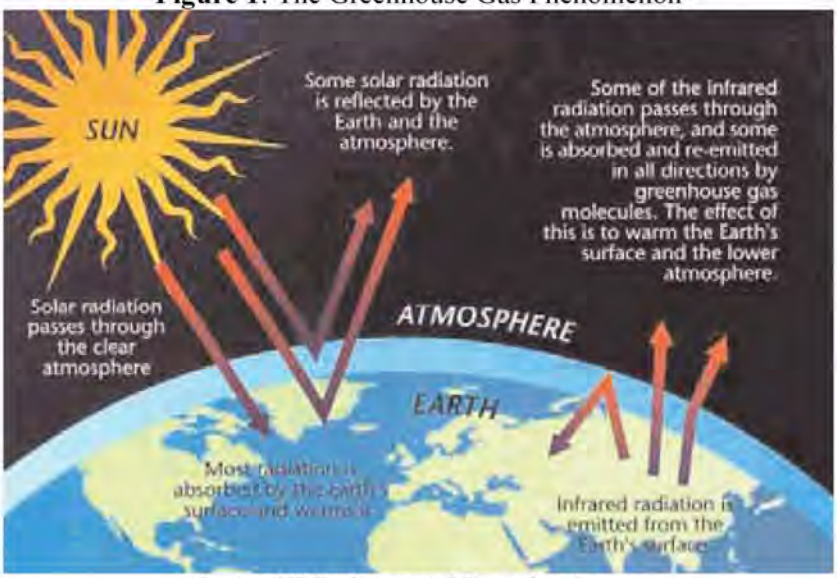
The plan is outlined below. Information is provided on the City's greenhouse gas emissions audits, business-as-usual forecast as well as currently occurring and future potential emissions reduction actions.

I. Introduction

A. Introduction to Climate Change Science

The Earth's atmosphere is naturally composed of a number of gases that act like the glass panes of a greenhouse, retaining heat to keep the temperature of the Earth stable and hospitable for life at an average temperature of 60ºF. Carbon dioxide (CO2) is the most prolific of these gases. Other contributing gases include methane (CH4), nitrous oxide (NO2), ozone (03) and halocarbons. Without the natural warming effect of these gases the Earth's surface temperature would be too cold to support life. (Figure 1)

Figure 1: The Greenhouse Gas Phenomenon



Source: US Environmental Protection Agency

However, recently elevated concentrations of these gases in the atmosphere have had a destabilizing effect on the global climate, fueling the phenomenon commonly referred to as global warming. The global average surface temperature increased during the 20th century by about 1°F.[1] According to NASA scientists, the 1990s were the warmest decade of the century, and the first decade of the 21st century is well on track to be another record-breaker. The years 2002, 2003, 2004 and 2005, along with 1998, were the warmest five years since the 1890s, with 2005 being the warmest year in over a century.[2]

[1] United Nations Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report. "Climate Change 2001: Synthesis Report. Summary for Policy Makers" http://www.ipcc.ch/pub/un/syreng/spm.pdf
[2] NASA Goddard Institute for Space Studies, http://www.nasa.gov/vision/earth/environment/2005_warmest.html

Scientific Facts and Projections:

- The atmospheric concentration of carbon dioxide (CO_2) during the last two decades has increased at the rate of 0.4% every year.
- Current CO_2 concentrations are higher than they have been in the last 420,000 years, and according to some research, the last 20 million years.
- About three-quarters of the CO_2 emissions produced by human activity during the past 20 years are due to the burning of fossil fuels.

Source: The UN Intergovernmental Panel on Climate Change (IPCC) TAR: Summary for Policy Makers

The climate and the atmosphere do not react in a linear fashion to increased greenhouse gases. That is to say that you cannot simply predict that for each ton of carbon dioxide emitted from a power plant or a vehicle's tailpipe, the Earth will warm a certain amount. The Earth's climate has a number of feedback loops and tipping points that scientists fear will accelerate global warming beyond the rate at which it is currently occurring. For example, as CO2 emissions have increased in recent human history, the oceans have been absorbing a significant portion of these gases, but as the oceans become more permeated with CO2, scientists anticipate they will reach a saturation point, after which each ton of anthropogenic emissions of CO2 will have a more substantial impact.[3] Another example of this compounding can be found in the polar ice caps. Ice is highly reflective and acts effectively like a giant mirror, reflecting the sun's rays back into space. As the planet warms and some of this ice melts away, a darker land or ocean surface is revealed. This darker surface will tend to absorb more heat, accelerating the speed at which the planet warms with each ton of greenhouse gas emitted. As these examples illustrate, the stakes are high, and there is no time to lose in the race against global warming.

B. Effects & Impacts of Climate Change

Global Impacts

Changes in temperature and climate will have a dramatic impact on plants and animals that are adapted to conditions that will no longer prevail. Surface temperatures are on course to increase by between 2.5 and 10.5ºF by the year 2100, with regions in the northern parts of North America and Asia heating by 40% above the mean increase.[4] In addition to causing average temperature increases, rising levels of greenhouse gases have a destabilizing effect on a number of different microclimates, conditions and systems.

The increase in the temperature of the oceans is projected to accelerate the water cycle, thereby increasing the severity and rate of both storms and drought, which, along with decreased snow pack, could disrupt ecosystems, agricultural systems and water supplies.

Globally, snow cover has decreased by 10% in the last forty years. Average sea level has risen between 1/3 and 2/3 of a foot over the course of the 20th century and is projected to rise by at least another 1/3 of a foot and up to almost 3 feet by the year 2100.[5] These coastal infringements on such a large scale could lead to not only significant

[3] United Nations Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report. "Climate Change 2001: Synthesis Report. Summary for Policy Makers" http://www.ipcc.ch/pub/un/syreng/spm.pdf
[4] Ibid
[5] Ibid

environmental and ecosystem disturbances, but also major population displacement and economic upheaval.

Local Impacts

Climate change is a global problem influenced by an array of interrelated factors that have concrete consequences for the Pacific Northwest. A 2005 report by the University of Washington's Climate Impacts Group found that climate change will significantly challenge the region's natural and built systems.[6] (All subsequent mention of climate impacts in Northwest, aside from the studies directly cited, reference the Climate Impacts Group 2005 study.)

***Natural disasters*:** The Climate Impacts Group has found that local climate trends will reflect continued increases in both average air and water temperatures. Additionally, sea level rise is likely to occur faster than global averages and earlier snowmelt may cause changes in river and stream flows. Sea level rise and increased seasonal flooding could incur considerable costs as these phenomena pose risks to property, infrastructure and even human life.

Impact on water: Water quality and quantity are also at risk to be depleted as a result of changing temperatures. With warmer average temperatures, more winter precipitation will fall in the form of rain instead of snow, shortening the winter snowfall season and accelerating the rate at which the snow pack melts in the spring.

Not only does such snow melt increase the threat for spring flooding, but it will also decrease the storage of the natural water tower in the Cascades, meaning less water will be available for agricultural irrigation, hydro-electric generation and the general needs of a growing population. As we have seen in recent years, water resources for agricultural and residential use may become scarce, especially during the summer months.

***Impact on plants and animals*:** The local native plants and animals are also at risk as temperatures rise. Scientists are reporting more species moving to higher elevations or more northerly latitudes. Increased temperatures also provide a foothold for invasive species of weeds, insects and other non-native threats.

Nearby shore habitat such as coastal wetlands and salt marshes are at risk of being inundated by rising sea levels. Increased flow and salinity of water resources would also seriously affect the food web and mating conditions for fish that are of both economic and recreational interest to residents. These trends compound the challenges already posed to dwindling populations of salmon, at all stages of their lifecycle.

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[6] Casola, Kay, Snover et. al. "Climate Impacts on Washington's Hydropower, Water Supply, Forests, Fish, and Agriculture." 2005. Climate Impacts Group, University of Washington: http://www.cses.washington.edu/db/pdf/kc05whitepaper459.pdf

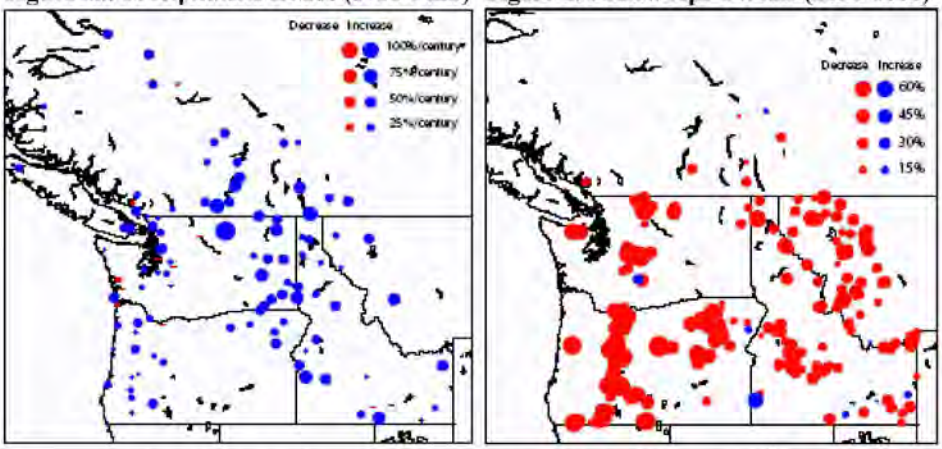
Additionally, the natural cycle of flowering and pollination, as well as the temperature conditions necessary for a thriving locally adapted agriculture would be altered. Perennial crops in particular will be challenged.

***Public health impact*:** Warming temperatures and increased precipitation can be encouraging to mosquito-breeding, thus engendering diseases for which mosquitoes are vectors, such as the West Nile virus, a disease of growing concern in our region.

Increased temperatures also pose a risk to human health because it increases ozone levels and air pollution toxicity, which are tied to increased rates of asthma and other pulmonary diseases. Furthermore, the anticipated increase in hotter days poses heat-stroke risks particular for the elderly, young, those already sick, and people who work outdoors.

Regional Evidence: The impacts of climate change are already here, and are expected to continue to escalate if the levels of heat trapping pollution continue to increase. Figure 2a shows precipitation trends; 2b shows trends in April 1 snow pack.

Figure 2a: Precipitation trends (1920-2000) **Figure 2b: Snow Apr 1 trend (1950-2000)**

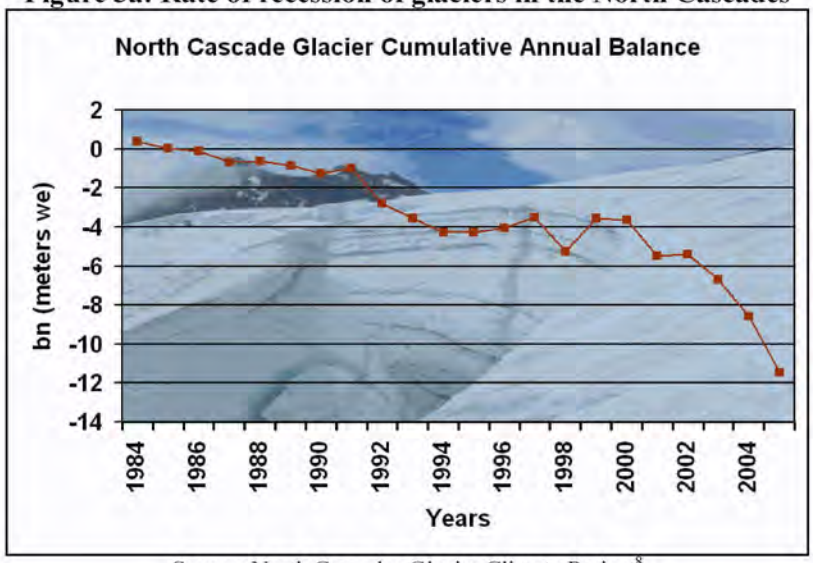


Source: Climate Impacts Group, University of Washington, 2006[7]

These figures show widespread increases in average annual precipitation for the period 1920 to 2000 and decreases in April 1 snow water equivalent (an important indicator for forecasting summer water supplies) for the period 1950 to 2000. The size of the dot corresponds to the magnitude of the change. Figure 3a below indicates the rate that glaciers in the North Cascades are shrinking. The loss of glacier volume since 1984 represents 20 to 40 percent of entire glacier volume. Figure 3b illustrates how this change has been so dramatic and rapid it can be seen with the naked eye.

[7] Climate Impacts Group. 2006. "Pacific Northwest 20th Century Climate Change." http://www.cses.washington.edu/cig/pnwc/cc.shtml#figure1

Figure 3a: Rate of recession of glaciers in the North Cascades



Source: North Cascades Glacier Climate Project[8]

Figure 3b: Eye-witness North Cascades Glacier Recession

Source: North Cascades Glacier Climate Project[9]

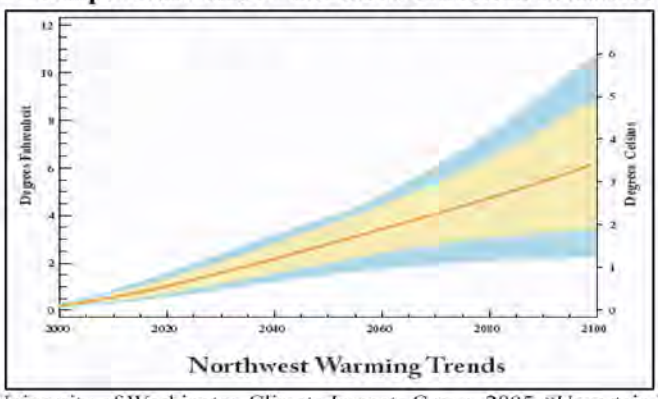
Scientists have calculated a number of predicted increases in average temperature in the Northwest under ten different climate change study scenarios. Figure 4 illustrates these predictions. Each scenario makes different assumptions about the levels of heat trapping pollution that humans will emit over the next one hundred years. The orange line indicates the average temperature from all of the scenarios. The yellow area indicates the temperature range that two-thirds of the scenarios fall within. The blue area indicates the full range of variability of all of the scenarios.

[8] North Cascades Glacier Climate Project. 2006. http://www.nichols.edu/departments/Glacier/

[9] North Cascades Glacier Climate Project. http://www.nichols.edu/departments/Glacier/. 2006.

It is important to note that there is very little variability in short-term predictions of the average global temperature in the next twenty to thirty years. However, the long-term outcome will be governed by decisions made today. This phenomenon is due to the significant inertia in the climate system: the impact of gases already in the atmosphere will not become apparent until further into the future. Moreover, despite the proliferation of energy saving technologies, existing power plants and vehicles will continue to be used. The short and medium-term implications of climate change are unavoidable. But the long-term impacts that will be felt between 2040 and 2100 have a high range of variability.

Figure 4: Temperature under increased emissions scenarios



Source: University of Washington Climate Impacts Group. 2005. "Uncertain Future"

C. Action Being Taken on Climate Change

National and State Action

Although significant action to prevent climate change has been lacking at the national level, there has been significant movement at the state and local levels.

State Actions: Many states have begun to consider the affects of climate disruption. A survey published in 2003 found that legislatures in 21 different states had passed legislation specifically directed at climate change.[10] The most common laws covered by the survey call for studies of the impacts of climate change, require inventories of the states' greenhouse gas emissions and creation of commissions to study the possible implications of greenhouse gas trading systems.

In addition to these individual state actions, there are two regional coalitions coordinating an interstate agreement to prevent climate change: the West Coast Governors' Global Warming Initiative and the Regional Greenhouse Gas Initiative (RGGI) of the Northeastern and Mid-Atlantic states.

The West Coast Governors' Global Warming Initiative was approved in 2004 by the Governors of California, Oregon and Washington. The Initiative attempts to synchronize a number of climate change measures each state was independently pursuing, including

[10] U.S EPA. http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsStateLegislativeInitiatives.html

the bulk purchase of hybrid cars for state fleets and organizing the deployment of electrification technologies at truck stops throughout the I-5 corridor. The RGGI coalition has also set reduction targets for heat trapping pollution emitted from the generation of electricity and is trying to establish a market-based regional cap and trade emissions program they hope to put into effect by 2009.[11]

Washington State

Over the past couple of years the Washington State Legislature has passed a number of bills that will have a significant impact on the reduction of greenhouse gas emissions.

SHB 3141 (2004) This bill initiates the process of regulating carbon emissions by requiring fossil fueled thermal power plants with a generating capacity of 25 MW or more to provide mitigation for 20 percent of the CO_2 emissions produced by that plant over a period of 30 years.[12]

ESHB 1397 (2005) Commonly called the "clean cars bill," this legislation adopts the California emissions standards for new cars, which are stricter than national standards. While the California standards, as they now stand, will have significant impact on the ambient air quality in our region, it will have only a minor impact on CO_2 emissions. Changes to the California standards, known as the "Pavley Amendment," are currently being reviewed by the California judiciary. If allowed, this rule would require significant improvements in average fuel efficiency and therefore would reduce CO_2 emissions significantly.

SSB 6508 (2006) This bill creates a renewable fuel standard requiring that biodiesel comprise a small percentage of all diesel sold in Washington and that all gasoline should be blended with a small percentage of ethanol. The percentage of the renewable fuels mandated for sale will be increased over time as the Department of Agriculture determines that the state's farmers have the capacity to meet the demand.

Local Action

A great deal of work is being done at the local level on climate change as well. ICLEI—Local Governments for Sustainability has been a leader on both the international and local level for more than ten years, representing over 770 local governments around the world. ICLEI was launched in the United States in 1995 and has grown to over 200 cities and counties providing national leadership on climate protection and sustainable development. In June 2006, ICLEI and the Northwest Clean Air Agency partnered to launch the Northwest Climate Protection and Energy Conservation Project funding, among other things, this report.

Additionally, a national effort called the U.S. Mayors' Climate Protection Agreement (MCPA) was launched locally by Seattle Mayor Greg Nickels to promote climate protection and the goals of the Kyoto Protocol – an international agreement addressing global warming pollution and ratified by 164 countries. On February 16, 2005, Seattle Mayor Greg Nickels launched the MCPA. Today it includes over 300 signatures from mayors representing over 49 million Americans in 44 states and Washington, D.C. Signing the agreement makes a pledge that your city will reduce its greenhouse gas

[11] http://www.rggi.org/agreement.htm

[12] House Bill Report: HB 3141, As Reported by House Committee On: Technology, Telecommunications & Energy. 2004. http://www.leg.wa.gov/pub/billinfo/2003-04/Pdf/Bill%20Reports/House/3141.HBR.pdf

emissions by 7 percent bellow 1990 levels by the year 2012. For more information about the MCPA, visit: http://www.seattle.gov/mayor/climate/

D. ICLEI and the Cities for Climate Protection Campaign

ICLEI's mission is to improve the global environment through local action. The Cities for Climate Protection® (CCP) Campaign is ICLEI's flagship campaign designed to educate and empower local governments worldwide to take action on climate change. ICLEI provides resources, tools, and technical assistance to help local governments measure and reduce greenhouse gas emissions in their communities and their internal municipal operations.

ICLEI's CCP Campaign was launched in 1993 when municipal leaders, invited by ICLEI, met at the United Nations in New York and adopted a declaration that called for the establishment of a worldwide movement of local governments to reduce greenhouse gas emissions, improve air quality, and enhance urban sustainability. The CCP Campaign achieves these results by linking climate change mitigation with actions that improve local air quality, reduce local government operating costs, and improve quality of life by addressing other local concerns. The CCP Campaign seeks to achieve significant reductions in U.S. greenhouse gas emissions by assisting local governments in taking action to reduce emissions and realize multiple benefits for their communities.

ICLEI uses the performance-oriented framework and methodology of the CCP Campaign's Five Milestones to assist U.S. local governments in developing and implementing harmonized local approaches for reducing global warming and air pollution emissions, with the additional benefit of improving community livability. The milestone process consists of:

- Milestone 1: Conduct a baseline emissions inventory and forecast
- Milestone 2: Adopt an emissions reduction target
- Milestone 3: Develop a Climate Action Plan for reducing emissions
- Milestone 4: Implement policies and measures
- Milestone 5: Monitor and verify results

On December 5, 2006, Tumwater adopted a resolution to take action for climate protection and officially joined the nearly 200 communities participating in ICLEI's Cities for Climate Protection Campaign.

II. Emissions Inventory

A. Reasoning, Methodology & Model

ICLEI's Cities for Climate Protection methodology allows local governments to systematically estimate and track greenhouse gas emissions from energy and waste related activities at the community-wide scale and those resulting directly form municipal operations. The municipal operations inventory is a subset of the community-scale inventory.

Once completed, these inventories provide the basis for creating an emissions forecast and reduction target, and enable the quantification of emissions reductions associated with implemented and proposed measures.

1. CACP Software

To facilitate local government efforts to identify and reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) Software package with Torrie Smith Associates. This software estimates emissions derived from energy consumption and waste generation within a community. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of equivalent carbon dioxide units, or eCO_2. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of eCO_2.

The emissions coefficients and methodology employed by the software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605).

The CACP software has been and continues to be used by over 170 U.S. cities and counties to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides Tumwater with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation, rather than an exact value.

2. Inventory Sources and Creation Process

The creation of an emissions inventory required the collection of information from a variety of sectors and sources. These data were entered into the software to create a municipal emissions inventory. The municipal inventory is a subset of total community emissions, and includes energy use and emissions derived from internal government operations.

There are two main reasons for completing separate emissions inventories for community and municipal operations. First, the government is committed to action on climate change, and has a higher degree of control to achieve reductions in its own municipal emissions than those created by the community at large. Second, by proactively reducing emissions generated by our own activities, the Tumwater government takes a visible leadership role in the effort to address climate change. This is important for inspiring local action in Tumwater, as well as for inspiring other communities. It was decided by City Council that an emissions inventory and climate action plan for the municipal sector would be created first, in order to establish a framework for completing those processes and also to show leadership in mitigating against future climate change. This report deals only with Tumwater's municipal emissions.

The municipal operations inventory is based on the year 2000. Another inventory was also created for the year 2006, which was the most recent complete year on record at the beginning of the inventory process. Using 2006 data gives the city a chance to examine its short-term greenhouse gas emissions growth.

When calculating Tumwater's emissions inventory, all energy consumed by the municipal sector was included. This means that, even though the electricity used by Tumwater is produced elsewhere, this energy and emissions associated with it appears in Tumwater's inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community.

B. Inventory Results

1. Municipal Operations Emissions Inventory for 2000

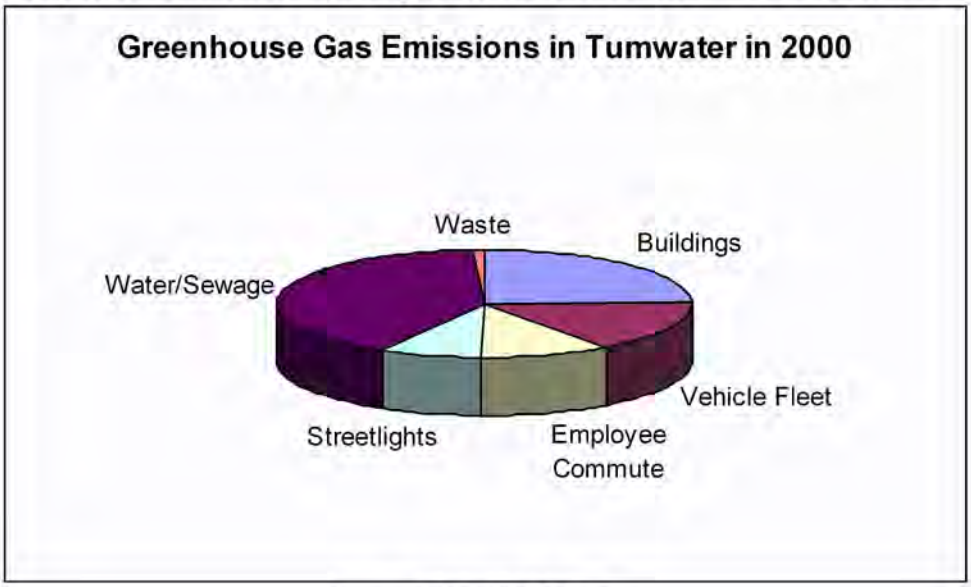
In the base year of 2000, Tumwater's municipal operations generated 3,141 tons of eCO_2. Table and Figure 1 show the breakdown of municipal operations emissions by source type. Total cost for the Buildings, Streetlights, and Water/Sewage sectors are shown with the Buildings data. The data did not lend itself to further analysis; it was not possible to break it out by sector.

Table 1: Tumwater Municipal Emissions Summary

Potential Sources	Equiv CO_2 (tons)	Energy (million Btu)	Cost ($)
Buildings	777	6,850	418,744
Vehicle Fleet	478	5,579	37,552
Streetlights	247	1,649	
Employee Commute	325	3,774	N/A
Water/Sewage	1,292	8,611	
Waste	22	N/A	N/A
TOTAL	**3,141**	**26,463**	**456,296**

Source: CACP Model output

Figure 1: Tumwater's Municipal Greenhouse Gas Emissions – Year 2000



Source: CACP Model output

Local government emissions typically fall between 2 to 5 percent of overall community emissions. As a minor contributor to total emissions, actions to reduce municipal energy use may have a limited impact on Tumwater's overall community emissions levels. However, municipal action has symbolic value and demonstrates leadership that extends beyond the magnitude of emissions actually reduced. As mentioned above, this was a main consideration in planning to complete Tumwater's municipal emissions inventory and climate action plan ahead of the community analysis.

Energy/Stationary Source Emissions

The breakdown for emissions from this sector is as follows. Water and sewage operations accounted for 41.1% of emissions, buildings for 24.7%, the vehicle fleet for 15.2%, employee commute for 10.3%, streetlights for 7.9% and waste for less than 1%. It became obvious that water and sewage operations for the City of Tumwater represented the majority of eCO_2 emissions from this sector. One facility in particular, a pump station situated at the Palermo Well Field Superfund site, consumed approximately 30% of the city's electricity usage in 2006 and was responsible for 19% of the city's greenhouse gas emissions.

Table 2: Tumwater Municipal Emissions Summary

Tumwater Municipal Emissions Summary	
	Municipal Operations Analysis
Base Year	2000

eCO_2 Emissions in 2000 (tons)	3,141

Source: CACP Model Output

2. Municipal Operations Emissions Inventory for 2006

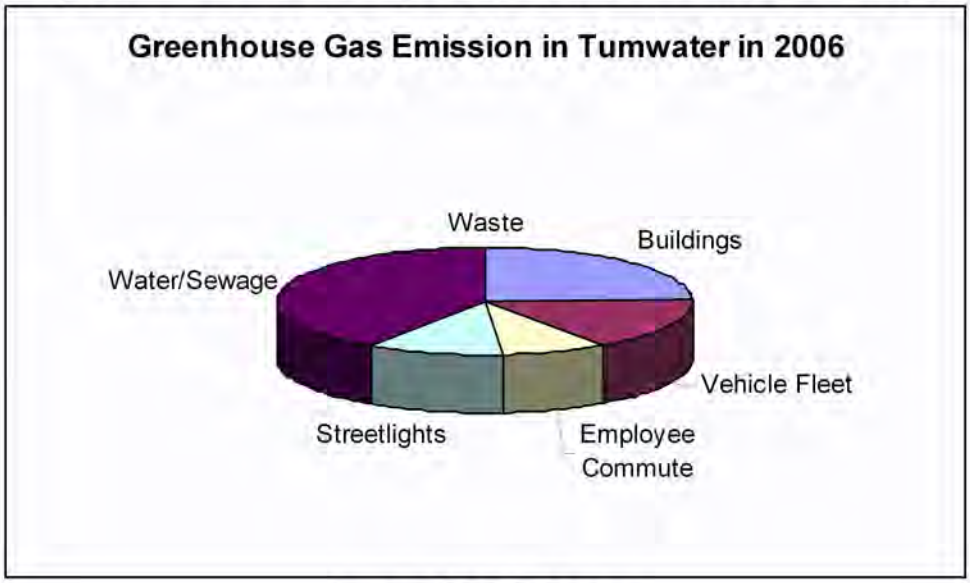
In the interim year of 2006, Tumwater's municipal operations generated 4,451 tons of eCO_2, a total increase of 41.7% since 2000, or 6.0% annually. Table 3 and Figure 2 show the breakdown of municipal operations emissions by source type.

Table 3: Tumwater Municipal Emissions Summary

Potential Sources	Equiv CO_2 (tons)	Energy (million Btu)	Cost ($)
Buildings	1,083	8,573	173,686
Vehicle Fleet	712	8,314	166,190
Streetlights	472	2,951	165,723
Employee Commute	472	5,527	NA
Water/Sewage	1,810	11,315	283,968
Waste	6	NA	NA
TOTAL	**4,410**	**34,983**	**789,567**

Source: CACP Model output

Figure 2: Tumwater's Municipal Greenhouse Gas Emissions – Year 2006



Source: CACP Model output

Energy/Stationary Source Emissions

The breakdown for emissions from this sector is as follows. Water and sewage operations accounted for 40.7% of emissions, buildings for 24.3%, and streetlights for 10.6%vehicle fleet for 16.0%, employee commute for 8.3%, and waste for less than 1%.

Again, water and sewage operations were the single largest source of greenhouse gas emissions.

Transportation Emissions

Vehicle pool emissions accounted for 16.0% of total emissions in 2006, while employee commute emissions contributed 8.3% to overall emissions.

Solid Waste Emissions

Solid waste emissions accounted for less than 1% of emissions in 2006, although this data is somewhat suspect. Some trends observed in the data provided by Pacific Disposal seemed suspicious, so a follow-up inquiry was made. The original data provider at that organization was unable to be reached for clarification, so the solid waste data for 2000 and 2006 should be considered somewhat suspect.

Table 4: Tumwater Municipal Emissions Summary

Tumwater Municipal Emissions Summary	
	Municipal Operations Analysis
Interim Year	2006
eCO_2 Emissions in 2006 (tons)	4,451

Source: CACP Model Output

III. Forecast for Greenhouse Gas Emissions

Based on the municipal operations emissions inventories developed for Tumwater for the base year 2000, our next step was to forecast future emissions generated in our community. The emissions forecast represents a business-as-usual prediction of how greenhouse gas (GHG) emissions may change in our community over time. The year 2020 was chosen for the emissions forecast. Data availability and energy usage predictions are also synced to this year; beyond this time, "business-as-usual" may incorporate different technological and societal practices.

Table 5: Tumwater's Emissions Summary

Tumwater's Emissions Summary	
	Municipal Operations Analysis
Base Year	2000
eCO_2 Emissions in 2000 (tons)	3,141
Target Year	2020
Business-as-usual projection of eCO_2 emissions in 2020 (tons)	10,760

Conducting an emissions forecast is also essential for setting the reduction target, since the amount of GHG emissions Tumwater has pledged to reduce will be derived from projected emissions.

IV. Greenhouse Gas Emissions Reduction Target

A reduction target provides a tangible goal for Tumwater's emissions reduction efforts. Our emissions reduction target represents a percentage by which the City aims to decrease emissions, below the 2000 baseline, by a target year.

Many factors were considered when selecting Tumwater's reduction target. We strove to choose a target that is both aggressive and achievable given local circumstances. The Kyoto Protocol target of 7% below 1990 levels was the target the United States agreed to in principal at the 1997 United Nations Council of Parties meeting, but has yet to ratify in Congress. Several European nations set similar goals and some have begun action towards meeting them. IPCC research suggests that we would need to achieve as much as a 60% reduction below 1990 levels in order to reverse global warming and stabilize the climate.

The City of Tumwater set out to align itself with the U.S. Mayors' Climate Protection Agreement, which was modeled after the Kyoto Protocol and sought a target of a 7% reduction below 1990 emissions levels by 2012. After some initial research, it became evident that there would be no way of verifying this reduction, as energy usage records from 1990 were unattainable for several sectors of the analysis. The baseline year was selected as 2000, as energy records from this year were much more reliable than those from 1990. Several cities working on their emissions analyses have had to make similar concessions.

Local factors considered in selecting the target reduction percentage included estimation of the effects of implemented and planned programs and policies, an approximate assessment of future opportunities to reduce emissions, targets adopted by peer communities, and emissions reductions expected to be consequences of policies mandated by the state of California. Tumwater has adopted a reduction target of 7% by the year 2012. To reach this target, Tumwater must reduce annual emissions by 1,530 tons by 2012. Based on the business-as-usual projection, the city will have to reduce emissions by over 7,800 tons by 2020.

Table 6: Tumwater Municipal Emissions Summary

Tumwater Municipal Emissions Summary	
	Municipal Operations Analysis
Base Year	2000
eCO_2 Emissions in 2000 (tons)	3,141
Target Year	2020
Business-as-usual projection of eCO_2 emissions in 2020 (tons)	10,760
% eCO_2 reduction Targeted	7% below 2000 levels
Quantity of eCO_2 Reduction Targeted (tons)	7,840

Source CACP Model Output

V. Existing Measures

A. Existing Municipal Operations Measures

Tumwater has already undertaken a number of municipal operations measures resulting in reduced greenhouse gas emissions relative to the base year of 2000. These measures are an excellent first step towards significant reductions of greenhouse gas emissions from municipal operations. For many of the policies, gathering specific greenhouse gas reduction information was not possible.

Building Lighting Retrofits

The standard fluorescent lighting used in Tumwater's municipal buildings has been T12 technology, until recent years, when more energy efficient T8 technology was adopted. The city's T12 fluorescent lights are replaced with T8 bulbs on a replacement schedule, that is, when the older bulbs burn out. In addition, the magnetic ballasts used in conjunction with the T12 bulbs are being replaced by electronic ballasts, which save energy and contain fewer toxic materials. The city's Facilities Department has kept no data on how many lights have been replaced, so it was not possible to create a greenhouse gas reduction figure for this measure.

Energy Conservation Efforts

In 2003, rising energy prices forced the city to implement an energy conservation program. This was mainly done by an informational campaign, reminding employees to turn off lights and machines when not in use. Overall energy usage in the city's buildings has been on the rise since 2001, with a slight decrease between 2005 and 2006, so the efficacy of this program is somewhat questionable. It is certainly possible that growth in city operations outpaced energy conservation efforts.

Traffic Signal Retrofits

The city has been conducting work on its approximately twenty traffic signals, replacing incandescent light bulbs with more energy efficient LED bulbs. This project is scheduled for completion in the next four to five years.

Purchase of Hybrid and Electric Vehicles

The City of Tumwater has purchased two vehicles that produce fewer emissions than standard automobiles. The city purchased an electric automobile to be used by the City's water meter reader, and a hybrid electric vehicle which would be used as a general motor pool vehicle. The electric vehicle replaced a small pickup truck, and the hybrid-electric vehicle replaced a standard mid-size sedan. Both vehicles replaced were around ten years old. Additionally, the City has plans to continue to purchase hybrid electric vehicles in the future.

Unfortunately, it was not possible to gather greenhouse gas emissions reduction data on these new vehicles. Annual mileage records were not kept for the electric vehicle, so it was not possible to determine how much electricity it consumed, which would enable a measure of greenhouse gas production to be made. Annual mileage statistics were unavailable for the other replaced vehicle, as well.

Increased Recycling Efforts

The City of Tumwater already participates in a recycling program with Pacific Disposal. Materials such as mixed paper (including glossy paper such as magazine and newspaper ads), cardboard, aluminum cans, plastic bottles and film (such as plastic grocery bags) are now collected from all of Tumwater's municipal buildings. This program is a step above what was in place in early 2007, when only mixed paper (not including glossy paper) and cardboard were collected from all municipal buildings, and aluminum cans were collected once a year from City Hall. The expanded operations began in the fall of 2007, and data on whether the expansion has resulted in increased recycling is not yet available.

Ongoing Tree Planting Projects

Tumwater's Stream Team has been very active in planting trees around the community, mainly in riparian areas. Some of their most notable projects have been planting at the golf course and at a twelve acre parcel along Percival Creek, which drains into Capitol Lake and ultimately into Puget Sound's Budd Inlet. The work is done by Stream Team volunteers, using mostly hand tools. The trees planted are those requiring little maintenance. Exact numbers of trees are impossible to measure, but Debbie Smith, the Stream Team coordinator, estimated that in the past several years the program has planted 10,000 or more trees and shrubs. In addition to the Stream Team, Tumwater Parks & Recreation plants trees as well. Over 250 trees are planted at Tumwater's golf course each year. Trees are also planted at Tumwater's city parks at irregular intervals.

Golf Course Restaurant/Pro Shop Renovation

Two greenhouse gas reduction measures have either already occurred or are slated for Tumwater's golf course. In 2002, the city replaced its forty gasoline-powered golf carts with electric powered carts. A second measure at the golf course, previously mentioned, entails a rehabilitation of the pro shop and restaurant building. Already in place was a plan to overhaul the building, including installing energy efficient double-paned windows and doors, air-tight metal door frames, a more efficient water heating system, a coupled water and air heating system that reduces the amount of energy needed to heat incoming air in the winter months, and a more energy efficient refrigerator for the restaurant. No estimations on the electricity savings from this project were provided, and thus a measure of greenhouse gas reduction could not be created.

B. Externally Imposed Measures

In addition to emissions reduction measures implemented within our community, the effects of measures recently implemented at the state and federal level also deserve consideration in the context of our greenhouse gas emissions inventory. They have not been integrated into the project emissions reductions for Tumwater above because they are imposed from outside of the community. However, actions at other levels warrant brief consideration, and have thus been outlined below.

In California, two state policies recently passed by the legislature, the renewable portfolio standard and the automobile emissions standards, will indirectly reduce individual emissions. Tumwater residents may not notice these changes in their day-to-day life, but they will have the potential to significantly impact town, and state, greenhouse gas emissions.

In 2002, the California Senate passed SB1078, requiring public utilities to gradually increase the percentage of their energy supply generated from renewable sources, reaching 20 percent renewable by 2017. This means that, over time, a larger and larger share of the energy electrifying municipal operations in Tumwater will be generated cleanly.

Nationwide, automobile manufacturers are bound by fuel efficiency standards set by the Department of Transportation. These standards, known as "CAFE" (Corporate Average Fuel Economy standards), require that the fleet of passenger cars sold by any single manufacturer have an average fuel economy of 27.5 mpg. This standard is the same today as it was in 1985, despite technical progress and increased understanding of the environmental impacts of fossil fuel combustion. However, these are federal standards, and states are prevented from passing laws addressing vehicle fuel economy. In response to the stagnant standards, the California Assembly passed AB 1493, which allows the California Air Resources Board to create carbon dioxide emissions standards for cars sold in California. They argue that a greenhouse gas emissions standard is distinct from a fuel economy standard, despite the fact that it would necessitate improved gas mileage. If the bill goes into law, by the year 2015 the reduction in fuel consumption will help reduce municipal vehicle fleet emissions in Tumwater.

This legislation is currently being challenged in court by car manufacturers, who suggest that the state is interfering with the federal CAFE standards. Therefore, the City of Tumwater should not consider these reductions to be definite, and should play an active role in lobbying state and federal governments for regulations that increase automobile fuel economy.

VI. Proposed Emissions Reduction Measures

After careful consideration of the distribution of emissions production across various sectors of the community, as well as resources available and potential costs and co-benefits, the most beneficial and feasible measures were chosen to reduce greenhouse gas emissions to 7% below 2000 levels by 2020. CACP Software was used to calculate the greenhouse gas reductions both in tons and percentage. However, these measures will not only result in reduced greenhouse gas emissions, but additionally will save money, reduce other pollution associated with municipal operations and electricity generation, and provide a leadership example to the community in general. The measures have been broken down by sector and are described below.

This initial round of measures will reduce greenhouse gas emissions by 90 tons per year once they have all been implemented; this reduction represents approximately 6% of the city's 2012 goal as outlined by the US Mayors Climate Protection Agreement. In order to reach this goal and the 2020 goal of reducing emissions by over 7,800 tons, additional measures will need to be researched and implemented in the future.

A. Municipal Measures

1. Contract with Washington State Energy Outreach Office

Importance/Context: Continues the work that has already been done with the City's Climate Protection Program.
Implementation Scenario: Resource Conservation Manager (RCM) services will be provided. General Administration will review city utility bills and previous climate work, interview staff, and prepare a report. They will help the city develop an RCM program, track progress of conservation measures, research grant opportunities and possible projects, and provide progress reports on a monthly basis.
Implementation Year: 2008
Co-Benefits: cost savings
Costs: $18,000

2. $25,000 Capital Facilities Plan Project

Importance/Context: The inclusion of this funding in the Capital Facilities Plan represents Tumwater's willingness to implement GHG reducing projects.
Implementation Scenario: Utilize funds to make energy-efficiency upgrades to city buildings.
Implementation Year: 2008
Energy & Resource Savings: Depends on which projects are chosen. See below for a list of potential projects.
Co-Benefits: cost savings, provides an example for the community
Costs: $25,000
Available Funding: Tumwater's 2008-2013 Capital Facilities Plan

3. Municipal Building Fluorescent Lighting Retrofits

Importance/Context: Retrofitting existing lighting systems with more energy-efficient technology is one of the quickest, most straight-forward methods of reducing greenhouse gas emissions.
Implementation Scenario: Replace all T12 fluorescent light bulbs and magnetic ballasts with more efficient T8 lights and electronic ballasts.
Implementation Year: 2008
Resource Savings: Citywide, this method could result in an energy savings of 39,170 kWh per year.
Emissions Reductions: Citywide, this method could result in a 20 ton GHG emission reduction per year.
Co-Benefits: cost savings (after the payback period of 5 years), electronic ballasts contain fewer toxic materials.
Costs: Equipment and labor: $20,000.
Available Funding: Tumwater's 2008-2013 Capital Facilities Plan includes $25,000 for energy reduction retrofits. This project would be an excellent use of those available funds.

4. LED Exit Sign Retrofit

Importance/Context: Like fluorescent lighting retrofits, installing LEDs is a quick way to begin reducing municipal greenhouse gas emissions.
Implementation Scenario: Replace incandescent Exit Signs with LED fixtures, which use less energy.
Implementation Year: 2008
Resource Savings: Citywide, this project could reduce energy use by 11,934 kWh per year.
Emissions Reductions: Citywide, this project could reduce GHG emissions by 6.146 tons per year.
Co-Benefits: cost savings (after the payback period of 8 years), LED technology lasts longer, reduces future equipment and labor costs.
Costs: Equipment and labor: $9,400
Available Funding: Future Capital Facilities and/or Budget funding.

5. Golf Course and City Hall LED Retrofits

Importance/Context: Like fluorescent lighting retrofits, installing LEDs is a quick way to begin reducing municipal greenhouse gas emissions.
Implementation Scenario: Replace incandescent can lighting in City Hall and the Golf Course Pro-shop/Restaurant building with LED fixtures, which use less energy.
Resource Savings: Citywide, this project could reduce energy use by 15,618 kWh per year.
Emissions Reductions: Citywide, this project could reduce GHG emissions by 8.016 tons per year.
Co-Benefits: cost savings (after the payback period of 4.5 years), LED technology lasts longer, reducing future equipment and labor costs.
Costs: Equipment and labor: $7,000

Available Funding: $25,000 in 2008-2013 CFP; Future Capital Facilities and/or Budget funding.

6. Replace Various Heating Systems in City Buildings

Importance/Context: Many of the elements of the heating systems in Tumwater's buildings have more energy efficient replacements.
Implementation Scenario: Replace water heaters and boilers in City Hall and Old Town Center, and the heating system in the Facilities building.
Implementation Year: 2009, 2011
Resource Savings: Citywide, this project could reduce energy use by 25,987 kWh per year.
Emissions Reductions: Citywide, this project could reduce GHG emissions by 13.384 tons per year.
Costs: Equipment and labor: $95,000
Available Funding: Future Capital Facilities and/or Budget funding.

7. Insulation and Window Retrofits

Importance/Context: Upgrading windows and insulation in buildings can help reduce energy usage.
Implementation Year: 2012
Implementation Scenario: Upgrade insulation in Old Town Center, and replace and upgrade windows and insulation in the Facilities building.
Resource Savings: Citywide, this project could reduce energy use by 7,779 kWh per year.
Emissions Reductions: Citywide, this project could reduce GHG emissions by 4 tons per year.
Costs: Equipment and labor: $66,000
Available Funding: Future Capital Facilities and/or Budget funding.

8. Electronic Vehicle Monitoring

Importance/Context: This program can help the city get the most efficient use out of its fleet vehicles.
Implementation Scenario: Install vehicle monitoring devices on the vehicles used most by city staff.
Implementation Year: 2010
Resource Savings: Citywide, this project could reduce fuel use by 2,900 gallons per year.
Emissions Reductions: Citywide, this project could reduce GHG emissions by 30 tons per year.
Co-Benefits: cost savings (after the payback period of 9 years [with $3/gal fuel prices])
Costs: Equipment and labor: $80,000
Available Funding: Future Capital Facilities and/or Budget funding.

9. Tire Pressure Monitoring

Importance/Context: Like fluorescent lighting retrofits, installing LEDs is a quick way to begin reducing municipal greenhouse gas emissions.

Implementation Scenario: Install sensors on the tires of fleet vehicles that indicate when tire pressure is low.
Resource Savings: Citywide, this project could reduce fuel use by 1,450 gallons per year.
Emissions Reductions: Citywide, this project could reduce GHG emissions by 15 tons per year.
Co-Benefits: cost savings (after the payback period of <1 year)
Costs: Equipment and labor: $1,200
Available Funding: Future Capital Facilities and/or Budget funding.

VII. Conclusion & Future Steps

Climate change is an issue of growing concern for communities across the United States and around the world. The City of Tumwater has displayed great leadership and foresight in choosing to confront this issue now. By reducing the amount of greenhouse gases emitted by its community, Tumwater joins hundreds of other American cities in stemming the tide of global warming and the numerous threats associated with it, such as increased droughts and flooding, disrupted agricultural systems and rising sea levels.

In addition to mitigating the destabilization of the climate and associated effects, Tumwater stands to benefit in many other ways from the proposed measures outlined in this report. Many of the outlined measures will reduce air pollution and conserve financial resources that can be put to use for other municipal programs. In addition, the measures set forth in Tumwater's Climate Action Plan are an excellent example to the community in general.

Future Steps

Meeting Tumwater's reduction target will require both persistence and adaptability. Several recommendations for the advancement of Tumwater's climate protection goals were made throughout the process of developing measures for greenhouse gas reduction and working with the city's government.

In future years, the city should complete the entire community analysis utilizing ICLEI software and support from staff within that organization. Helping bring the community on board and finding ways to reduce GHG emissions associated with Tumwater's 16,000 residents would also greatly advance the city's climate protection efforts.

The city should also finish the remaining step in the ICLEI process once the projects presented above have been implemented: monitoring and verifying emissions progress. To make sure the Local Action Plan is implemented effectively and on schedule, it is important to include procedures for monitoring its implementation, measuring results, keeping track of changing conditions, taking advantage of new information and ideas, and so on. Measuring results is important. This requires following up on the sources and data developed in preparing the emissions analysis and forecast.

In order to sustain the momentum that Tumwater's Climate Protection Program has generated thus far, some type of oversight should be adopted by the city. Perhaps the best method would be to convene a special panel consisting of city staff who are familiar with the city's operations and may be able to craft strategies and measures to help the city further reduce its GHG emissions. It would be important for the participants of this panel to keep abreast of developments in energy efficiency and conservation strategies, and current climate policy, as well as keep track of municipal energy usage. The panel would optimally report to the General Government Committee in order to coordinate efforts and share strategies, on a recurring basis to be set in the future.

The City of Tumwater's Capital Facilities Plan is reviewed every year, and this provides ample opportunity for the city to implement climate protection measures in future years. The Climate Protection Program proposal included in the 2008-2013 CFP included a potential timeline for the implementation of various measures. In order for the city to continue the progress it has already made in climate protection, it is critical that these and other greenhouse gas reduction strategies be included and funded in future CFPs.

Finally, until further concrete greenhouse gas reduction measures are identified, it is important that the city continue to entertain the option of participating in Puget Sound Energy's Green Power Program or a similar initiative. During the course of quantifying measures that Tumwater could adopt to reduce its GHG emissions, green tags and carbon offsets were never considered a permanent solution to the climate change problem—rather, it was recognized that they may provide the only means of meeting the city's GHG reduction goals, as the sum of all other measures examined did not bring the city to its stated goals.

Appendix A - Data Collection Process, Assumptions and Notes

In order to identify sources of Tumwater's greenhouse gas emissions and obtain records and information that would be used for GHG emissions analysis, meetings were held with representatives from the public works, facilities, finance and human resources departments in order to determine sources of energy consumption throughout the City of Tumwater. In addition, utility bills and other records were collected and analyzed for the years 2000 and 2006. Once all energy records were compiled, emissions audits were created using the CACP software.

The 2006 records were more easily separated into the sectors used for analysis in the CACP software. For 2000, only aggregate electricity information was available, so energy data for the years 2001-2006 was used to create an overall average ratio of energy use, which was applied to the year 2000. A similar process was used to figure out the makeup of fuel usage (diesel vs. gasoline) for the City's vehicle fleet.

For the Employee Commute section, a 2005 CTR survey was used because no information was available for 2006. Values from this survey had to be extrapolated to the City's entire workforce. Values from the 1999 and 2001 surveys were averaged to produce values for 2000. It was assumed that for both years, 25% of employees worked a 9/80 compressed workweek, and another 25% worked a 4/10 compressed workweek. Employees were assumed to report to work 50 weeks out of the year.

Estimates were used in calculating costs and emissions reduction potential of strategies, as detailed information was not always available.