City of Everett Comprehensive Plan
Climate Change & Sustainability Element
Background Report

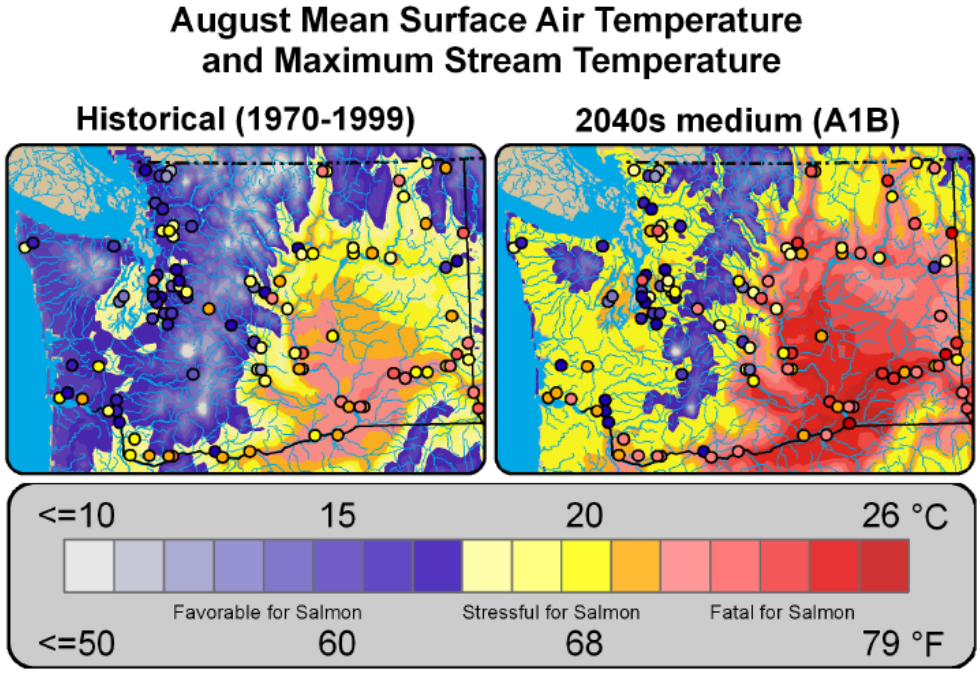

Figure 9. August mean surface air temperature (colored patches) and maximum stream temperature (dots) for 1970-1999 (left) and the 2040s (right, medium emissions scenario, (A1B)). The area of favorable thermal habitat for salmon declines by the 2040s in western Washington, and in eastern Washington many areas transition from stressful to fatal for salmon. Circles represent selected stream temperature monitoring stations used for modeling stream temperatures.

January 2015

Cover Figure From: Littell, J.S., M. McGuire Elsner, L.C. Whitely Binder, and A.K. Snovers (eds). 2009. The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate – Executive Summary. In the Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate, Climate Impacts Group, University of Washington, Seattle, Washington.

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I. Introduction / Science of Climate Change

Increased concentrations of greenhouse gases (GHG) in the atmosphere from fossil fuel emissions and land use change emissions is resulting in significant changes to our climate and natural environments. The following are excerpts from recent publications that document the science and potential impacts of climate change. Climate change will have significant impacts globally that will vary significantly by location. For example, some communities on low lying islands will be completely devastated and potential increase in hurricanes will impact the east coast of the United States. This background report primarily focuses on information that is general in nature or focuses on the Northwest. But climate change impacts in other regions of the US and the world have the potential to significantly impact the economy of the Northwest, so these national and global impacts are also addressed to some extent. See the individual reports for the data and analysis associated with the findings.

Key Definitions:

Climate Change: Climate change refers to the alteration of the global atmosphere attributed to human activity compared to natural climate variability. Climate change effects are not limited to global warming (increases in surface temperatures), but also include sea-level rise, ocean and ice sheet dynamics, ocean acidification, and extreme weather events.[1]

Greenhouse Gases: Gases that absorb heat (infrared radiation) emitted from the earth's surface. Increases in the atmospheric concentration of these gases cause Earth to warm by trapping more of this heat. These gases include water vapor, CO_2, methane, nitrous oxide and ozone.

Sustainability: Development that meets the needs of the present without compromising the ability of future generations to meet their own need.[2]

A. IPCC, 2013: Summary for Policy Makers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.

This publication states

- Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.
    - Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. In the Northern Hemisphere, 1983-2012

[1] From American Planning Association Washington Chapter. *Executive Summary: Sustainable Washington 2009: Planning for Climate Change*. November 2009.

[2] This foundational definition of sustainability was established by the 1987 report from the World Commission on Environment and Development, *Our Common Future* (the 'Brundtland' report).

was *likely* the warmest 30-year period of the last 1400 years (medium confidence).

- Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 to 2010 (high confidence). It is *virtually certain* that the upper ocean (0-700 m) warmed from 1971 to 2010, and it *likely* warmed between the 1870s and 1971.
- Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Artic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (*high confidence*).
- The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901 to 2010, global mean sea level rose by .19 (0.17 to 0.21 m.
- The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.

- Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.
- Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

- Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond. Most aspects of climate change will persist for many centuries even if emissions of CO_2 are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions.

B. **2014: *Climate Change Impacts in the United States: The Third National Climate Assessment.***

The Northwest Chapter of this publication, which addresses the states of Washington, Oregon and Idaho, states that

- Temperatures increased across the region from 1895 to 2011 by about 1.3^{o}F. An increase in average annual temperature of 3.3^{o}F to 9.7^{o}F is projected by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat trapping gases. The increases are projected to be largest in summer.
- Change in annual average precipitation in the Northwest is projected to be within a range of an 11% decrease to a 12% increase for 2030 to 2059 and a 10% decrease to an 18% increase for 2070 to 2099. One aspect of seasonal changes in precipitation is largely consistent across climate models: for scenarios of continued growth in global heat-trapping gas emissions, summer precipitation is projected to decrease by as much as 30% by the end of the century, with the average projection being a 10% reduction. While a

10% reduction in summer precipitation is a small amount, unusually dry summers have many noticeable consequences, including low streamflow west of the Cascades and greater extent of wildfires throughout the region.

- Changes in the timing of streamflow related to changing snowmelt have been observed and will continue, reducing the supply of water for many competing demands and causing far-reaching ecological and socioeconomic consequences.
    - Since around 1950, area-averaged snowpack on April 1 in the Cascade Mountains decreased about 20%, spring snowmelt occurred 0 to 30 days earlier depending on location, late winter/early spring streamflow increases ranged from 0% to greater than 20% as a fraction of annual flow, and summer flow decreased o% to 15% as a fraction of annual flow, with exceptions in smaller areas and shorter time periods.
    - Warming is projected to increase river-related flood risk the most in basins with both winter rainfall and late spring snowmelt-related runnoff peaks.
    - Regional models project increases of 0% to 20% in extreme daily precipitation, depending on location. Averaged over the region, the number of days with more than one inch if precipitation is projected to increase 13% in 2041 to 2070 compared with 1971 to 2000 under a scenario that assumes a continuation of current rising emissions trends. This increase in heavy downpours could increase flood risk in mixed rain-snow and rain-dominant basins, and could also increase stormwater management challenges in urban areas.
    - Reductions in summer flows will require more tradeoffs among objectives of reservoirs, especially with the added challenges of summer increases in electric power demand for cooling and additional water consumption by crops and forests. Economic impacts of hydropower changes could be hundreds of millions of dollars per year.
    - Region-wide summer temperature increases and increased river flooding and winter flows and decreased summer flows will threaten many freshwater species, particularly salmon, steelhead, and trout. Rising temperatures will increase disease and/or mortality in several iconic salmon species, especially for spring/summer Chinook and sockeye in the interior Columbia and Snake River basins.
- In the coastal zone (including Puget Sound) the effects of sea level rise, erosion, inundation, threats to infrastructure and habitat, and increasing ocean acidity collectively pose a major threat to the region.
    - Many wetlands, tidal flats, and beaches will probably decline in quality and extent as a result of sea level rise, particularly where habitats cannot shift inland because of topographical limitations for physical barriers resulting from human development. Species such as shorebirds and forage fish will be harmed, and coastal infrastructure and communities would be at greater risk from coastal storms.
    - Ocean acidification threatens culturally and commercially significant marine species directly affected by changes in ocean chemistry (such as oysters) and those affected by changes in the marine food web (such as Pacific salmon). Northwest coastal waters are among the most acidified worldwide, especially in

spring and summer with coastal upwelling combined with local factors in estuaries.
    - Increasing coastal water temperatures and changing ecological conditions may alter the ranges, types, and abundances of marine species. Warming water in regional estuaries, such as Puget Sound, may contribute to a higher incidedence of harmful blooms of algae linked to paralytic shellfish poisoning, and may result in adverse economic impacts from beach closures affecting recreational harvesting of shellfish. Toxicity of some harmful algae appears to be increased by acidification.
    - Erosion, inundation, and flooding will threaten public and private property along the coast; infrastructure, including wastewater treatment plans; stormwater outfalls, ferry terminals, and coastal road and rail transportation, especially in Puget Sound.
- The combined impacts of increasing wildfire, insect outbreaks, and tree diseases are already causing widespread tree die-off and are virtually certain to cause additional forest mortality by the 2040s and long-term transformation of forest landscapes. Under higher emissions scenarios, extensive conversion of subalpine forests to other forest types is projected by the 2080s.
    - Many impacts will be driven by water deficits, which increase tree stress and mortality, tree vulnerability to insects, and fuel flammability.
    - These changes could have enormous impacts to forest-dependent species.
    - Increased wildfire could exacerbate respiratory and cardiovascular illnesses in nearby populations due to smoke and particulate pollution.
    - Projected forest changes will have moderate economic impacts for the region as a whole, but could significantly affect local timber revenues and bioenergy markets.
- While the agriculture sector's technical ability to adapt to changing conditions can offset some adverse impacts of a changing climate, there remain critical concerns for agriculture with respect to costs of adaptation, development of more climate resilient technologies and management, and availability and timing of water.
    - Northwest agriculture's sensitivity to climate change stems from its dependence on irrigation water, a specific range of temperatures, precipitation, and growing seasons, and the sensitivity of crops to temperature extremes. Projected warming will reduce the availability of irrigation water in snowmelt-fed basins and increase the probability of heat stress to field crops and tree fruit. Some crops will benefit from a longer growing season and / or higher atmospheric carbon dioxide, at least for a few decades. Longer-term consequences are less certain. Changes in plant diseases and pests, and weeds present additional potential risks. Higher average temperatures generally can exacerbate pest pressure through expanded geographic ranges, earlier emergence or arrival and increased numbers of pest generations.

The Urban Systems, Infrastructure, and Vulnerability chapter of this publication had the following key messages:

- Climate change and its impacts threaten the well-being of urban residents in all U.S. regions. Essential infrastructure systems such as water, energy supply, and transportation will increasingly be compromised by interrelated climate change impacts. The nation's

economy, security, and culture all depend on the resilience of urban infrastructure systems.

- In urban settings, climate-related disruptions of services in one infrastructure system will almost always result in disruptions in one or more other infrastructure system.
- Climate vulnerability and adaptive capacity of urban residents and communities are influenced by pronounced social inequalities that reflect age, ethnicity, gender, income, health, and (dis)ability differences.[3]
- City government agencies and organizations have started adaptation plans that focus on infrastructure systems and public health. To be successful, these adaptation efforts require cooperative private sector and governmental activities, but institutions face many barriers to implementing coordinated efforts.

The Land Use and Land Cover Change chapter of the publication states

- Choices about land-use and land-cover patterns have affected and will continue to affect how vulnerable or resilient human communities and ecosystems are to the effects of climate change.
- Land-use and land-cover changes affect local, regional, and global climate processes.
    - Urbanization is having significant local impacts on weather and climate. Land-cover changes associated with urbanization are creating higher air temperatures compared to the surrounding rural area. This is known as the "urban heat island" effect. Urban landscapes are also affecting formation of convective storms and changing the location and amounts of precipitation compared to pre-urbanization.
    - Land-use and land-cover changes are affecting global atmospheric concentrations of greenhouses gases. The impact is expected to be most significant in areas with forest loss or gain, where the amount of carbon that can be transferred from the atmosphere to the land (or from the land to the atmosphere) is modified. Even in relatively un-forested areas, this effect can be significant.
- Individuals, businesses, non-profits, and governments have the capacity to make land-use decisions to adapt to the effects of climate change.
- Choices about land use and land management may provide a means of reducing atmospheric greenhouse gas levels.
    - Such choices can affect the balance of these gases directly, through decisions to preserve or restore carbon in standing vegetation (like forests) and soils, and indirectly, in the form of land-use policies that affect fossil fuel emissions by influencing energy consumption for transportation and in buildings.
    - Land-use decisions in urban areas also present carbon reduction options. Carbon storage in urban areas can reach densities as high as those found in tropical forests, with most of that carbon found in soils, but also in vegetation, landfills,

[3] The 2009 University of Washington Climate Impacts Group impact assessment for Washington State states that "The greater Seattle area in particular can expect substantial mortality during future heat events due to the combination of hotter summers and population growth. Considering just the effects of climate, a medium climate change scenario projects 101 additional deaths among persons aged 45 and above during heat events in 2025. By 2045, approximately a 50% increase in additional deaths could be attributed to climate change; even more excess deaths could be expected if population continued to grow beyond 2025 projections. Nearly half of these are expected to occur among persons 85 years of age and older."
http://www.cses.washington.edu/db/pdf/wacciaexecsummary638.pdf

and the structures and contents of buildings. Urban and suburban areas tend to be net sources of carbon to the atmosphere.

The Adaptation chapter states

- Substantial adaptation planning is occurring in the public and private sectors and at all levels of government; however, few measures have been implemented and those that have appear to be incremental changes.
- Barriers to implementation of adaptation include limited funding, policy and legal impediments, and difficulty in anticipating climate-related changes at local scales.
- There is no "one-size fits all" adaptation, but there are similarities in approaches across regions and sectors. Sharing best practices, learning by doing, and iterative and collaborative processes including stakeholder involvement, can help support progress.
- Climate change adaptation actions often fulfill other societal goals, such as sustainable development, disaster risk reduction, or improvements in quality of life, and can therefore be incorporated into existing decision-making processes.
- Vulnerability to climate change is exacerbated by other stresses such as pollution, habitat fragmentation, and poverty. Adaptation to multiple stresses requires assessment of the composite threats as well as tradeoffs among costs, benefits, and risks of available options.
- The effectiveness of climate change adaptation has seldom been evaluated, because actions have only recently been initiated and comprehensive evaluation metrics do not yet exist.

The publication includes much more information regarding the science behind climate change, the global and national impacts of climate change, as well as mitigation strategies. The Mitigation chapter states that to meet the emissions reductions in the lower impact scenario used in the assessment, annual global CO_2 emissions would need to peak at around 44 billion tons within the next 25 years or so and decline steadily for the rest of the century. At the current rate of emissions growth, the world is on a path to exceed the 44 billion ton level within a decade. Thus achievement of a global emissions path consistent with the lower impact scenario will require strenuous action by all emitters.

C. **2012. *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future.***

The Committee's projections for the west coast of the United States are significantly different from global projections. Off the Washington coast the rates of relative sea-level rise are substantially lower than the global mean. This is due to regional tectonics associated with the Cascadia Subduction Zone and because of local steric contributions, dynamic height differences caused primarily by changes in winds, and the gravitational and deformational effects of modern land ice melting. The Committee projections for Sea-Level Rise relative to Year 2000 for Seattle in cm are

2030		**2050**		**2100**	
Projection	Range	Projection	Range	Projection	Range
6.6 ± 5.6	-3.7 – 22.5	16.6 ± 10.5	-2.5 – 47.8	61.8 ± 29.3	10.0-143.0

Projections converted to inches:

approx. .4 to 5	*approx. 2.4 to 10.7*	*approx. 12.8 to 35.9*

Ranges converted to inches:

approx. -.5 to 8.9	*approx. -1 to 18.8*	*approx. 3.9 to 56.3*

The ranges reflect the fact that uncertainties grow as the projection period increases.

As mean sea-level rises, the incidence of extreme high-sea–level events will become increasingly common. Extreme events can raise sea level much faster than the rates projected by the committee. For example, unusually high sea levels may occur temporarily when major storms coincide with high astronomical tides, and especially during years when regional sea levels are anomalously heightened during El Nino events.

The biggest game changer for future sea level along the west coast is a great Cascadia earthquake. The related coastal subsidence of such an earthquake would, in a matter of minutes, produce significantly higher sea levels off the Cascadia coast than 100 years of climate-driven sea-level rise. A great earthquake could cause 1-2 m of sea-level rise in some areas, which is significantly higher than the committee's projections for Cascadia in 2100. The earthquake-induced sea-level rise would be an addition to the expected global warming-related sea-level rise.

D. Washington State Blue Ribbon Panel on Ocean Acidification (2012): *Ocean Acidification: From Knowledge to Action*

At the current rate of global carbon dioxide emissions, the average acidity of the surface ocean is expected to increase by 100-150% over pre-industrial levels by the end of this century. Acidification along the outer coast of Washington is strongly influenced by coastal upwelling while acidification in shallow estuaries, including those in Puget Sound, may be particularly influenced by inflows of fresh water (which is naturally lower in pH than seawater) carrying nutrients and organic carbon from human and natural sources. The added organic carbon, as well as nutrients that stimulate excessive algal growth, can make seawater more acidic when algae and other organic matter decompose. Many life processes, including photosynthesis, growth, respiration, recruitment, reproduction, and behavior are sensitive to carbon dioxide and pH. As a result, ocean acidification has the potential to affect a wide variety of organisms, from sea grasses to fish, in many different ways. Ocean acidification leads to conditions that are chemically corrosive for shellfish and other calcifiers. Shellfish larvae and juveniles are especially vulnerable.

Washington State will need to respond vigorously to ocean acidification if we are going to avoid significant and possibly irreversible losses to our marine environment and all it supports, including shellfish farming and wild harvest of shellfish and other commercially and culturally

important marine species. Significant reductions in GHG emissions and nutrient and organic carbon inputs are needed to slow ocean acidification.

E. November 2013. *20 Facts about Ocean Acidification.*

Select facts included in this document include

- Reducing nutrient runoff might offset some of the local changes caused by OA, and could increase the overall health of marine ecosystems. But this would buy only a little time, because the root cause of OA is global atmospheric CO_2 emissions.
- Blue carbon is under investigation as a way of locally offsetting CO_2 levels. "Blue carbon" is CO_2 captured from the atmosphere or seawater by salt marshes, mangroves, and seagrass meadows. These environments store it as organic material for decades.
- Geo-engineering proposals that seek just to cool the planet will not address OA, because they do not tackle its cause: excess atmospheric CO_2. Proposals that capture CO_2 and store it away from seawater will mitigate the effects of OA somewhat, but most such proposals are now only cost- or energy-effective on very small scales.

F. Taylor Shellfish Farms Videos

In these videos, Bill Dewey talks about the impact of ocean acidification on growing shellfish in Puget Sound and WA State.

- Acidification: A Growing Threat to Oceans Worldwide
- Ocean Acidification: How are Shellfish and Shellfish Growers Coping.

G. June 2014. ***Risky Business The Economic Risks of Climate Change in the United States: A Climate Risk Assessment for the United States.***

Risky Business Project co-chairs Michael R. Bloomberg, Henry Paulson, and Tom Steyer tasked the Rhodium Group, an economic research firm that specializes in analyzing disruptive global trends, with an independent assessment of the economic risks posed by a changing climate in the U.S. Rhodium convened a research team and also partnered with Risk Management Solutions (RMS), the world's largest catastrophe-modeling company for insurance, reinsurance, and investment management companies around the world. The team leveraged recent advances in climate modeling, econometric research, private sector risk assessment, and scalable cloud computing to provide decision-makers with empirically grounded and spatially-explicit information about the climate risks they face. The research team's work was reviewed by an independent Risky Business Expert Review Panel composed of leading climate scientists and economists. More information is available at http://rhg.com/reports/climate-prospectus and http://riskybusiness.org/.

The research analyzed the risks of "business as usual" to specific critical sectors of the economy and regions of the country. It focused in particular on sectors that are already making large, expensive investments in infrastructure that will likely last well into the future: agriculture, energy, and coastal infrastructure. They also looked at the impact of climate change on America's labor productivity and public health, which influence multiple economic sectors. These latter impacts are also deeply connected to our shared future quality of life.

The assessment looked at not only the most likely outcomes, but also climate futures that have a lower probability of occurring but particularly severe consequences should they come to pass.

Our findings show that, if we continue on our current path, many regions of the U.S. face the prospect of serious economic effects from climate change. However, if we choose a different path – if we act aggressively to both adapt to the changing climate and to mitigate future impacts by reducing carbon emissions – we can significantly reduce our exposure to the worst economic risks from climate change, and also demonstrate global leadership on climate.

The American economy is already beginning to feel the effects of climate change. These impacts will likely grow materially over the next 5 to 25 years and affect the future performance of today's business and investment decisions.

The analysis found that risks vary significantly by region and sector.

Our risk assessment begins with the straightforward fact that human-induced climate change leads to rising temperatures. What matters isn't just the heat, it's the humidity – or in this case, a dangerous combination of the two. One of the most striking findings in our analysis is that increasing heat and humidity in some parts of the country could lead to outside conditions that are literally unbearable to humans, who must maintain a skin temperature below 95°F in order to effectively cool down and avoid fatal heat stroke. The U.S. has never yet seen a day exceeding this threshold, but if we continue on our current climate path, this will change, with residents in the eastern half of the U.S. experiencing 1 such day a year on average by century's end and nearly 13 such days per year into the next century.

As a standard business risk assessment, we looked at the data to see exactly where the greatest risks lie, and confirmed that some regions and economic sectors face extreme and unacceptable risks. These are some of our gravest concerns:

- Rising seas and greater coastal storm damage already threaten the financial value and viability of many properties and infrastructure along the Eastern Seaboard and Gulf Coast. If we stay on our current climate path, some homes and commercial properties with 30-year mortgages in places like Virginia, North Carolina, New Jersey, Alabama, Florida, and Louisiana and elsewhere could quite literally be underwater before the note is paid off.
- Rising temperatures will also reduce labor productivity, as some regions – especially the Southeast and Southwest – become too hot by mid-century for people to work outside during parts of the day.
- Heat will also put strains on our energy system, simultaneously decreasing system efficiency and performance as system operators struggle to cool down facilities, and increasing electricity consumption and costs due to a surge in demand for air conditioning.
- As parts of the nation heat up, the worst health impacts will be felt among the poor – many of whom work or even live outdoors or can't afford air conditioning at home – and among those too elderly or frail to physically withstand the heat or get themselves to air-conditioned facilities.

These impacts won't be contained within regional boundaries; the ripple effects are likely to resonate throughout the economy.

The reality of these impacts, especially in the Southwest and Southeast may also mean that Americans have no choice but to migrate to cooler and more livable areas, disrupting lives, livelihoods, and regional identities formed over generations.

Northwest

- By mid-century … the average Northwest resident will likely go from experiencing only 5 days of 95°F or warmer temperatures per year on average for the past 30 years to an additional 7 to 15 extremely hot days by mid-century, and to an additional 18 to 42 extremely hot days by the end of this century. This represents an increase of 3 to 8 times the number of hot days for the region per year, which is a significant change from historic norms.

- Our research shows that if we stay on our current path, sea level at Seattle will likely rise by 0.6 to 1.0 foot between 2000 and 2050 and by 1.6 to 3.0 feet between 2000 and 2100. Looking out to the tail risks, though, there is a 1-in-100 chance of more than 5.9 feet of sea level rise by 2100 in Seattle.

- The economy of the Northwest is dependent on its coastlines, but it is also heavily dependent on its forests. Oregon and Washington are the number one and two softwood-producing states in the nation, respectively; these two states plus Idaho produce more than $11 billion in primary wood product sales. Our review of existing research suggests the Northwest's forest will experience significant potential impacts from climate change, in particular from wildfire – due to both increased drought and to wood damage from pests surviving warmer winters. One study we reviewed found that if temperatures rise 3.2^{o}F by mid-century, this could lead to 54% increase in the annual area burned in the western U.S. The same study found that the forests of the Pacific Northwest and Rocky Mountains will likely experience the greatest increases in annual burn area (78% and 175%, respectively).

Taking a classic risk assessment approach to climate change in the U.S. leads to the inescapable conclusions that if we continue on our current climate path, the nation faces multiple risks across every region. Our research also shows that if we act today to move onto a different path, we can still avoid many of the worst impacts of climate change, particularly those related to extreme heat. We are fully capable of managing climate risk, just as we manage risk in many other areas of our economy and national security – but only if we start to change our business and public policy decisions today.

There are three general areas of action that can help to minimize the risks U.S. businesses currently face from climate change:

- Business Adaptation – changing everyday business practices to become more resilient. Coastal states and cities are being forced to adapt to climate realities without adequate financial support from the federal government. These public sector adaptation costs will only grow as the private insurance industry continues its exodus from the business of

insuring coastal real estate and the bond market begins to wake up to the vulnerability of key infrastructure investments to climate change.

- Investor Adaptation – incorporating risk assessment into capital expenditures and balance sheets. In 2010 the Securities and Exchange Commission issued interpretive guidance on climate disclosure, giving companies some idea of how to consider their "material" risks from climate change.
- Public Sector Response – instituting policies to mitigate and adapt to climate change. Climate change is a global issue that demands an effective policy response from the U.S. According to the latest IPCC report, the world may have as little as 15 years to "keep planetary warming to a tolerable level," through an aggressive push to bring down carbon emissions. The authors strongly urge the American business community to play an active role in the public discussion around climate mitigation and preparedness, which we believe is the single most effective way for businesses to decrease the risks we have identified in this project.

H. July, 2009 *Unlocking Energy Efficiency in the U.S. Economy*
http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/unlocking_energy_efficiency_in_the_us_economy

This report provides a detailed analysis of the magnitude of the efficiency potential in non-transportation uses of energy, a thorough assessment of the barriers that impede the capture of greater efficiency, and an outline of the practical solutions available to unlock the potential.

The research shows that the US economy has the potential to reduce annual non-transportation energy consumption by roughly 23 percent by 2020, eliminating more than $1.2 trillion in waste—well beyond the $520 billion upfront investment (not including program costs) that would be required. The reduction in energy use would also result in the abatement of 1.1 gigatons of greenhouse-gas emissions annually—the equivalent of taking the entire US fleet of passenger vehicles and light trucks off the roads.

Such energy savings will be possible, however, only if the United States can overcome significant sets of barriers. These barriers are widespread and persistent, and will require an integrated set of solutions to overcome them—including information and education, incentives and financing, codes and standards, and deployment resources well beyond current levels.
In addition to the above central conclusion, five observations will be relevant to a national debate about how best to pursue energy efficiency opportunities of the magnitude identified and within the timeframe considered in this report. Specifically, an overarching strategy would need to:

- Recognize energy efficiency as an important energy resource that can help meet future energy needs while the nation concurrently develops new no- and low-carbon energy sources
- Formulate and launch at both national and regional levels an integrated portfolio of proven, piloted, and emerging approaches to unlock the full potential of energy efficiency
- Identify methods to provide the significant upfront funding required by any plan to capture energy efficiency
- Forge greater alignment between utilities, regulators, government agencies, manufacturers, and energy consumers

- Foster innovation in the development and deployment of next-generation energy-efficiency technologies to ensure ongoing productivity gains

The analysis shows large potential savings in existing building stock. Looking at the residential sector through 2020, the analysis shows a potential nationwide end-use energy savings of 1300 Trillion British Thermal Units (TBTUs) from improvements to existing non-low income housing – a 39% savings - and 610 TBTU's for existing low income housing. This compares with only 320 TBTUs in savings from new housing over the same period. These savings result from available technologies, including sealing HVAC ducts, basement and attic insulation, and programmable thermostats.

Similarly, existing private commercial buildings present an opportunity for end-use savings of 810 TBTU, compared to only 270 TBTU from new private buildings over the same period. Additional opportunities for end use savings included 360 TBTUs for government buildings, 570 TBTUs for office and non-commercial devices, 290 TBTUs for community infrastructure, and 3,650 trillion BTUs for the industrial sector.

II. City of Everett Plans and Actions Related to Reducing Greenhouse Gases and Adapting to the Impacts of Climate Change

The City has taken a variety of actions over the years to document and reduce GHG emissions, and to mitigate or adapt to the impacts of climate change. These include the following:

A. Mayor's Climate Protection Agreement.

In 2006 Mayor Stephanson signed the Mayor's Climate Protection Agreement, committing the City to take the following three actions:

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

Also in 2007 the City joined ICLEI – Local Governments for Sustainability and began its GHG emissions inventory for municipal operations, using ICLEI's Clean Air and Climate Protection software. This was completed in 2007 and presented to City Council in February 2008.

B. Ordinance No. 2995-07 Adopting a Sustainable Building and Infrastructure Policy

In this 2007 Ordinance, the City declared its intent to promote green building practices and low impact development in the design, construction and management of all City-owned facilities. The policies directed city departments to utilize Leadership in Energy and Environmental Design (LEED) criteria to implement green building practices to the maximum extent practicable in the planning, design and construction of all new City capital improvement projects:

- For new City building projects exceeding 5,000 sf, LEED silver certification is required unless the City Council determines it is not practicable or appropriate considering such things as the type of structure, available resources, construction costs, and life-cycle costs.
- For new projects under 5,000 sf and for remodels and renovations where the scope of the project or type of structure limits the ability to achieve LEED silver certification, City departments shall incorporate cost effective green building practices based on estimated life cycle cost analysis and the limits of available funding.

The ordinance also encouraged city staff to budget for and attend sustainable building training and/or obtain LEED accreditation, and to consider LEED accreditation, experience and abilities when hiring consultants.

And the ordinance directed the city to encourage the use of LEED, green building practices and low impact development in private development projects through land use regulations, building codes, and development standards.

The City's new Municipal Court building was awarded a LEED Silver Certificate.

C. City of Everett Comprehensive Plan and Implementing Regulations

Vehicular emissions are a large portion of the GHG emissions in the Northwest. For example, Seattle's Climate Action Plan states that road transportation is Seattle's largest source of GHG emissions, comprising approximately 40% of 2008 community emissions.[4] In the city of Shoreline 2012 vehicle emissions were 53% of the community's total GHG emissions.[5] Land use patterns and transportation systems can have a large impact on a community's GHG emissions. Numerous studies have come to the same conclusion: the higher a city's density is, the lower its per capita carbon emissions will be.[6] A dense, compact pattern with mixed-uses that support walking, bicycling, and transit use with open space conservation helps reduce energy consumption. One study stated "it is reasonable to assume an average reduction in vehicle miles travelled per capita with compact development relative to sprawl of three tenths;" and that "Compact development has the potential to reduce U.S. transportation CO_2 emissions by 7 to 10 percent, when compared to continuing urban sprawl." [7]

The **Land Use Element** of the Comprehensive Plan encourages concentrated development in designated locations in activity centers, such as the downtown, and in mixed use corridors with a focus on land use strategies that include requiring transit compatible development in and near transit corridors, and improving the street system to encourage walking and bicycling for both recreational and travel purposes. Detailed subarea plans were developed for transit oriented areas and corridors, including the Everett Station Area, Downtown, Broadway north of 41st Street, the Core Residential areas around the downtown, and Evergreen Way. The Evergreen Way plan was highly coordinated with Community Transit and their Bus Rapid Transit (BRT) stations.

The overall objective of the **Transportation Element** of the Comprehensive Plan is to provide a balanced transportation system that controls the sprawl of urban land uses and encourages alternative means of travel to the single occupant vehicle (SOV) particularly during peak hour commute periods. The most visionary aspect of the original 1994 GMA Transportation Element plan was to include "mode of travel" targets for each of 6 subareas for SOV, transit, carpool, pedestrians/bike and substitute modes. This element was reinforced in the 2006 Update to the Plan. The Plan also adopts a position in its concurrency provision that congested levels of vehicular traffic would need to be accepted in the peak commute hours of travel if the overall goal of reducing SOV travel is to be attained.

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[4] City of Seattle Climate Action Plan.
[5] City of Shoreline Website
[6] Oregon Transportation and Growth Management Program. Cool Planning: A handbook on Local Strategies to Slow Climate Change.
[7] Urban Land Institute , *Growing Cooler: The Evidence on Urban Development and Climate Change*, October 2008.

The Plan includes a Non-motorized (Trail) Sub-Element, and incorporates by reference a Shoreline Public Access Plan (2003) and a Bicycle Master Plan (2011).

In 2008, City Council adopted Resolution No. 6016 recognizing the City's adoption of the Complete Streets Program. "Complete Streets" is a nationally recognized program promoting policies intended to accommodate and enable safe access for all right of way users and further promoting the safe movement along and across street corridors for pedestrians, bicyclists, and transit riders of all ages and varying abilities. The Resolution found that the Complete Streets program principles have been incorporated into the Transportation Element of the Comprehensive Plan and "consistent with this, the City will plan, design, maintain and operate the City's transportation system consistent with the goals, policies and objectives of the Transportation Element of the Comprehensive Plan with regard to fulfilling the incorporated Complete Street policy goals."

The **Capital Facilities and Utilities Element** of the Comprehensive Plan includes a Conservation Goal that promotes conservation of utility resources. Policies direct the City to facilitate the conversion to cost-effective and environmentally sensitive alternative technologies and energy sources, as well as to set goals and timelines for reduction of electric energy consumption within City-owned facilities, and implement measures to achieve those goals.

D. City of Everett Climate Action Plan for Municipal Operations 2011

In 2009 the City received a $1.4 million Energy Efficiency and Conservation Block Grant from the US Department of Energy that was used to fund a variety of energy efficiency projects, as well as ICLEI Membership and preparation of the City of Everett Climate Action Plan for Municipal Operations. The energy efficiency projects are addressed separately later in this document.

In 2010 the City retained ICLEI to update the GHG inventory with a newer version of ICLEI's software and prepare the plan. The GHG inventory used 2001 as the baseline year, and 2006 as an interim year, for reference. GHG emissions were modeled for buildings and facilities, street lights and traffic signals, employee commute, vehicle fleet, solid waste facilities, water delivery facilities, and transit. Emissions were also modeled for the wastewater treatment plant in 2006, but information was not available for 2001. Excluding the wastewater treatment plant, emissions increased 2.5 percent from 2001 to 2006. The largest contributors to emissions were electricity used in buildings and to move and deliver drinking water, and the gasoline and diesel fuel used for the municipal feet, which includes Everett Transit buses. 2006 GHG emissions were 27,130 metric tons carbon dioxide equivalent ($MTCO_2e$)

GHG emissions did not go up for all sectors analyzed. Water delivery facility emissions actually decreased 16% from 2001 to 2006, likely due to water efficiency and conservation practices implemented as part of the City's 2001 Comprehensive Water Plan. The biggest increases were from Employee commute, which rose 30% and Transit, which rose by just under 40%.

The Plan identifies programs and policies to reduce GHG emissions from municipal operations. These are grouped into three categories of activities or measures: existing measures that the City has already begun implementing, measures that build and expand on the work to reduce GHG emissions the City has already begun, and entirely new measures. Measures were analyzed from the following City departments or divisions: Facilities, Fire, Motor Vehicles, Parks and Recreation, Police, Public Works, and Transit. A wide variety of measures were identified such as high efficiency lighting, HVAC and lighting retrofits, purchase of hybrid vehicles, water filtration plant pump replacement, boiler replacement, swim center pool cover, green purchasing, waste reduction, water pollution control facility anaerobic digester, and increased bicycle and motorcycle police operations. If all of the measures identified in the plan were implemented the city's annual operational emissions would decrease by 40% in 2030 compared to taking no actions.

The plan does not address greenhouse gas emissions for the community at large, but only those related to government operations. Municipal operations emissions generally account for between 2 – 10% of the total emissions profile for a City. Since the government provides services for the broader community, it may increase emissions in a manner that should result in lower emissions for the community as a whole. For example an increase in transit services will result in larger emissions from municipal operations, but should provide more efficient service than large numbers of people driving alone and reduce the community's overall emissions.

E. City of Everett Hazard Inventory and Vulnerability Analysis (July 2011) and City of Hazard Mitigation Plan (August 2011, Approved September 10, 2012)

The 2011 *City of Everett Hazard Inventory and Vulnerability Analysis* and *Hazard Management Plan* updated a 2006 Plan. The 2011 Analysis and Plan added two new hazards: pandemics and climate change, which were ranked number 3 and 4 respectively out of 10 hazards. Severe storms ranked 2 out of 10, up from a ranking of 6 in 2006. [Other hazards and their 2011 rankings are earthquakes (1), fire (5), flooding (6), hazardous materials (7), landslides (8), tsunami & seiche (9), and volcanic eruptions (10).]

The Assessment's section on Climate Change includes a good basic description of climate change and its potential impacts to the Everett area. It is Section III of this document.

The Hazard Inventory and Vulnerability Analysis section on Severe Storms states that

> Severe storms are likely to become more frequent as the impacts of climate change increase the probability of extreme weather events. As the events become more powerful and more frequent, mitigation efforts to reduce the risks they pose will also become more complex and more expensive. Secondary hazards to severe local storms include flooding, landslides, and electrical hazards, which may cause downed power lines. Other services such as water or phone may not be able to operate without power.

The Analysis's section on Pandemics states,

> In some areas, global climate change has the potential to increase the frequency and severity of epidemic and pandemic disease. In the cases of zoonotic

> transmission, when a disease spreads from animals to humans, a changing climate and changing landscape means that humans are coming into contact with wildlife, insects, and other creatures that have moved closer to human settlements. Warmer climates are more hospitable to insects like mosquitoes, which can carry malaria, the West Nile Virus, and other illnesses. Deforestation and other forms of habitat destruction force the creatures that lost their habitat into closer contact with humans. Movement of climate change "refugees" may increase population density, which in turn leads to closer human contact and can contribute to unsanitary conditions. ….dense and/or unsanitary living conditions increase the risk of disease transmissions.

The Analysis's section on Flooding states,

> Climate change is impacting the timing, frequency, and severity of flooding worldwide. In the Pacific Northwest, early spring flooding may be reduced due to smaller snowpack, but later spring flooding may occur more often due to earlier snowmelt. And
>
> Annual discharges may not change with climate change, but the frequency of intense winter storms will. There will be more heavy rains and onshore surf. Upland forests will be stressed and die-offs may occur reducing storage and increasing the rate of discharge.

The Analysis identifies a wide variety of impacts of Climate Change on property, critical infrastructure, public health, the environment, and the economy.

The purpose of the *Hazard Mitigation Plan* is to provide concrete strategies that Everett can use to increase its hazard resilience. It is based on the *Hazard Inventory and Vulnerability Analysis*. A large variety of mitigation measures are identified ranging from measures to develop neighborhood networks, Port preparedness, supporting local business, enhancing communications, education and outreach, environmental sustainability, addressing isolation / transportation, and the built environment / vulnerable structures. Some of the mitigation measures related to climate change include

- Complete a study to determine Everett's greenhouse gas emissions, and implement reasonable goals for greenhouse emissions reduction. The responsible agency for the action is identified as the Facilities Department. The action would elaborate on the study of municipal emissions existing to include private industry and individual activities in Everett. Emissions reductions targets set out by the US Conference of Mayors, to which Everett is signatory city, should be adopted as regulations. Consideration should be given to ways to improve the efficiency of power usage as a method of emissions reduction. Partner with businesses in Everett to examine incentives to reduce GHG emissions.
- Monitor Everett's capacity to address increases in magnitude and frequency of severe weather events. Complete a study on the capabilities of the city to deal with severe weather events that occur with a 30% greater frequency. This would include street cleaning equipment, salt, sandbags, and whatever other supplies are used to in a severe

storm. The OEM will continue to monitor the city's preparedness for increasing severe weather events after the initial determination of readiness.

- Provide a vegetated river walk along the coastal floodplain. The coastal floodplain provides an opportunity for residents and visitors to enjoy the shore. This corridor could also enhance natural riparian corridor values and be designed to meet the intent of the NMFS 2008 Biological Opinion.
- Enable city officials to text during an emergency.
- Create targeted information and services for non-English language groups
- Increase the modes and amount of communication to residents on preparedness topics and emergency alert systems.
- Create a system for businesses on which they can update their operations status and available supplies after a disaster.
- Work with local businesses to disseminate emergency information and supplies to residents.
- Map possible sea level rise and monitor it near the Port of Everett. Set up a monitoring station to track sea level rise changes. Create maps based on projected sea level rise to see which areas are likely to be threatened. The responsible agency was identified as the Port of Everett.

F. EMC Chapter 46.68 Commute Trip Reduction 1998, updated 2010

The purpose of the Commute Trip Reduction Ordinance is to comply with the statewide Commute Trip Reduction (CTR) Law of 1991 and the CTR Efficiency Act of 2006. The ordinance requires all employers with 100 or more full-time employees who arrive at a worksite between 6 a.m. and 9 a.m. on weekdays to adopt a commute trip reduction plan that achieves the goals in the City's Plan to reduce the percentage of drive-alone commute trips and vehicle miles traveled by employees.

Everett Transit receives funds from the WA State Department of Transportation to help affected employers in the City of Everett meet their commute trip reduction goals. Everett Transit provides training, guidance, and support to employers in designing and implementing their own CTR programs, to ensure that they are in compliance with the State's CTR Law and City's CTR Ordinance.

The City's Rideshare Program for City employees ("Smart Move") provides incentives to encourage the use of public transit, carpooling, vanpooling, biking, and walking for commuting to work. Public transportation subsidies include the ORCA passport card (all-inclusive regional bus and train PugetPass), ORCA choice card (up to $72 value PugetPass), or specific agency passes of up to $72 in value (Skagit Transit), depending on the employee's eligibility. Employees who vanpool receive a $72 monthly subsidy toward their vanpool costs, and employees who carpool, bike or walk receive $15 a month. Additional participant benefits include preferential carpool parking, emergency taxi trips, and participation in regional and state promotions. All employees have access to assistance with carpool/vanpool ride matching and transit trip planning.

G. Compressed Work Week / Work Schedule Adjustments

Approximately 360 full-time City employees work a compressed schedule, rather than the standard 5 day week. This results in a reduction in GHG emissions from employees commuting to and from work. The Fire Department alone saves 212 metric tons of CO_2 per year by encouraging office personnel to utilize 4-day work weeks and by adjusting the work schedule of all employees in fire suppression.

H. Department of Energy Grant

In 2009 the City received a $1.4 million Energy Efficiency and Conservation Block Grant from the US Department of Energy that was used to fund the Local Climate Action Plan for Municipal Operations discussed above, as well as the following energy efficiency projects:

- Community Housing Improvement Program (CHIP) Weatherization revolving fund. A $100,000 revolving weatherization fund will be used for projects such as replacing windows and insulating uninsulated walls, ceilings, water pipes and floors. The first project funded was replacement of the windows on the 40 unit Commerce Building on Hewitt Ave. As the loan is repaid, additional weatherization work will occur.
- HVAC Replacement systems in City buildings, including the Police headquarters, Public Works Service Center,
- Lighting upgrades at the Performing Arts Theatre, EverPark parking garage, Main Library, Motor Vehicles, Panama Building, Car Wash, and at Kasch, Langus, Rotary, Walter E. Hall, Hauge Homestead and TA Sullivan Parks
- Pump replacement at the Waste Water Treatment Plant
- Purchase of 35 BigBelly solar powered trash compactors to reduce trash collecting driving time and fuel use. (Parks had purchased nine prior to the grant and knew they were efficient and effective. They have since acquired a few more as part of projects such as the Theater Plaza and one or two at a time through their annual budget. They now have about 50.)
- Community Energy Challenge. Snohomish County PUD #1 used $200,000 from the City grant for subcontractor services and equipment to implement energy efficiency direct-install activities in multi-family complexes in the Casino Road community. Direct Install measures include CFLs, energy efficient light fixtures, low-flow showerheads and faucet aerators, as well as a small number of thermostats and smart power strips. The PUD's Community Power! Program used the free in-unit Direct Install funded by the City's EECBG contribution as an enticement to encourage participation in shell and common area retrofits that carried an owner's investment. While the City's contribution did not directly fund these projects, the PUD considers the resulting energy savings a "spill-over" effect of the funding because it is unlikely the projects would have occurred had it not been for the Direct Install. The "spill-over" projects included window, insulation and lighting retrofits in 5 multiple family complexes in the Casino Road community.

I. Department of Commerce Energy Grants

Post EECBG projects, the State of Washington legislature in 2012 established a Department of Commerce Energy Efficiency grant program. The program consisted of three rounds so far. The City has been successful in obtaining grants in all three rounds totaling over $1.8 million dollars. The funding for the first two grants was used for projects to reduce energy usage at Fire Station #1, the Main and Evergreen Branch Libraries, Culmback Building, Senior Center, Wall Street Building, Police Headquarters and Everett Performing Arts Building. Projects included adding insulation, replacing a roof, HVAC upgrades, replacing rooftop units, adding an air intake, and retrofitting catalyst controls on a heating system.

The third grant of approximately $500,000 will be used to replace High Pressure Sodium (HPS) street light fixtures with energy efficient LED fixtures. The City is also getting low interest loans to fund the majority of the project.

J. Parks Department

Wading Pool Cover
An insulating blanket covers the outdoor wading pool at the Forest Park Swim Center at night, reducing CO_2 emissions by 3 metric tons per year.

Lighting
The Parks Department is in a multi-year process to exchange out incandescent light bulbs to LEDs through their annual budgeting process.

New Boiler
Parks replaced the boiler system at the American Legion Park greenhouses in 2010. That sealed combustion boiler was replaced with a condensing boiler, reducing CO_2 emissions by 17 metric tons of CO_2 per year.

K. Facilties Department Lighting

In addition to the EECBG lighting retrofits, Facilities has instituted an extensive relighting program that replaces Metal Halide fixtures that burn at 400+ watts with T-5 or T-8 fixtures that burn at 24 to 35 watts per lamp

L. Fire Department

Building Upgrades
The 2011 Climate Action Plan for Municipal Operations states that the Fire Department was in the process of a series of energy efficiency upgrades to its administration building and 6 fire stations. Upgrades include new energy efficient windows and a more efficient HVAC system.

M. Carl Gipson Senior Center

Solar Power**.** In 2011, the Snohomish County PUD Planet Power program, which funds solar projects at schools and public buildings, and Bonneville Environmental Foundation (BEF) paid for installation of a solar power demonstration project at the Carl Gipson Senior Center. 16 solar panels were installed on the south side of the building The solar array provides power to the center's computer lab and two Wii tournament stations. The 4 kW array is located on the center's south-facing parapet wall and is visible from the nearby bus stop and sidewalk. The array also features an interactive kiosk, which is located in the senior center's multi-purpose room and displays the real-time system data, weather data, and information about our regional renewable energy resources. Energy production and carbon dioxide emissions avoided can be viewed at http://www.solar4rschools.org/schools/carl-gipson-senior-center. As of 8/12/2014 the panels generated 11,041.5 kilowatt hours of power and kept 15,441 pounds of CO_2 greenhouse gasses out of the atmosphere.

Kitchen Expansion / Food Waste Recycling**.** In 2010, a major Federal grant helped complete a 2,000 square feet expansion to the kitchen. Energy efficient appliances were installed including a dishwasher/sanitizer, a hot hold oven, a steamer, and an oven and grill. In 2013 an energy efficient washing machine was purchased.

The 2010 expansion project also added new energy efficient windows in the MPR East room, as well as a quarter million dollars' worth of sprinkler systems. The sprinkler system would reduce emissions significantly in case of a fire.

The Senior Center partners with Senior Services of Snohomish County's green program. Food waste is recycled daily in compostable bags. Paper and aluminum cans are also recycled.

Light bulbs. All of the light bulbs in the Center have been replaced with energy efficient bulbs, partially through a PUD program for LED bulbs, that requires future replacement bulbs to be LED.

Transit. Many of the Senior center members are aging in place and have traded in their autos for para transit and the bus. The Senior Center regularly hosts Everett Transit outreach events, and they are a base site for scheduling Ride Around the Sound trips to teach seniors how to use the bus system to get around various counties.

Window Replacements. The Center is currently in the process of replacing three windows in their Sun Room that have broken seals.

N. Vehicle Replacements / Operations

Everett Transit replaced 10 heavy duty diesel buses with 10 diesel-electric hybrid buses, and replaced three gas vehicles with three all electric vehicles for short trips around town, Everett Station and the bus yards.

Everett Transit's partnership with Community Transit for Swift BRT has introduced another line of diesel-electric hybrid buses on Evergreen Way and reduces trips by more than 3,000 daily.

Parks Department purchased an electric truck for flower basket watering throughout the city, and instituted a department vehicle idling policy in the spring of 2014.

In the last 10 years (2004 and up) Motor Vehicles purchased

- 7 Toyota Prius Hybrids
- 10 Ford Escape Hybrids
- 5 Ford Escapes (new model) with turbocharged 4-cylinder engines yielding same MPG as some hybrids
- 15 V6 powered Ford Police Patrol Utilities with better MPG
- 9 Ford Fusion hybrid sedans for the Police Department (due in September 2014)

Motor Vehicles switched engine oil to 5W-30 for better MPG and will be adding 5W-20 oil as well shortly. They also went back to re-refined motor oil for both gas and diesel motors saving crude oil.

The City uses a biodiesel blend (95% diesel, 5% biodiesel) that results in an annual reduction of 233.45 metric tons of CO_2.

Motor Vehicles tries to "right-size" everything purchased, or at least tries to buy smaller, more efficient units when it makes sense. They also purchase hybrid and electric powered vehicles, trucks, and construction machinery when financially possible.

Motor Vehicles provided Parks and Utilities with guidelines for reducing idling. Both Parks and Utilities have established department policies to reduce idling. In an effort to at least help heavy equipment idling, Motor Vehicles also plans to order an auxiliary diesel fired heater on a rubber tired loader in 2015. The unit will keep the cab warm without running the main engine. Someday, these loaders will have a hybrid option as well. Some manufacturers have hybrid options now, but only on the larger size machines, not the size the city will purchase.

O. Building Code

The City adopts the revised Washington State Energy code every three years. The Energy Code follows national standards with Washington State amendments and is under constant research and revision. The Energy Code continues to require higher energy efficiency within buildings (envelope, lighting and mechanical systems) with each update, and higher energy efficiency standards are anticipated with each 3-year update for the next several code cycles. The State Energy Codes adopted from 2013 through 2031 must incrementally move towards achieving a 70% reduction in annual net energy consumption for new residential and commercial buildings by 2031. Energy cost savings for Washington State resulting from the 2012 state update of the commercial and residential building energy codes are estimated to be on the order of nearly $380

million annually by 2030.[8] Buildings constructed today are significantly more efficient than those constructed even 15 years ago.

P. Tree / Forest Programs[9]

Urban forests are disappearing and with them go services such as reduction of stormwater runoff and absorption of particulates, and other air pollutants, including greenhouse gases. Trees capture carbon dioxide through the process of photosynthesis and help remove soot and other pollutants through their leaves and branches. They store the carbon from the absorbed carbon dioxide in the woody mass of their branches and trunks, and release oxygen into the air. Each acre of healthy, mature Western Washington forest could be responsible for the storage of more than 300 tons of carbon, which translates to the removal of more than 1,100 tons of carbon dioxide from the atmosphere (approximately the carbon dioxide emissions of 215 vehicles). One large healthy tree can absorb 75 percent of the carbon dioxide produced by the average car. Trees that shade city streets are 15 times more effective in reducing carbon dioxide buildup than trees in rural areas.

A mature tree canopy reduces surrounding air temperatures by 5-10 degrees and can create microclimates conducive to air movement. A 25-foot tree reduces annual heating and cooling costs of a typical residence by an average of 8-12% (University of Washington 1998).[10] Lowering energy consumption reduces electricity use and the amount of carbon dioxide emitted into the atmosphere from power plants.

- **City Street Tree Program**
  In 1993, Everett adopted a Public Tree Policy and a Public Tree Management Ordinance. The ordinance authorized a Tree Committee, a subcommittee of the board of Park Commissioners. Goals of the committee include increasing the urban forest canopy on city-owned lands, optimizing species diversity, and using native trees and understory plants where appropriate.

  The Everett Parks and Recreation Department manages urban forests within the city park system and other areas as assigned, including city gateways and downtown corridors. The Public Works Department manages the urban forest within developed and undeveloped right-of-ways and open spaces. They also assist property owners in managing the trees within right-of-ways and partner with neighborhoods to manage free street tree planting programs. From 2000 – 2013, 10,849 trees were planted by both departments. Both departments have also removed trees over the years that are mostly wind-downed or categorized as hazardous trees. The City's policy is to replace trees at a

[8] U.S. Department of Energy web site: https://www.energycodes.gov/adoption/states/washington

[9] Information taken from *Green Everett Partnership 20-Year Forest Management Plan*, March 2013 and *2013 State of the Urban Forest Annual Report* presented to the City of Everett Board of Park Commissioners March 2014 by the Everett Tree Committee.

[10] Another study states that asphalt and concrete streets and parking lots are known to increase urban temperatures 3-7 degrees. These temperature increases significantly impact energy costs to homeowners and consumers. A properly shaded neighborhood, mostly from urban street trees, can reduce energy bills for a household from 15-35%. (Dan Burden, Senior Urban Designer, Glatting Jackson and Walkable Communities, Inc., 22 Benefits of Urban Street Trees May, 2006 at http://mainstreetmountjoy.com/documents/22BenefitsofUrbanStreetTrees_000.pdf)

2 to 1 ratio. The number of trees removed is unknown prior to 2011, but from 2011-2013, 2,598 more trees were planted than removed.

The Tree Committee's 2013 State of the Urban Forest Annual Report to the Board of Park Commissioners included a variety of recommendations to increase, protect and manage the City's tree canopy.

- **Green Everett Partnership 20-Year Forest Management Plan, March 2013**
  The City of Everett and Forterra developed a coordinated restoration and stewardship program - a 20-year Forest Management Plan. The Plan aims to bring 354 acres of Everett's forested parkland into active management during the next 20 years. Everett's forestlands face a variety of threats, including fragmentation, declining canopy, invasive-dominated understory, and native trees struggling to regenerate. Without intervention there will be a significant decline in tree canopy in the near future. The plan provides for controlling invasive species, planting native species, including developing a long-lived forest canopy with conifers, maintenance and monitoring.

Q. Comprehensive Water Plans

Modeling Impacts of Climate Change. Everett's 2007 Comprehensive Water Plan Appendix 6-2 included an evaluation of the potential impacts of global climate change on the watershed yield for Everett's municipal water supply system. Water system modeling was combined with simulated streamflow data developed using down-scaled data from global circulation models to determine the potential impacts of climate change on water supply, hydropower generation, transmission infrastructure, and reservoir storage. The Climate Impacts Group at the University of Washington developed climate change forecasts for 2050 and 2100 based on global climate models developed for the Fourth Intergovernmental Panel on Climate Change (IPCC) Assessment. From the 10 available modeled climate scenarios, three indicator simulations were selected for the analysis. The baseline 2000 forecast model used the average global climate warming scenario, the pessimistic forecasts were the highest global climate warming scenario, and the optimistic forecast was the lowest global climate warming scenario.

The pessimistic forecasts result in more runoff to the Sultan River and a change in the seasonal flow pattern, with greater streamflows in the fall and winter, lower snowpack in the winter and spring, and decreased streamflows in the spring and summer. During the fall and winter months, average daily streamflow could increase significantly compared to historic flows. In November, both the 2050 and 2100 forecasts result in an average daily flow that is approximately 30% higher than historic flows.

The optimistic streamflow forecasts more closely follow observed historical trends by average monthly flows, but result in 12% less Sultan River water volumes in 2050 and 14 percent less water, on average in 2100.

The modeling looked at safe yields under three operational scenarios. Safe yield is the quantity of water that can be extracted from a source at specified demand levels and seasonal variations while still meeting the supply reliability standard, instream flow requirements, and other system

constraints. Regardless of the scenario or whether the forecast reflected best or worst case climate change conditions, safe yield decreased in comparison to the baseline 2000 safe yield. This occurs even though the pessimistic forecasts are associated with higher flows in the Sultan River, since the increase inflows occur at a time during which they cannot be stored, and the late spring and summer flows decrease significantly.

The City is in the process of updating the Comprehensive Water Plan. The September 2014 Draft Addendum to the 2007 Comprehensive Water Plan used the same climate change assumptions as the 2007 Plan and concluded the projected 2100 average and instantaneous water demands are satisfied by existing water rights. A yield analysis concluded that climate change has the potential to reduce Everett's safe yield by about 10 percent.[11]

Water Conservation Programs. Everett's water conservation program began in the early 1980's and was significantly expanded in 2000, following rigorous analysis of 20 potential demand-side measures as part of the 2000 Comprehensive Water Plan. For Everett's 2007 Comprehensive Water Plan, nearly 30 demand-side measures were analyzed. Based on this analysis, a revised water conservation program was implemented in 2007 that was designed to save 1.97 million gallons per day (MGD) by the end of 2012. Conservation measures implemented included a wide variety of measures, such as installing meters, customer assistance, education, leak detection, water conservation demonstration gardens, toilet and clothes washer rebates, indoor and outdoor conservation kits, and providing reclaimed water to Kimberly Clark. As of the end of 2013, it is estimated that these measures collectively saved about 2.3 MGD.[12] Savings also resulted from changes to the plumbing code. The City's 2011 *Climate Action Plan for Municipal Operations* estimates that implementation of conservation programs in the 2000 plan reduced CO_2 emissions by 578 metric tons per year, with an increase to 1,014 metric tons per year once the additional savings expected by 2012 were accounted for. Savings resulted from decreased energy usage at the Water Filtration Plant, Water Pollution Control Facility, and pumping lift stations.

The September 2014 Draft Addendum to the 2007 Comprehensive Water Plan states that the regional conservation program planned for 2014-2019 is expected to save 0.8 MGD 2014 and achieve cumulative savings of 2.03 MGD by 2019. Measures include education, indoor and outdoor conservation kits and watering timers, commercial indoor and outdoor audits, and other incentives and miscellaneous measures to be evaluated on an individual bases over the next 6 years. In addition, changes to the plumbing code are expected to result in savings of 1.44 MGD by 2010. This should result in a reduction in Everett's energy usage similar to the 2007 water conservation program.

R. Comprehensive Sewer Plan

As part of Everett's *2012/2014 Comprehensive Sewer Plan* update, consultants modeled rainfall for use in assessing the adequacy of stormwater and combined sewer systems. To account for climate change to a year 2100 planning horizon, rainfall volumes were readjusted upward by 9 percent in the winter months (Dec-Mar), 13.5% in transition months (Oct-Nov, Apr-May) and 18

[11] The September 2014 Draft City of Everett 2014 Addendum to the 2007 Comprehensive Water Plan, page ES-7
[12] The September 2014 Draft City of Everett 2014 Addendum to the 2007 Comprehensive Water Plan, Section 5.5

percent during the summer months (Jun-Sep). These adjustments were based on review of simulations from various climate models conducted by the University of Washington Climate Impacts Group. Interim adjustments were provided for the 30-year and 50-year planning horizon. For example the 30 year adjustments ranged from 3% for the winter months to 6% for the summer months.

S. Let it Rain Green Stormwater Infrastructure (GSI) Program

In recent years Everett has been experiencing, along with other regional municipalities, more frequent extreme storm events that have been predicted by climate scientists due to global climate change. During these hydrologic weather microburst events, stormwater can back up and flood homes, and cause combined sewer overflows. These events also erode hillsides and urban stream banks. As a result of these frequent hydrologic weather microburst events the Everett Public Works Department has convened a Green Stormwater Team and is implementing a Green Infrastructure program to help homeowners use methods that slow, spread, filter and return stormwater into the ground instead of the municipal sewer system. Current programs include public education, training, rain barrel sales and rain barrel retrofit workshops. Additional programs include rain garden design workshops and rebates for homeowners who successfully construct rain gardens in the North Everett combined sewer area. Additional workshops and rain garden workshops will continue into 2015.

The City also recently adopted requirements for installation of backwater valves in the combined sewer system areas of north Everett with rebates provided by the City. The City is also separating stormwater from the sewer system in portions of north Everett.

T. Surface Water Comprehensive Plan

The City is in the process of updating the *Surface Water Comprehensive Plan* (previously the Drainage Basins Plans). For the Plan a single runoff correction factor was used to account for both expected future development and future climate change precipitation expected in the year 2100. This factor was applied to the stormwater runoff simulated using historic precipitation records in conjunction with the existing land use.

The future, year 2100 climate change precipitation that was used for the initial explicit modeling is the same as that used for the Everett Sewer Comprehensive Plan. To account for climate change to a year 2100 planning horizon, rainfall volumes were readjusted upward by 9% in the winter months (Dec.-Mar.), 13.5% in transition months (Oct.-Nov., Apr.-May) and 18% during the summer months (Jun.-Sept.). These adjustments were based on a review of simulations from various climate models conducted by the University of Washington Climate Impacts Group.

The runoff correction factor is based on future scenario modeling efforts completed for sub-basins in the Port Gardner Bay Watershed Basins and North Creek basin. A comparison of runoff rates from the existing and future scenarios were evaluated to calculate a correction factor. The comparison of existing and future stormwater flows revealed that an increase of 45 percent from existing storm flows accounted for 90 percent and 84 percent of the 2- and 25-year future storm events, respectively, for the Port Gardner Bay Watershed Basins; and 97 and 94 percent of the 2-

and 25-year future storm events, respectively, for the North Creek basin. Although a 45 percent correction factor results in conservative peak flow values for some sub-basins, increases in flow rate do not result in an equivalent increase in project cost; the factor is therefore an appropriate safety factor to use to estimate future flow rates in the Surface Water Comprehensive Plan.

U. Recycling / Waste Reduction / Composting

Significant GHG emissions can be avoided by waste reduction, sustainable product design, recycling, and composting. Designing and using products sustainably, recycling products at the end of their useful life, and composting organic material are critical waste management strategies that reduce emissions. For example,

- Using recycled materials rather than raw materials to create new products results in substantially fewer emissions during production. Thus, recycling products at the end of their useful life avoids emissions for the next generation of products.
- Composting organic waste builds healthy soil and plants, which serve as reservoirs for carbon that would otherwise result in GHG emissions in the atmosphere.[13,14]

Solid waste management is covered by a wide variety of laws that address recycling, composting and waste reduction. Perhaps the most significant was the 1989 Waste Not Washington Act that stated

- Waste reduction and source separation must become fundamental strategies for solid waste management.
- It is the responsibility of county and city governments to develop and implement aggressive and effective waste reduction and source separation strategies. Steps should be taken to make recycling affordable and convenient to the rate payer.
- All government entities in the state should set an example by implementing aggressive waste reduction and recycling programs at their workplaces and by purchasing products that are made from recycled materials and are recyclable.

<u>1988 - 1995</u>[15]

In April 1988, City Council passed Resolution 2994 that directed the Mayor to prepare a municipal solid waste management plan for the City of Everett. The plan was to include the state mandated plan elements and address waste reduction and recycling programs. In 1988 the City conducted a pilot recycling study and found that the greatest participation and material recovery rates occurred with weekly residential collection. An October 1990 Solid Waste Management Plan was adopted as an element of a joint City of Everett-Snohomish County plan, and was approved by Ecology in 1991.

Implementation of Everett's Plan was completed by a City contractor, working with City and Snohomish County staff. The Plan developed several waste reduction program

[13] Seattle Climate Action Plan, June 2013, page 44.

[14] The US EPA developed a Waste Reduction Model (WARM) that shows increased recycling creates very substantial benefits in terms of reduced GHG emissions. Snohomish County Climate Change Technical Memorandum for Snohomish County Comprehensive Solid and Hazardous Waste Management Plan, Final Draft 2013.

[15] 1995 Amendment to the City of Everett Solid Waste Management Plan.

recommendations with the goal of achieving a 3 to 5 percent reduction in waste generation. By 1995, waste audits of local public buildings and waste reduction and recycling audits of approximately 700 local businesses had been completed. The Plan also had a goal of achieving 35% recycling rate by 1994. By 1995, a curbside collection program for secondary and yard waste for all single-family through fourplex dwellings was established; a commercial recycling program that included on-site audits, education and promotion had been implemented; and preparations were made for implementation of a multifamily program in 1995. The City had also initiated yard waste and sewage sludge co-composting at a facility adjacent to the Water Pollution Control Facility.

In 1993, City Council adopted a procurement policy promoting the use of recycled and recyclable products by the City. The purpose of the policy is to promote the development of markets for recycled products by establishing preferential purchase programs that are applicable to City departments and contractors. Also in 1993, the City began a comprehensive internal recycling program for all City departments. Today, that program alone diverts approximately 100 tons per year of recyclable materials.

<u>1995 – present</u>
In 1995 the City adopted an Amendment to the Solid Waste Management Plan. The recommended waste reduction program included

- A smart shopper campaign to encourage consumers to purchase products with less packaging and to reuse certain products .
- A buy recycled campaign to develop a source guide and build a display promoting the purchase of products manufactured with recycled materials.
- Workshops for Everett School District teachers to implement kindergarten through 12th grade waste management curricula.
- Technical assistance for businesses
- Variable can garbage collection rates
- In-house waste reduction strategies
- Awards for achieving a high level of waste reduction
- Continuation of the City's policy of providing a maximum 10% price preference for materials and supplies that are manufactured with recycled materials.

The recommended recycling program included

- Promoting residential recycling through an annual mailing, periodic utility bill inserts, a telephone resource line and awards
- Promoting business recycling by technical assistance to identify recyclable materials and recommend handling methods that facilitate recycling
- Promoting recycling in schools by maintaining recycling opportunities in all Everett schools, and providing technical assistance for special projects initiated by teachers.
- Minimize the quantities of waste that must be disposed from City office and public works operations.

The City did not update the 1995 Plan, and in 2003 came under Snohomish County's Solid Waste Management Plan. The City has a representative on the County's Solid Waste Advisory Committee. City staff and contractors have continued to work with Snohomish County and

others to implement programs related to recycling, waste reduction, and composting. This work was funded through the City's Solid Waste Management Utility[16] and grants from the Department of Ecology. Washington State Department of Ecology Coordinated Prevention Grants provide multiyear partial funding (75% funding) of waste prevention, waste reduction and recycling programs. Examples of work completed by City staff and contractors include:

- Developing a Business Conservation Guide, a multifamily recycling guide, a guide to restaurant recycling and composting, and numerous guides and instructional flyers that promote recycling and waste reduction strategies, and are distributed in concert with interactive outreach and education programs.
- Partnering with downtown businesses to provide public recycling containers
- Working with Snohomish County and others to maintain and regularly update a Commercial Business Recycling Guide
- Working with local solid waste and recycling service providers to increase recycling participation and tonnage diversion at/in single and multifamily residential communities.
- Developing and maintaining an internal government ("in-house") waste reduction, recycling and recycled product procurement program that serves as a community conservation role model.
- Promoting and supporting waste reduction, waste prevention and recycling programs to commercial businesses in the city.
- Supporting recycling, composting and waste reduction programs in schools.
- Insuring that opportunities to recycle, compost and divert waste are accessible to the public at public events, festivals, and public gatherings.
- Regular coordination, information sharing, and teamwork of waste stream programs and issues including solid waste handling, disposal and reduction, recycling, household and business generated hazardous waste, organics, illegal dumping, specialty items (electronics, used medications, paint, fluorescent bulbs, batteries, etc.) with two solid waste and recycling service providers, Snohomish County, Washington State Department of Ecology, Snohomish Health District, local Cities and Towns in Snohomish County and the Washington State Recycling Association.
- Maintaining a resource information center (website, telephone, public and community speakers) to respond to and assist city residents and businesses with disposal and recycling inquiries.

<u>Current 2013 Snohomish County Comprehensive Solid and Hazardous Waste Management Plan[17]</u>

The first goal of Snohomish County's current 2013 Plan is to "Support Actions to reduce climate change and promote sustainability." The policies include

- Support efforts and actions by County and other agencies to reduce GHG emissions and to lessen and prepare for the impacts of climate change.

[16] Ordinance No. 2498-00 continuing the solid waste management utility stated "Whereas, as an integral part of management of solid waste, the City Council finds that waste reduction and recycling should be encouraged, emphasized, upgraded, and if necessary, subsidized in the City of Everett, and that some expenditure of public funds will be required to establish and promote a successful waste reduction and recycling program."

[17] Changing Waste for Changing Times – Snohomish County Comprehensive Solid and Hazardous Waste Management Plan Final Draft, 2013. The Plan includes Technical Memorandums on Climate Change, Organics, Product Stewardship, Waste Prevention, and Energy from Waste.

- Continue to monitor new and existing technologies for potential benefits to produce energy, fuel, or other useful byproducts.
- Continue to be a leader in product stewardship initiatives and legislation
- Continue to offer and develop programs that encourage waste prevention.

The second goal of the plan is to "Ensure efficient services for a growing and changing customer base." Applicable policies include

- Continue to offer and develop programs that encourage recycling.
- Continue to promote and expand the collection and non-landfilling of yard debris, wood waste, and food waste.

A wide variety of recommendations are provided to implement those policies. Actions that both cities and the County are responsible for implementing include:

- Promote activities such as smart shopping, the use of durable grocery bags, and buying in bulk when appropriate.
- Implement upgraded procurement policies.
- Design consistency into programs by working with neighboring jurisdictions on items such as materials collected, new programs such as disposal bans, and joint education and outreach programs.
- Explore methods to encourage the diversion of additional amounts of edible food to charitable organizations.
- Evaluate increased use of every other week residential garbage collection.
- Participate in a regional effort to provide more consistent messages for solid waste programs and issues.

V. Analysis of Sea Level Rise Impacts on Flooding in Development Permits

The FEIS for the Riverfront redevelopment included an analysis of the potential effect of sea level rise due to global climate change on flood elevations. An analysis has also been completed for the Port of Everett's Waterfront Place application. The Port plans to elevate the lowest portions of the site along the edges to approximately 2.0 feet above current extreme high tide elevations at the site, while most of the interior portions of the site will be about 2.5 feet above current extreme high tide elevations.

III. Climate Change Excerpt from City of Everett 2011 Hazard Identification and Vulnerability Analysis.

CLIMATE CHANGE

Definitions

Climate Change: Changes in climate patterns at a local, regional or global scale.

Climate: Measures of temperature, humidity, precipitation, atmospheric pressure, and other meteorological conditions over a long period of time in a given area. This data is useful in establishing predictable patterns useful for organizing human endeavors in an area.

2011 UPDATE

Climate change is a new addition to this plan.

Weather: A short term or current measurement of meteorological conditions in an area.

Global Warming: A measured increase in global temperatures over the past decades.

Greenhouse Gas: A gas that absorbs and emits infrared radiation, including water vapor, carbon dioxide, methane, nitrous oxide, and ozone. These gases trap heat entering the earth's atmosphere and warm the planet.

General Background

Climate change is a term referring to a global shift in climate patterns that has been occurring for decades. Recently, scientific consensus on this phenomenon is that emissions of some greenhouse gases are accelerating due, in large part, to human activity. These gases trap heat in our atmosphere, leading to global warming. The excess heat in the atmosphere has led to numerous shifts in climate, and thus to shifts in weather patterns that lead to various smaller consequences, including increased evaporation and subsequent precipitation, earlier snowmelt, and shifting seasonal changes. Figure 16 shows the historical and projected changes in carbon dioxide, a greenhouse gas.

FIGURE 16: HISTORICAL AND PROJECTED ATMOSPHERIC CARBON CONCENTRATIONS[56]

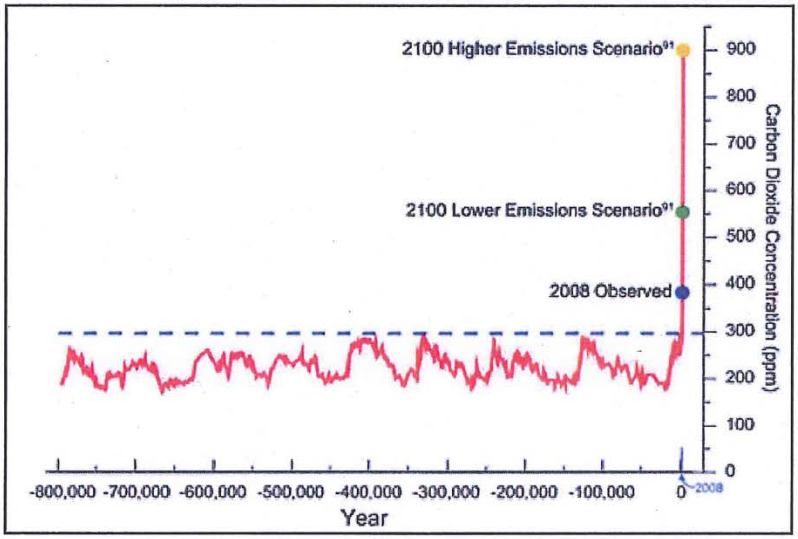
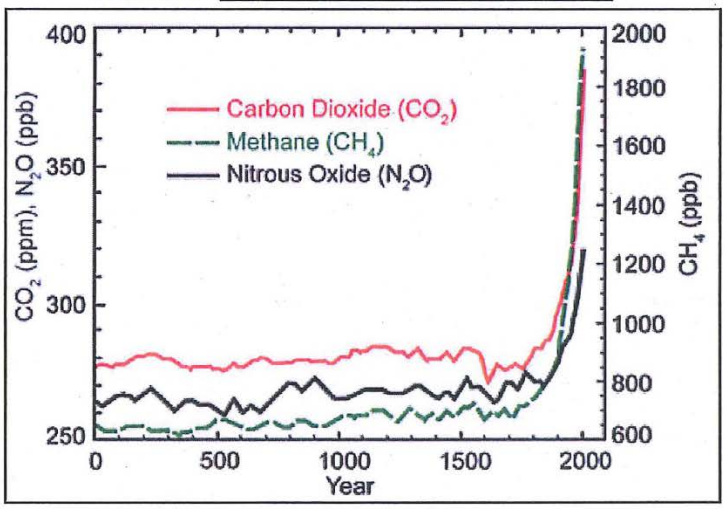


Figure 17 shows the historical change in three greenhouse gases.

FIGURE 17: HISTORICAL GREENHOUSE GAS LEVELS[57]



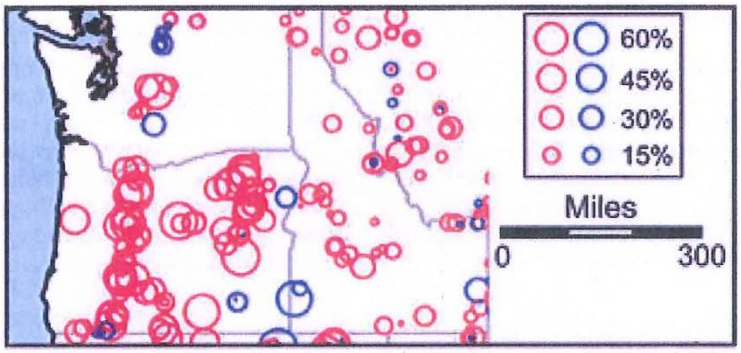
Scientific consensus about changing global climate patterns solidified around the 2007 Intergovernmental Panel on Climate Change (IPCC) report, which summarized data about and made predictions on the future impacts of climate change.[58] A 2006 study by the Climate Leadership Initiative on the impacts of climate change on Washington State identified several indications that

56 US Climate Change Research Program. (2009). "Global Climate Change Impacts in the United States." Cambridge University Press: New York. p. 27.
57 Global Climate Change Impacts in the United States, 13.
58 Solomon, S. et al. (2007). "Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change." Cambridge University Press: Cambridge, UK. Accessed online on April 3, 2011 from http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html

the climate of Washington State is already changing, including increased average temperatures, the retreat of glaciers, decrease in snowpack, and increase in wildfires over the last few decades.[59]

Impacts of climate change are already being measured in the Pacific Northwest. Glaciers and snowpack in the Cascades have been in retreat in the last few decades. The map below shows changes in the measured snowmelt on April 1 from 1950 to 2002.

FIGURE 18: CHANGES IN SNOWMELT ON APRIL 1ST, 1950-2002[60]



Climate change is a significant hazard for Everett, but its impact will be felt most as it influences the frequency and severity of other known hazards. The nature of climate change also makes it more difficult to predict the patterns of future climatic events.

LOCATION

Climate change may influence the location of other hazard events in Everett. For instance, increased temperatures may make the threat of fires more widespread. Increased severe weather events and heat waves will impact all of Everett.

FREQUENCY

The frequency of other hazard events that already impact Everett may be influenced by climate change. Seasonal events may shift in timeframe. The 2006 report explains how reduced snowpack and a shift from snow to rain in winter may reduce the incidence of rain on snow winter flooding events, but more flooding may occur later in the spring.[61] Severe storms may occur more frequently.

SEVERITY

Climate change could influence the frequency and severity of other hazards mentioned in this HIVA, including severe storms and flooding. Increased summer temperatures will increase the risk of fires, especially wildfires. While it is difficult to predict the long-term severity of climate change impacts to Everett, it is likely that the nearest-term impacts will be through the increase in the frequency and severity of hazards as well as through the appearance of new hazards such as drought and heat waves.

59 Washington Economic Steering Committee and the Climate Change Leadership Initiative Institute for Sustainable Environment. (2006). "Impacts of Climate Change on Washington's Economy: A Preliminary Assessment of Risks and opportunities." University of Oregon, pp. 7-8.
60 Global Climate Change Impacts in the United States, 14.
61 Global Climate Change Impacts in the United States, 135.

Secondary Hazards

Increases in average temperatures expand the habitat range of invasive species, which could damage forests and spread diseases, including West Nile virus and Lyme disease. These changes in habitat may also change the influence of endangered or economically important local species, such as salmon.

One hazard not already introduced in this report that will increase with climate change is the hazard of heat waves. Temperatures will become higher for longer time periods during summer months. Heat waves kill more people than all other weather events, and the most impacted are the young, elderly, sick, or overweight individuals in a population.[62]

In many ways, hazards such as severe weather, landslides, fire, flooding, and pandemics can all be considered secondary hazards to climate change. Severe weather will be more common and damaging due to the increased warming of the atmosphere (the input of energy into a system produces 'work', in this case in the form of weather). Increases in severe weather events mean more heavy downpours, which increases the risk of flooding and landslides. Fire risk is directly related to temperature and precipitation, and as droughts begin to appear in western Washington along with higher temperatures, fires will be more common. The weather conditions that facilitate the spread of disease and pandemics, such as those mentioned above, are also related to climate change.

Exposure and Vulnerability

Population

The entire population is exposed to risks posed by climate change. Those elements of the population most at risk from weather-related events, such as the young, the sick, and the elderly, are also most vulnerable to climate change impacts.

Property

Severe weather-related events are already a leading cause of property damage, and the amount of damage is expected to increase as the frequency and severity of events increases.

Critical Infrastructure

Water

Everett obtains its water from reservoirs fed by snowmelt. As climate change reduces snowpack in the Cascade Range, the water system will be threatened. A decrease in snowpack is already being observed throughout the Pacific Northwest.[63]

Transportation Systems

Sea-level rise may impact the Port of Everett and endanger its facilities. Furthermore, increases in river peak flow will cause an increase in the sedimentation of the port area and necessitate additional dredging.

62 American Red Cross. "Heat Wave Safety Checklist." Accessed online on April 3, 2011 from http://www.redcross.org/portal/site/en/menuitem.53fabf6cc033f17a2b1ecfbf43181aa0/?vgnextoid=1750779a32ecb110VgnVCM10000089f0870aRCRD&currPage=bf10779a32ecb110VgnVCM10000089f0870aRCRD

63 USGS website. (2009). "Fifty-Year Record of Glacier Change Reveals Shifting Climate in the Pacific Northwest and Alaska, USA." Accessed online on April 3, 2011 from http://pubs.usgs.gov/fs/2009/3046/

Health and Healthcare
The potential increase in heat waves and other hazards will add stress to healthcare resources and increase the risk of already vulnerable elements of the population to hospitalization for weather and heat-related illnesses and injuries.

Environment
Climate change may unbalance delicate ecosystems, including salmon habitats. Increased temperatures will shift seasons, and may inhibit the growth and life cycles of native species and encourage the spread of non-native species to areas previously unsuited for them. Nutrient concentrations in oceans and lakes may shift, which further disrupts food supplies and habitats.[64]

Impact Scenario

The July 2010 heat wave in Russia illustrated some of the complicated interaction between unpredictable or extreme changes in climate and the hazards they directly or indirectly impact. July 2010 was the warmest month in western Russia in the last 130 years. The heat and lack of rainfall created drought conditions that aided the spread of wildfires. The death toll from this event may have been as high as 15,000. There was an almost two-fold increase in the natural death rate for that time period, with deaths resulting from the fires, as well as from the poor air quality caused by those fires.[65] While western Washington and western Russia have different climate conditions, increased heat waves may be expected to bring similar consequences if they occur in this area.

Issues

Our climate is changing and there is agreement among the scientific community that, as a result, the frequency of each of the following impacts is increasing:

- Higher intensity storms
- Hotter and dryer summers
- Cascade drainages having higher winter and lower summer flows
- Additional stresses to biological natural systems, including forest regeneration.
- Insects and disease vector introduction

64 USFWS. (2010). "Climate Change in the Pacific Northwest." Accessed online on April 3, 2011 from http://www.fws.gov/pacific/Climatechange/changepnw.html
65 Kim, Lucian and LLevitov, Maria. (August 10,2010). "Russia Heat Wave May Kill 15000, Have $15 Billion of GDP." Bloomberg News L.P. Accessed online on April 3, 2011 from http://www.bloomberg.com/news/2010-08-10/russia-may-lose-15-000-lives-15-billion-of-economic-output-in-heat-wave.html

IV. Regional Policies / Strategies Related to Climate Change

Everett's Comprehensive Plan is required to be consistent with Vision 2040 and the Snohomish Countywide Planning Policies.

A. Transportation 2040

Transportation 2040 contains a Four-Part Greenhouse Gas Strategy:

- **Land Use**: Implement VISION 2040, further the goal of balancing jobs and housing, focus growth in centers and provide for efficient communities;
- **User Fees**: transition the region over time to a user fee/roadway pricing system:
- **Choices:** continue to provide travelers options to the single-occupant vehicle;
- **Technology:** support development of technology to dramatically reduce tailpipe emissions;

In May 2014, PSRC published an updated Appendix L: Climate Change Background that updated the modeling of GHG emissions based on the 2014 Transportation 2040 Update, new models, and actions that had been taken since 2010 when the Appendix was first published. The updated results of the Four-Part Greenhouse Gas Strategy produce a range of emissions reductions between 19% and 36% below 2006 modeled emissions in the year 2040. As a comparison, the state's GHG emission reduction limits are to return to 1990 levels by 2020, reduce emissions to 25% below 1990 levels by 2035, and 50% below 1990 levels by 2050; these limits are economy-wide and not sector specific.

The 2010 Appendix L also included an Introduction to the Considerations of Adaptation to Climate Change in the Long-Range Transportation Planning Process. It addressed issues such as sea level rise and storm surge, economic impacts and disruption to the transportation system due to flooding, current planning efforts and possibilities for incorporating adaptation to climate change in the long-range transportation planning process. Examples included

- Changes to the design assumptions of roadway and other facilities
- Changes to the siting of new facilities
- Creating operational response plans
- Incorporation of expected increases in maintenance costs in long-range planning and capital budgets
- Inventory of critical, high-value infrastructure to evaluate the potential risks from the impacts of climate change.
- Future research and analysis such as developing higher resolution climate models, additional information regarding the projections of extreme weather events and storms, and the installation of land motion sensors near high-value assets such as waterfront and port areas to provide measurement of the vertical motion of the land (i.e., uplift and subsidence)

B. VISION 2040 Policies and Actions Related to Climate Change

Goal: The region's communities will be planned and designed to promote physical, social, and mental well-being so that all people can live healthier and more active lives.

- **MPP-DP-45:** Promote cooperation and coordination among transportation providers, local governments, and developers to ensure that joint- and mixed-use developments are designed to promote and improve physical, mental, and social health and reduce the impacts of climate change on the natural and built environments.
- **DP-Action-9** The Puget Sound Regional Council will develop a best practices toolkit for sustainable design for both urban and rural areas including, but not limited to, adaptive reuse low-impact development, green development, and low-energy efficient development practices for development and infrastructure.

Goal: The region will safeguard the natural environment by meeting the needs of the present without compromising the ability of future generations to meet their own needs.

- **MPP-En-1:** Develop regionwide environmental strategies, coordinating among local jurisdictions and countywide planning groups.
- **MPP-En-2:** Use integrated and interdisciplinary approaches for environmental planning and assessment at regional, countywide and local levels.
- **MPP-En-3:** Maintain and, where possible, improve air and water quality, soils, and natural systems to ensure the health and well-being of people, animals, and plants. Reduce the impacts of transportation on air and water quality, and climate change.

Goal: The region will meet or do better than standards established for water quality. The quality of the water flowing out of the region – including Puget Sound – should be as good as or better than the quality of water entering the region.

- **MPP-En-16:** Identify and address the impacts of climate change on the region's hydrological systems.

Goal: The overall quality of the region's air will be better than it is today.

- **MPP-En-17:** Maintain or do better than existing standards for carbon monoxide, ozone, and particulates.
- **MPP-En-18:** Reduce levels for air toxics, fine particulates, and greenhouse gases.
- **MPP-En-19:** Continue efforts to reduce pollutants from transportation activities, including through the use of cleaner fuels and vehicles and increasing alternatives to driving alone, as well as design and land use.

Goal: The region will reduce its overall production of harmful elements that contribute to climate change.

- **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 the 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.

- **Air Quality: En-Action-6** The Puget Sound Regional Council and its member jurisdictions will work with the Puget Sound Clean Air Agency to identify steps to improve air quality beyond the minimum standards.
- **Climate Change Action Plan: En-Action-7** The Puget Sound Regional Council and its member organizations will work with the Puget Sound Clean Air Agency, state agencies, and other environmental professionals to prepare an action plan containing regional and local provisions. The plan should investigate ways to: (a) address climate change in accordance with the Governor's 2007 Climate Change initiative and state legislation on greenhouse gas emissions reduction (RCW 80.80.020), (b) reduce greenhouse gas emissions, and (c) take specific mitigation steps to address climate change impacts. The plan should also address establishing a regional climate change benchmark program.

- **MPP-PS-1:** Protect and enhance the environment and public health and safety when providing services and facilities.
- **MPP-PS-12:** Promote the use of renewable energy resources to meet the region's energy needs.
- **MPP-PS-13:** Reduce the rate of energy consumption through conservation and alternative energy forms to extend the life of existing facilities and infrastructure.

Goal: The region's economy prospers through the creation of great central places, diverse communities, and high quality of life that integrates transportation, the economy, and the environment.

- **MPP-Ec-15:** Ensure that economic development sustains and respects the region's environmental quality.

Goal: As a high priority, the region will maintain, preserve, and operate its existing transportation system in a safe and usable state.

- **MPP-T-5:** Foster a less polluting system that reduces the negative effects of transportation infrastructure and operation on the climate and natural environment.
- **MPP-T-6:** Seek the development and implementation of transportation modes and technologies that are energy-efficient and improve system performance.
- **MPP-T-7:** Develop a transportation system that minimizes negative impacts to human health.
- **T-Action-14** The Puget Sound Regional Council will update its programming and project selection criteria to address health impacts and reduction of greenhouse gas emissions.

C. Snohomish Countywide Planning Policies Related to Climate Change

- **Env-7** The County and cities should support the implementation of the state‘s climate change initiatives and work toward developing a common framework to analyze climate change impacts when conducting environmental review under SEPA.
- **Env-8** The County and cities should establish and/or support programs to reduce greenhouse gas emissions and to increase energy conservation and alternative/clean energy among both public and private entities.
- **Env-9** The County and cities should use natural systems to reduce carbon in the atmosphere by establishing programs and policies that maintain and increase forests and vegetative cover.
- **Env-10** The County and cities should establish a planning framework in local plans and coordinate regionally to anticipate, prepare for, and adapt as necessary to likely impacts of climate change.

- **GF-3** Decisions on land use, transportation, and economic and social infrastructure should consider and include ways to reduce greenhouse gas emissions and provide for soft solutions to address both traditional needs as well as emerging challenges. Soft solutions should emphasize:
  a. Integrated planning;
  b. Adaptive management;
  c. Efficiency and resiliency;
  d. Minimize single use, maximize re-use; and
  e. Minimize the need for treatment by minimizing the level of pollution.

D. Puget Sound Clean Air Agency Strategic Plan 2014-2020

Long-Term Vision for the Region’s Air Quality and Climate: The strategies in this plan move the central Puget Sound region toward this vision:

- All the people and natural systems in our region benefit from clean and healthy air all the time, regardless of socio-economic status or geographic location.
- Our region does its part, and more, to protect the climate.
- Everyone in the region plays an active role in achieving this vision.

Goal 2: Become the most climate-friendly region in the United States.

Targets

- Greenhouse gas emissions in 2020 return to 1990 levels.
- Greenhouse gas emissions drop 25% from 1990 to 2035.

Objective 2.1 Reduce emissions of greenhouse gases from transportation
Targets

- Transportation greenhouse gas emissions in 2020 return to 1990 levels.
- Zero-emission vehicles comprise 10% of public and private fleets’ new vehicle purchases by 2016.

Strategies

A. Secure the adoption of state and local carbon-reducing policies.
   1) Influence and achieve the implementation of a clean fuel standard in Washington.
   2) Influence and achieve other policies and incentives that support investment in electric vehicles and renewable fuels.

B. Target vehicle and infrastructure projects that accelerate regional uptake of electric vehicles and renewable fuels.
   1) Support investment in electric vehicles and renewable fuels, increase acceptance and eliminate barriers to adoption.
   2) Educate public and private sector fleets about electric vehicles and renewable fuels in our region, sharing information and lessons learned, as appropriate.
   3) Gather consumer input and facilitate public education about electric vehicles and cleaner fuels through partnerships and community collaboration.

C. Inventory regional transportation greenhouse gas emissions to guide efforts and measure success.

D. Motivate people to make more climate-friendly choices through education and outreach.

E. Host and strengthen our support of the Western Washington Clean Cities Coalition.

F. Influence regional transportation planning to advance low-carbon transportation infrastructure and policies.
   1) Advocate a climate-friendly regional growth strategy.
   2) Advocate strong multi-passenger vehicle, transit, bicycle and pedestrian infrastructure.
   3) Work with PSRC and countywide forums to improve decision-making tools, models and criteria, particularly for use in selecting transportation infrastructure projects for federal funding.

Objective 3.5 Be a model of environmental sustainability

Target

- Achieve carbon-neutrality by 2020.

Strategies

A. Optimize our transportation choices to reduce emissions.

B. Reduce our use of resources such as paper, water and electricity through conservation and efficiency measures.

C. Procure safe and environmentally friendly products.

D. Find offset projects within the region to bring agency operations' net climate impact to zero.

Note that the plan's other Goal - Protect public health and the environment from air pollution – and the associated targets and strategies will also result in reduced emissions and help to reduce the impacts of climate change.

V. Local Power Providers

A. Snohomish County PUD[18]

Renewable power is electricity that is generated from a renewable resource. "Renewable" generally refers to energy generated by a technology:

- that relies on a renewable fuel source; and
- whose process generates little or no emissions that cause pollution.

Renewable generation sources include hydroelectric projects, wind, solar, geothermal, tidal, landfill gas and biomass.

In 2013, the PUD received 84% of its power supply from BPA Columbia River hydropower, 6% from its long-term wind and other renewable resources contracts, 6% from its long-term wind and other renewable resources contracts, 6% from its own hydroelectric projects, and 4% from wholesale market purchases. The PUD's renewable power sources other than the BPA include:

- The Jackson, Youngs Creek, Woods Creek and Packwood (20% share) Hydroelectric Projects
- Hampton Lumber Mill biomass facility
- White Creek, Wheat Field, and Hay Canyon Wind Projects
- Klickitat County PUD's Landfill Gas Project**,** which converts garbage into methane gas that is used to generate electricity.

The PUD:

- Encourages waste reduction, conservation and recycling.
- Introduces new energy-efficient products and services, like LED lighting for homes and street lights.
- Applies current science and technology to manage its own generation facilities.
- Directly invests in new, local, environmentally sound energy technologies, including geothermal, tidal, solar, small hydro and energy storage.

The PUD's Board of Commissioners has committed the utility to meeting load growth to the extent possible through cost effective energy efficiency and renewable generation sources.

Snohomish County PUD has an expansive conservation program that provides education and incentives to customers. Examples include

- incentives for installation of solar electric (photovoltaic) or solar hot water systems in residences, including information sessions, an experienced network of installers, and financial incentives
- Planet Power, a voluntary green power program that funds the development of local, small-scale renewable energy projects
- cash incentives for weatherization upgrades, insulation, duct sealing, insulated windows and heat pumps

[18] Snohomish County PUD website and September 18, 2014 letter from Steven J. Klein, CEO/General Manager of Snohomish County PUD NO. 1 to Mr. Ray Stephanson, Mayor and Mr. Dave Koenig, Manager Planning Department (In Capital Facilities and Utilities Background Report).

- subsidized efficient light with CFLs and LEDs
- discounts on Energy Star lighting fixtures
- rebates on efficient clothes washers
- special pricing on efficient showerheads
- rebates to builders that include energy efficient heat pumps, and Energy Star washers, refrigerators and electric hot water tanks
- incentives for Energy-Star rated manufactured homes
- free weatherization for qualifying low income customers
- incentives for energy-efficient commercial kitchen equipment
- technical advice and incentives for process system improvements / equipment for businesses
- technical advice and incentives for data centers and grocery stores

In a September 18, 2014 letter to the City, the PUD stated

> For the City of Everett, as the regional growth strategy is implemented, multi-use and higher density housing will take a prominent role in implementing that vision. However, multi-family housing often presents unique challenges in efforts to improve the energy efficiency performance of these housing units. A persistent impediment arises due to the split owner/occupant nature of a large number of multi-family developments: the owner pays for efficiency improvements but the occupant pays the electricity bill. This "split incentive" issue has been a perennial challenge to nationally improving energy efficiency in multi-family housing.
>
> Snohomish County PUD continues to pursue approaches to address these multi-family issues and challenges and is very interested in pursuing partnerships with the City of Everett to help ensure that, as multi-use and higher density housing is developed, it is done so in an energy-efficient manner. To that end, we encourage the City of Everett to explore potential incentives, processes and other opportunities to support investment by developers in pursuing energy efficient designs and technologies as they design, construct and maintain these types of developments.

B. Puget Sound Energy (PSE)[19]

PSE also provides a wide variety of education, technical advice and incentives for conservation of natural gas resources, such as

- rebates for energy efficient gas appliances / equipment, including residential, commercial and industrial projects
- rebates for weatherization
- free or discounted WaterSense labeled showerheads
- voluntary green power program
- home energy audits

[19] PSE website

VI. Other Local Jurisdictions

A. Snohomish County[20]

Snohomish County has an Office of Energy & Sustainability (OES) that works to conserve natural resources, reduce the County's climate impact, and facilitate environmental stewardship. OES partners with departments across County government and in the community to develop innovative programs and policies to actively address environmental challenges.

In 2008 Snohomish County completed a greenhouse gas emissions inventory and forecast for County facilities and operations, and has an adopted goal to reduce carbon emissions from county government operations to 20% below 2000 levels by 2020. OES and the Snohomish County Green Team, an inter-departmental group, developed a Sustainable Operations Action Plan (SOAP) for County Operations that was adopted in 2013. SOAP includes 7 goals with related objectives and strategies:

- Implement green building practices and use green materials
- Reduce greenhouse gas emissions from County operations, especially transportation
- Conserve resources and use renewable energy technologies
- Reduce, recycle and repurpose waste
- Implement green purchasing practices
- Promote ecological preservation and healthy ecosystems
- Lead by example

Snohomish County is documenting progress on the SOAP Plan via SOAP Action Updates on the Energy and Sustainability webpage, and a two-year SOAP progress report which will be published and available to the public in early 2015.

Snohomish County has partnered with Puget Sound Cooperative Credit Union (PSSCU) to launch an Energy Smart Loan program for Snohomish County residents to increase access to energy efficiency improvements and renewable energy projects. Based on the County's two-year Energy Smart Loan Program Report[21], the program made 360 loans totaling $3.7 million. The 6,170 million BTUs in energy savings during the program's first two years is enough energy to power 166 homes for a year and the equivalent of 990 metric tons of greenhouse gas emissions avoided.

In June of 2010, the County installed a 16.4kw photovoltaic (solar) system on the roof of the Administration building in Everett. This project was one of 13 different energy conservation projects made possible through Energy Efficiency and Conservation Block Grant (EECBG) funding from the Department of Energy.

Snohomish County's Solid and Hazardous Waste Management Plan has a large emphasis on Climate Change. See Section II.U. of this report for more information.

Snohomish County's Comprehensive Plan includes a 2012 Climate Change and Sustainability section in their Natural Environment Element with the following goals, objectives and policies:

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[20] Snohomish County website

[21] *Energy Smart Loan Program Report: 2012-2014*, http://www.snohomishcountywa.gov/DocumentCenter/View/17610

GOAL NE 10 **Help sustain Snohomish County's economy, environment and communities by minimizing greenhouse gas emissions and supporting clean energy development.**

Objective NE 10.A **Adopt practices for Snohomish County government services and operations that minimize greenhouse gas emissions.**

NE Policies

10.A.1 Identify and implement technologies to improve the efficiency of Snohomish County buildings and service vehicles.

10.A.2 Identify and implement operational and purchasing policies and practices that reduce emissions, support energy conservation and efficient use of resources.

10.A.3 Pursue options and incentives to reduce the vehicle miles traveled by Snohomish County employees in both their commuting and job-related activities.

10.A.4 Achieve green building certification for new county buildings and major renovation projects whenever appropriate and feasible.

10.A.5 Inventory the county's greenhouse gas emissions and develop and implement a plan to minimize emissions.

Objective NE 10.B **Develop strategies for Snohomish County communities that support sustainability and minimize greenhouse gas emissions.**

NE Policies

10.B.1 Incorporate the most current scientific consensus on climate change into the county's planning processes.

10.B.2 Establish land use patterns that minimize transportation-related greenhouse gas emissions and encourage the preservation of resource lands, open space and habitat.

10.B.3 Support market development for alternative fuels and clean energy sources.

10.B.4 Encourage climate-friendly businesses and business practices and a clean energy economy.

10.B.5 Seek to reduce vehicle miles traveled by encouraging expanded availability and use of public transportation through planning, partnerships, investments and incentives.

10.B.6 Adopt development regulations that foster energy conservation, environmental enhancement, recycling and waste reduction.

10.B.7 Investigate long-term strategies to address waste management within Snohomish County's borders to reduce emissions from the transport of waste, increase reuse and recycling and foster sustainable practices.

10.B.8 Develop education and incentive programs related to climate change and sustainability so that citizens, businesses and others can make informed decisions.

10.B.9 Support intergovernmental planning regarding climate change and sustainability and coordinate local efforts with regional, state and federal efforts.

10.B.10 Incorporate principles of sustainability and "green building" design - as set forth in "Leadership in Energy and Environmental Design" (LEED) certification - for development of the county Cathcart site. Ensure that this development will serve

as a model for "green" building and sustainable neighborhood development in Snohomish County.

10.B.11 Incorporate energy-conserving and climate-friendly construction and development techniques within all development activity at the county Cathcart site.

GOAL NE 11 Help sustain Snohomish County's economy, environment and communities by responding and adapting to the impacts of climate change.

Objective NE 11.A Improve the county's preparedness to respond to climate change.

NE Policies

11.A.1 Work with community stakeholders, establish partnerships and organize resources to coordinate a response to the projected impacts of climate change.

11.A.2 Periodically assess Snohomish County's vulnerability to climate change, based on the most current scientific consensus, and utilize the findings and community priorities to guide policy development and infrastructure investments.

11.A.3 Incorporate measures that account for, mitigate and monitor the expected impacts of climate change in planning for economic, environmental, and community health.

11.A.4 Implement strategies and monitor progress to protect the county's natural resources and systems from the projected impacts of climate change.

Objective NE 11.B Strengthen the county's ability to adapt to climate change impacts.

NE Policies

11.B.1 Incorporate adaptive management for climate change, in response to the most current scientific consensus, into future comprehensive plans and development regulations.

11.B.2 Develop strategies to encourage a diversified and sustainable economy that is resilient to the impacts of climate change.

11.B.3 Develop incentives that encourage citizens to reduce the adverse impacts from climate change to their lives and communities.

11.B.4 Promote the efficient use, conservation and protection of water resources.

B. Snohomish Basin Salmon Recovery Forum[22]

The Snohomish Basin, the second largest drainage in the Puget Sound, contains diverse aquatic resources. It is home to ESA-listed Chinook salmon, steelhead trout and bull trout char populations as well as other fish and wildlife populations of local and regional significance. Among Puget Sound watersheds, it is the largest producer of coho salmon and the second largest producer of Chinook salmon supporting two spawning populations, the Skykomish and the Snoqualmie. Additionally, the Snohomish Basin contains a diverse portfolio of land uses, including agriculture, forestry and some of the most rapidly developing areas in the Puget Sound

[22] County website and September 26, 2014 Draft Snohomish Basin Protection Plan

region. Ecological challenges include altered hydrologic and sediment processes, degraded water quality, loss of wetlands and riparian forests as well as degraded shoreline conditions.

The Snohomish River Basin Salmon Recovery Forum, with Snohomish County as the lead, includes members from Snohomish and King counties, Tulalip Tribes, 14 cities, many special purpose districts, interest groups ranging from conservation to farming and business, and citizens. The group set the recovery priorities to restore Salmon and other aquatic species protected under the Endangered Species Act for the basin in the 2005 Snohomish River Basin Salmon Conservation Plan. The Forum is supported by a variety of committees. The City of Everett has active membership on the Policy Development Committee, the Technical Committee and currently has a seat as Vice-Chair of the Forum.

The Forum is the decision making body and is responsible for the Snohomish Basin Conservation Plan (SBPP), to be implemented and updated as per the requirements of Federal Agency oversight of the Endangered Species Act enforcement in the Puget Sound Ecological Significant Unit (ECU) as designated by the Federal Government.

Currently the Snohomish Basin Conservation Plan is being updated and renamed the Snohomish Basin Protection Plan (SBPP). The creation of the Snohomish Basin Protection Plan (SBPP), intended to refine existing strategies and offer new thinking, was motivated by a collective understanding by recovery partners that protection must and can be done better to protect and enhance threatened salmonids, and by doing so, protect other species. The SBPP builds on information recognized at the time of the Snohomish River Basin Conservation Plan (2005) and integrates new tools and political context developed since. Information on the progress of recovery – both restoration gains and protection losses – is included.

The report describes the technical approach, supported by extensive technical appendices, used to describe the importance of hydrology to salmon habitat across the basin at a variety of scales. A case is made for how the protection of specific hydrologic components will support specific life stages of fish. Information on land use, potential future pressures, and the predicted effects of climate change[23] is presented at a planning unit scale in order to point out specific geographies that could benefit from increased protective action.

The SBPP focused on utilizing local assessments (e.g., Climate Change Impacts on Flooding, King County 2010) and two climate change impact efforts which focused on modeling conditions specific to the Snohomish Basin. The first model that the SBPP evaluated was from Battin et al. (2007), which projected climate change impacts on specific environmental attributes and Chinook salmon populations in the Snohomish River Basin. These efforts focused on climate related changes in flow, temperature, and habitat capacity across the salmon life cycle. The primary environmental variables emphasized in the analysis included mortality in adults due to temperature, egg mortality due to temperature, and egg mortality due to bed scour.

[23] Since the 2005 Plan was prepared, refined information has been developed on the predicted effects of climate change. The university of Washington Climate Impacts Group and the Pacific Northwest National Laboratories have released model results which provide greater detail on potential changes in water temperature, flow volume, and flow timing.

The second climate change modeling effort utilized in the SBPP was the Snow Caps to White Caps project from the Pacific Northwest National Laboratory (PNNL 2013). This effort focused on developing numerical models for water movement and distribution from the top to bottom of the Snohomish Basin, and assessed changes in hydrology based on various management questions as well as current and future conditions. Management scenarios included changes in land-use (urbanization and forest maturation) and future conditions were evaluated across climate change scenarios. Changes in long-term monthly flow, specifically peak and low flow conditions, were evaluated for the SBPP efforts.

An example of the analysis for the Basin's estuary planning unit: This is a rain dominated system and is not expected to change due to climate change. Impacts from frequency and magnitude of rain events may be more localized in this watershed. Important to keep in mind is that this area is hydraulically connected to the Snohomish River which is subject to climate change influence, as well as diurnal tidal cycles, this could cause a cumulative climate change effect that could impact water level and salinities in this Planning Unit. There is a possibility as climate change brings sea level rise, existing semi-saline restoration areas will change and the need to acquire restoration sites up stream will be required as the estuary shifts location.

The draft Plan describes one interesting method for potential adaptation to the impacts of climate change. The Tulalip Tribes is working with the University of Washington on a pilot program to improve water storage in the headwaters of the basin to ameliorate the hydraulic shifts caused by climate change. The program traps beavers on Tulalip Reservation land and releases them in appropriate areas in the United State Forest Service land. By allowing beavers to create a complex series of dams it will slow the rain and/or snow melt along the way. It is predicted in 80 years that there will be less snow melt from basins like the Skykomish. Beaver ponds could help with the delivery of water throughout the dry seasons. It is also predicted with lack of snow melt that the forests will dry out making them more prone to disease and fire. By keeping water stored in the forests it will help keep forests wet and limit the spread of disease and fire. The Plan recommends studying and identifying land suitable for beaver relocation in USFS areas and modeling hydraulic impacts the beavers have on the hydrology.

C. Port of Everett

The Port of Everett evaluates the impact of sea-level rise on new and replaced structures, both in-water and upland, on a case-by-case basis. They typically suggest replacement structures be elevated 1-2' higher than existing structures.

The Port has a strong recycling program in place. They are working to incorporate more recycled materials into their overall operations, including recycled office, maintenance and custodial supplies and to use recycled materials for its construction projects when possible.

The Port partnered with the Department of Ecology to obtain a grant to reduce emissions by retrofitting some of their marine terminal equipment.

Clean energy alternatives, such as vehicles and electric gantry cranes are widely used at the Port of Everett. The Port is embarking on a comprehensive effort to purchase environmentally

friendly equipment and vehicles. Over the years aging diesel vehicles have been replaced with hybrid and ultra-low sulfur diesel vehicles. The Port uses clean energy fuel sources, when possible, by burning an ultra-low sulfur diesel that reduces emissions.

The Port recommends that trucks arriving and departing Port of Everett shipping facilities bypass the downtown core to reduce the amount of time the trucks are idling and releasing emissions.

The Port also has a voluntary commute trip reduction program for employees.

VII. Washington State

The Washington State Department of Ecology maintains a website that describes Washington State's response to climate change and provides background information, educational materials, etc. - http://www.ecy.wa.gov/climatechange/index.htm

In April 2014 Governor Inslee issued an Executive Order to reduce carbon pollution and promote clean energy. The Executive Order was in response to a report by a consultant hired by Inslee's Climate Legislative and Executive Workgroup stating that the State will not meet its statutory reduction reductions in GHG emissions for 2020, 2035, and 2050[24] with current state and federal policies. However, the State can meet its statutory 2020 target if near-term action is taken to implement a new comprehensive emission reduction program. The executive order outlined a series of steps to cut carbon pollution in Washington and advance development and use of clean energy technologies. The Action plan elements call for the following steps:

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

See http://www.governor.wa.gov/issues/climate/default.aspx for more information.

The Policy Framework page of Ecology's Climate Change web site, which is copied below, includes the adopted policy laws and executive orders from 2005-2010.

Policy Framework (2005-2010)

Washington has adopted a set of coordinated policies to grow our economy and reduce our greenhouse gas emissions. Emissions in this state come from transportation (46%), electricity (20%), industrial sources (16%), residential and commercial buildings (9%), agriculture (6%) and waste (3%). The policies we have adopted will help the state meet its statutory greenhouse gas reduction targets and the Governor's commitment to growing green jobs.

Greenhouse Gas Emissions Limits

- State greenhouse gas emissions reduction limits in law. (RCW 70.235.020)
- Return to 1990 levels by 2020
- By 2035, reduce emissions to 25% below 1990 levels
- By 2050, reduce emissions to 50% below 1990 levels.

Emissions Inventory and Reporting

- Persons operating the following sources must report to the Department of Ecology their emissions of certain greenhouse gases (RCW 70.94.151 changed in 2010 (see 6373-S.SL)):
- A single facility, source, or site that emits at least 10,000 metric tons of greenhouse gases annually in Washington; or
- A supplier of liquid motor vehicle fuel, special fuel, or aircraft fuel that supplies products equivalent to at least 10,000 metric tons of carbon dioxide annually in Washington.

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[24] By 2020, reduce overall emissions of GHGs in the State to 1990 levels;
By 2035, reduce overall emissions of GHGs in the State to 25% below 1990 levels;
By 2050, reduce overall emissions to 50% below 1990 levels, or 70% below the Stat's expected emissions that year.

- Department of Ecology, by December 31st of each even-numbered year beginning in 2010, must report to the governor and the appropriate committees of the senate and house of representatives the total emissions of greenhouse gases for the preceding two years, and totals in each major source sector. (RCW 70.235.020)

Creating Green Economy Jobs

- Established a comprehensive green economy jobs growth initiative, Evergreen Jobs Initiative with the goal of, by 2020, increasing the number of green economy jobs to 25,000 from the 8,400 green economy jobs the state had in 2004. (RCW 43.330.310 and RCW 43.330.370)
- Created a clean energy leadership council in collaboration with a private-public alliance focusing on growing Washington's clean technology sector.
- Authorize financing of the upfront costs of renewable energy and energy-efficiency improvement projects and establish the Sustainable Energy Trust Program. (RCW 43.180)
- Promote forest products green industry growth. See Chapter 187, laws of 2019 (2420-S.SL amending RCW 43.330.310).
- Created the Energy Freedom Program to provide financial support for the development of the bioenergy industry, promote clean energy, the development of bioenergy crops, energy efficiency, renewable energy, and innovative energy technology markets in Washington. (RCW 43.325)
- Allow exemption from permitting requirements for anaerobic digester complying with specific conditions, to spur renewable energy development from agricultural waste. (RCW 70.95.330)

Reducing Emissions from Transportation

- California "Clean Car" Greenhouse Gas Tailpipe Standards adopted in 2005. (RCW 70.120A.010). Changed in 2010 to exempt vehicles used by military personnel.
- Minimum renewable fuel content requirements and fuel quality standards. (RCW 19.11.110, RCW 19.11.120)
- Starting in 2010, new vehicles must disclose greenhouse gas emissions. (RCW 70.120A.050)
- Electric vehicles planning and infrastructure provisions were enacted by Chapter 459 Law of 2009 and codified in several RCWs.
- Department of Transportation is required to establish an alternative fuels corridor pilot project along I-5. (RCW 47.38.070)
- Substitutes for ozone-depleting and high-global warming potential vehicle refrigerants are approved for use. (RCW 46.37.470)
- Commute trip reduction program required from all large employers. (RCW 70.94.537)
- Washington is the first state with statutory benchmarks for reducing vehicle miles travelled. (RCW 47.01.440)

Reducing Emissions from Electricity and Buildings

- Department of Commerce is required to develop a state energy policy strategy that balances the goals of maintaining competitive energy prices, fostering clean energy economy and jobs and meeting the State's obligation to reduce greenhouse gas emissions. (See2658-S2.SL, Chapter 271 laws of 2010, Part IV sections 401-403)
- Energy Independence Act (Initiative 937) sets energy conservation and renewable energy targets. Large utilities must acquire renewable resources like wind and solar to meet part of their electricity needs and must implement all cost-effective energy-efficiency measures. (RCW 19.285)
- The State Energy Codes adopted from 2013 through 2031 must incrementally move towards achieving seventy percent reduction in annual net energy consumption for new residential and commercial buildings by 2031. (RCW 19.27A.160)
- Department of commerce is required, by December 31, 2010, to develop and implement a strategic plan for enhancing energy efficiency in and reducing greenhouse gas emissions from homes, buildings, districts, and neighborhoods (RCW 19.27A.150). The strategic plan must be used to help direct the future code increases in RCW 19.27A.020. The strategic plan needs to identify barriers to achieving net zero energy use in homes and buildings and identify how to overcome these barriers in future energy code updates and through complementary policies.
- High Performance Public Building Act requires all new and major renovated state-funded buildings over 5,000 square feet to meet green building standards, known as LEED Silver Certification. (RCW 39.35D.030)
- The 2010 Supplemental Capital Budget section 1016 the Jobs Act for K-12 provides competitive grants to public school districts and higher education institutions for operational cost savings improvements to schools and higher education facilities and for related projects that result in energy and operational cost savings. An appropriation of $50 million was allocated to the Department of Commerce and another $50 million is provided to the Superintendent of Public Instruction (see section 5007).
- The 2010 legislature enacted HB 2561, Chapter 35 Laws of 2010 referred to as the Jobs Act. It authorizes the State Finance Committee, composed of the Governor, Lieutenant Governor and the State Treasurer, to issue general obligation bonds in the amount of $500 million. The bonds proceeds will be used to fund construction of energy savings improvements to public facilities. The Jobs Act Bonds is referred to a vote of Washington residents at the next general election.
- Adopted more stringent efficiency standards for appliances and other products, such as ice makers, compressors and various lighting. (RCW 19.260.040)

- All new electric generating resources, including those under long term contract, must meet a greenhouse gas emission performance standard. (RCW 80.80.040)
- New fossil-fueled thermal generating facilities and existing facilities proposing to increase their capacity by fifteen percent are required to provide mitigation for twenty percent of the total carbon dioxide emissions produced by the facility. (RCW 80.70.020 (enacted in 2004)).
- The Department of Commerce may create an appliance efficiency rebate program with available funds from the energy efficient appliances rebate program authorized under the federal energy policy act of 2005 (P.L. 109-58). (RCW 43.330.340)
- Net metering required for all small renewable energy systems. (RCW 80.60)
- Counties may enact "energy overlay zones" to facilitate siting of renewable energy projects based on feedstock availability, infrastructure and environmental impacts. Eligible technologies include biomass energy, mill waste, and landfill and wastewater treatment gas. (RCW 36.70C.020, RCW 36.70C.130)
- Municipalities may aggregate energy audits and implement cost-effective energy conservation measures among multiple government entities. (RCW 43.19.691)

Helping Communities Save Energy and Reduce Emissions

- Department of Commerce was required to develop by December 2009, for counties and cities, a range of advisory methodologies to estimate greenhouse gas emissions reductions resulting from specific activities and measures. (RCW 36.70A.580)
- Pilot programs for community-wide energy efficiency upgrades must be implemented by Washington State University Extension Energy Program. (RCW 70.260.020)
- Improved the low-income residential weatherization program by broadening the coverage of the program. (RCW 70.164 changed in 2010 (6468-S.SL)
- Transfer of development rights program created to encourage new development in high-density areas. (RCW 43.362)
- State Agencies financing infrastructure and economic development projects must take into consideration GHG emissions reduction goals and reduction in vehicle miles traveled. (RCW 70.235.070)
- Properties in the Housing Trust Fund must be assessed for their energy efficiency and must be prioritized for energy efficiency funding. (RCW 43.185.140)
- Promote compact high-density urban development by providing incentives to cities to adopt optional elements and regulations, prepare non-project environmental impact statement (EIS), establish a transfer development rights (TDR) program, collect fees to recover EIS cost, and receive 10 years immunity to SEPA appeals. (Chapter 153, Law of 2010)

State Agencies Reducing Emissions from their Operations

- State agencies are required to quantify and reduce their carbon footprint to achieve state agency's mandatory targets. (RCW 70.235.050 and RCW 70.235.060)
- State agencies are required to establish policies and implement a fuel economy standard for acquisition, operation, and authorized use of state vehicles as well as develop strategies to reduce fuel consumption and vehicle emissions. (RCW 43.41.130)
- Certain state agencies must meet building energy performance standards that are benchmarked to national standards and report on their performance. Agencies that fail to meet the standards must perform a preliminary energy audit and implement cost-effective energy conservation measures by July 1, 2016. (RCW 19.27A.190)
- Agencies must reduce current paper use, increase paper recycling, purchase 100 percent recycled content paper, and set up conservation and recycling program. (RCW 70.95.725)
- The Department of Transportation must develop a joint comprehensive commute trip reduction plan for all state agencies sites located in the Olympia, Lacey, and Tumwater urban growth area. (RCW 70.94.551)
- Effective June 1, 2013, all state agencies and local governments are required to satisfy 40% of their fuel usage for publicly owned vessels, vehicles, and construction equipment with electricity or biofuel. By June 1, 2015, 100% these fuel needs are to be met by electricity or biofuel, to the extent practicable. (RCW 43.19.648)
- After June 15, 2010, state agencies must, when purchasing new petroleum-based fuel vehicles for vehicle fleets: (a) achieve an average fuel economy of 40 miles per gallon for light duty passenger vehicles; and (b) achieve an average fuel economy of 27 miles per gallon for light duty vans and sports utility vehicles; or (c) purchase ultra-low carbon fuel vehicles. Some vehicles are excluded. (Substitute House bill 3105, Chapter 159, Laws of 2010)
- State agencies must develop strategies and recommendations for reducing the number of miles that each employee drives. (RCW 70.94.551)
- State must install electrical outlets capable of charging electric vehicles in each of the state's fleet parking and maintenance facilities. (RCW 43.19.648)

Preparing for and Adapting to Climate Change

- Comprehensive assessment of the impacts of climate change on Washington State was conducted by the Climate Impacts Group with the University of Washington under the 2008 Cleaner Energy Act, Chapter 19.285.
- Established a voluntary pilot local government global warming mitigation and adaptation program through June 30, 2010 for up to three counties and six cities. (RCW 36.70A.5801)
- Ecology and other state agencies are required by December 2011, to develop a response strategy to assist the state and local governments in preparing for and adapting to impacts from climate change. (Chapter 43.21M)
- All state agencies must strive to incorporate adaptation plans of action as priority activities when planning or designing agency policies and programs. Agencies must consider the integrated climate change response strategy when designing, planning, and funding infrastructure projects; and incorporating natural resource adaptation actions and alternative energy sources when designing and planning infrastructure projects. (RCW 43.21M.040)

Financing and Tax Incentives:

- Municipal electric utilities and public utility districts providing electricity may give financial assistance for energy conservation projects. (RCW 35.92.360; RCW 54.16.280)
- An electrical, gas, or water company may file a conservation service tariff with WUTC. (RCW 80.28.303)
- Electrical, gas, and water companies, or finance subsidiaries, may issue conservation bonds upon approval by WUTC. (RCW 80.28.306)
- Sales taxes exemptions or credits and financing are listed in:
  - Department of Revenue publications on Renewable Energy Tax Incentives and Overview of Tax Incentives (PDF).
  - Department of Commerce web pages on state bioenergy, and energy efficiency grants.
  - For a complete listing of the incentives see also the U.S. Department of Energy Federal and State Incentives and Law .

Executive Orders

- **EO 07-02**Washington Climate Change Challenge: This order, signed in February 2007, established goals for reducing greenhouse gas emissions, creating jobs and reducing fuels spending. It was the basis for creating the Climate Advisory Team to recommend ways to reduce greenhouse gas emissions. It also directed the state to assess steps required to prepare for the impacts of climate change on water supply, public health, agriculture, forestry and coastal areas.
- **EO 09-05** Washington's Leadership on Climate Change: This order, signed in May 2009, requires the state to:
  - Develop emission reduction strategies to help meet the state's statutory greenhouse gas reduction limits.
  - Develop industry emission benchmarks.
  - Work with TransAlta to reduce by more than half the emissions from the company's coal-fired power plant near Centralia.
  - Develop forestry offset protocols and financial incentives to reduce greenhouse gas emissions from the forestry sector.
  - Recommend how to implement a low carbon fuel standard or alternative measures to reduce carbon emissions from transportation fuels.
  - Join with other West Coast states and the private sector to develop and implement a "West Coast Green Highway" that supports electric and alternative-fuel vehicles.
  - Develop additional strategies to reducing greenhouse gas emissions from the transportation sector.
  - Work with the five largest metropolitan planning organizations to increase transit options.
  - Prepare for rising sea levels and the risks to water supplies caused by climate change impacts.

Other Important GHG Reduction Policies Enacted Prior to 2005

- Voluntary green power purchase option required of all large electric utilities. (RCW 19.29A.090)
- Integrated resource plan or resource plan required biennially of all state's electric utilities. (RCW 19.280)
- Fuel mix disclosure to customers required for all electric utilities. (RCW 19.29A.060)
- Municipalities are authorized to negotiate performance-based energy contracts with energy service contractors. (RCW 39.35A)

VIII. Federal Agency Example

In October 2009, President Obama signed the Federal Leadership in Environmental, Energy, and Economic Performance Executive Order (E.O.) requiring each federal agency to develop, implement, and annually update an integrated Strategic Sustainability Performance Plan (SSPP). Each plan includes a discussion of the climate change risks and vulnerabilities on the agency's operations and mission. The E.O. also requires agencies to actively participate in the Interagency Climate Change Adaptation Task Force and "develop approaches through which the policies and practices of the agencies can be made compatible with and reinforce that strategy." By 2012, each SSPP was required to include an agency climate adaptation plan for implementation in FY 2013.[25]

A. The following is from the Department of Defense's recently issued 2014 adaptation plan: ***Department of Defense 2014 Climate Change Adaptation Roadmap.***

Climate change will affect the department of Defense's ability to defend the Nation and poses immediate risks to U.S. national security. The impacts of climate change may increase the frequency, scale, and complexity of future missions, including Defense Support to Civil Authorities, while at the same time undermining the capacity of our domestic installations to support training activities. Climate-related effects are already being observed at installations throughout the U.S. and overseas and affect many of the department's activities and decisions related to future operating environments, military readiness, stationing, environmental compliance and stewardship, and infrastructure planning and maintenance.

Climate change will interact with other stressors in ways that may affect the deployment of U.S. Forces overseas and here at home. As climate change affects the availability of food and water, human migration, and competition for natural resources, the department's unique capability to provide logistical, material, and security assistance on a massive scale or in rapid fashion may be called upon with increasing frequency. As the incidence of and severity of extreme weather events change, the department will adapt to meet these dynamic operational realities.

The report identifies a wide variety of potential effects on Department plans and operations, training and testing, built and natural infrastructure, and acquisition and supply chain.

The report includes goals to

- Integrate climate change considerations across the Department and manage associated risks
- Collaborate with internal and external stakeholders on climate change challenges.

The roadmap includes actions the Department will take to address climate change, as well as on-going efforts. On-going efforts include actions such as

- reviewing existing directives, policies, manuals and associated guidance documents to identify which ones should incorporate consideration of climate change, and establishing a plan for revisions.

[25] Center for Climate and Energy Solutions. Climate Change Adaption: What Federal Agencies are Doing. February 2012 Update.

- rebuilding after extreme storms with more wind-resistant structures
- burying utility lines underground
- protecting water supply wells
- installing firebreaks and making timber stand improvements to reduce fire fuel loads.
- considering climate change when designing buildings, including potential increased heating or cooling requirements.
- conducting research that will support further integration of climate change
- participates in nationwide efforts such as the U.S. Global Change Research Program and the National Climate Assessment processes
- modified risk management methodologies related to locating critical infrastructure.

For additional actions being taken by the Department of Defense and other Federal agencies, see Center for Climate and Energy Solutions (C2ES). February 2012 Update. *Climate Change Adaptation: What Federal Agencies are Doing.* http://www.c2es.org/docUploads/federal-agencies-adaptation.pdf and the Council on Environmental Quality web site: http://www.whitehouse.gov/administration/eop/ceq/initiatives/resilience

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