King County
2007 Climate Plan

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Executive Summary

This 2007 King County Climate Plan is the initial response to the Executive Orders on Global Warming Preparedness of March 2006 and King County Council Motion 12362 of October 2006, as described in Section 1. It provides an overview of how King County seeks to reduce greenhouse gas emissions and works to anticipate and adapt to projected climate change impacts, based on best available science. It builds on over 15 years of efforts across King County departments to stop the causes of climate change and to prepare for regional climate change impacts. Most of all, as described in "Reasons for Optimism" (Section 2), the King County Climate Plan is a forward-looking, ambitious and optimistic workplan based on the conviction that climate change is both a problem and an opportunity for leadership, public health improvements, and economic prosperity.

As a brief overview of the science behind climate changes already being observed, "Global Climate Change" (Section 3) outlines how human emissions of greenhouse gases – especially from burning of fossil fuels – are driving an increase in the temperature of the Earth's surface and oceans. Based on work from the Climate Impacts Group at the University of Washington and the Intergovernmental Panel on Climate Change report of February 2, 2007 this section then describes how warmer air and water worldwide is leading to a cascade of other climate changes, including but not limited to sea level rise, loss of sea and land-based ice, and decreases in snowpack and glaciers.

While greenhouse gas emissions produced within the King County region constitute only a small percentage of national and global quantities, our region can play a critical role in pioneering the policies, practices and investments that inform climate change mitigation efforts worldwide. In addition, as a region on the front lines of climate change impacts, King County and its partners are already implementing and refining practical preparedness steps, so that King County can provide leadership for governments worldwide to adapt to the inevitable changes that will take place.

"Greenhouse Gas Emissions" (Section 4) and "Impacts to the Pacific Northwest" (Section 5) provide the base of information that we must have to achieve emissions reduction and preparedness strategies: sources and explanations of our operational, regional, state and national greenhouse gas emissions; and a comprehensive picture of regional climate change impacts we can anticipate for the Pacific Northwest. As detailed in Section 4, the King County region's biggest source of greenhouse gas emissions is the transportation sector. As described in Section 4, regional public health, water supply and quality, property and infrastructure, government services, economic prosperity and biodiversity are vulnerable to climate change in numerous and different ways, as this region can expect warmer temperatures, some changes in precipitation, sea level rise, and reduced snowpack and streamflow. At this point, some aspects of climate change are well-known, such as increased frequency of fall and winter flooding,

whereas we are still learning about others, such as impacts to precipitation and storm intensity.

Finally, in both arenas of mitigation and adaptation, "Goals and Actions" (Section 6A and 6B) gives us reason for optimism. We not only issue a bold goal for our region—climate stabilization, or 80% reduction of greenhouse gas emission below today's levels by 2050—but we also detail the critical first and near-term steps to reach that goal. In addition, as a founding member of the Seattle Climate Partnership, we will work aggressively to help implement the recommendations of Seattle's Green Ribbon Commission. The Green Ribbon Commission's report and recommendations can be found at: http://www9.seattle.gov/climate/report.htm.

King County will develop clear greenhouse gas accountability and limits, and will implement practical, meaningful policies and investments in the following areas: climate-friendly transportation choices; clean fuels, clean energy and energy efficiency; and land use, building design and infrastructure. Many extraordinary efforts are underway on these counts, but we can and must be more ambitious. Bold planning and investments in these areas -- i.e. electrified transportation, more public transit, greenhouse gas accounting in capital projects, and expansion of green building practices -- are truly the foundation of our bridge to significant greenhouse gas emissions reduction. Simply put, to reduce greenhouse gas emissions we need cleaner cars, fewer cars and cleaner infrastructure.

At the same time, building a climate impacts-resilient community is a new challenge that King County is undertaking with innovative and highly practical thinking. First and foremost, King County is not only partnering with national leaders in climate science, such as the Climate Impacts Group at the University of Washington, but also developing climate expertise of its own. As a result, the regular climate information updates that King County decision-makers and planners receive put King County in an excellent position to invest in capital projects that will make our region more resilient.

The list of solutions that King County has developed in response to climate impacts information ranges from the Brightwater reclaimed water "backbone," which will provide relief to the region's water supply in context of predicted drought, to planned improvements to roads, bridges and seawalls, in context of sea level rise and flooding. It is important to note that in all of these decisions, climate change information is but one factor, and that the decisions King County has made so far also seek to maximize additional benefits of actions to public health, economic development, and environmental protection. Moreover, as described in "Performance Measurement" (Section 6C), it will also be critical to track, measure and share information about progress on these initiatives; King County officials recognize that we must learn from our experiences, if we are to adapt to the changes that are predicted.

Building on the excellent work already underway in many of the areas addressed in this plan, the King County Executive, departments and staff are committed to make this ambitious agenda a reality. Thus, this comprehensive plan of activities to reduce

greenhouse gas emissions and improve the resilience of the region to climate impacts represents not simply one reason – but a list of reasons -- for optimism about the issue of global climate change.

Climate change is real, but we have an opportunity now to prevent its worst impacts. If we act effectively during the next ten years —to take these steps to reduce global greenhouse gas emissions and to prepare our region for the physical impacts of climate change—we will be able to limit the severity of climate change consequences for 21st century and beyond.

1. Background on the 2007 King County Climate Plan

In March 2006, King County Executive Ron Sims issued Executive Orders on Global Warming Preparedness (PUT 7-5, 7-7 and 7-8), which directed King County to reduce greenhouse gas emissions and prepare for anticipated climate change impacts. These Executive Orders mandated that county departments take climate change actions with regard to land use, transportation, environmental management and clean energy use. These Executive Orders specifically required county departments to collaborate on development of a Global Warming Mitigation and Preparedness Plan (the "Climate Plan"), due to the Executive in January 2007. The Executive Order on Renewable Energy and Related Economic Development (PUT 7-6) similarly directed the development of a King County Energy Plan.

In October 2006, building on the Executive's policy directives, the King County Council passed Motion 12362, mandating that King County departments and the King County Executive submit a Global Warming Mitigation and Preparedness Plan (the "Climate Plan") to the Council on February 1, 2007, as well as an annual report in each subsequent year. Consistent with the abovementioned Executive Orders, Motion 12362 required specific actions to be taken in the following areas: emissions inventories, greenhouse gas reduction targets, land use, environmental management, emergency preparedness, energy use and transportation.

The full text of Executive Orders PUT 7-5 through 7-8 and Council Motion 12362 can be found in Appendix A and Appendix B. More information and a complete history of King County's efforts in the area of climate change are provided at the end of this section.

What the King County Climate Plan Is

This 2007 King County Climate Plan is the initial response to the Executive Orders on Global Warming Preparedness of March 2006 and King County Council Motion 12362 of October 2006. It represents the first major work product of King County's interdepartmental "global warming action team," convened by King County Executive Ron Sims in January 2006. Members of this team represent the Executive Office, the Department of Development and Environmental Services, the Department of Executive Services, the Department of Natural Resources and Parks, the Department of Public Health, and the Department of Transportation (Appendix C).

At the direction of the King County Executive and King County Council, this response consists of the following core elements and activities:

- It provides an overview of how King County seeks to reduce greenhouse gas emissions and works to anticipate and adapt to projected climate change impacts, based on best available science;

- It sets a process in motion to embed climate change mitigation and adaptation as critical factors in the cost-benefit evaluations of all decisions made by King County;

- It is a companion plan to the 2007 King County Energy Plan, a document detailing internal policies, programs and investments in climate-friendly, renewable energy that are critical to reducing operational greenhouse gas emissions and reducing dependence on foreign fossil fuels; and

- It builds on over 15 years of efforts across King County departments to stop the causes of climate change and to prepare for regional climate change impacts.

King County has taken significant steps in the past to address climate change. Nevertheless, this is the first document that brings all of King County's actions related to climate change together in one single plan.

Publication of this year's plan sets in motion a dynamic, ongoing evaluation and enhancement of King County's responses to the causes and effects of climate change. Future annual reports will provide more detailed information on the findings of evaluations and the results of improvements, including identifying areas in which we are making progress, as well as areas where we may need to increase or alter our efforts. We will track our actions consistently and carefully. As needed, future annual reports will recommend appropriate and successive modifications to this plan, including new steps to reduce greenhouse gas emissions and to prepare for regional climate change impacts.

The priority of actions described in this plan or of actions related to a particular issue will change as we learn more. Our current understanding of global climate change and regional impacts is not perfect. We will know more over time, with research and monitoring. Current and future generations in King County must be prepared to make informed decisions based on this new information. This plan must therefore be developed now with flexibility for future leaders to change course as we improve our understanding of greenhouse gas emissions, climate change impacts and the efficacy of mitigation and adaptation measures. In sum, protecting the health, safety and prosperity of King County in the long term will likely require that we develop new institutions and ways of thinking, and will almost surely require that our management priorities evolve.

What the King County Climate Plan Is Not

This plan is not a technical implementation plan for King County programs to reduce emissions and adapt to climate change impacts. Divisions and programs will create technical implementation documents based on the direction set forth in this plan. These documents are in development and, upon completion, will be available by request.

This plan is not a silver bullet to reduce regional emissions or protect King County residents and business from climate change impacts. Everyone is responsible for taking steps necessary to reduce greenhouse gas emissions. The severity and scope of impacts this century will depend largely on how much we are able to reduce global greenhouse gas emissions now and in the coming decades. Reducing greenhouse gas emissions is the best strategy we can pursue immediately in order to minimize the costly and even catastrophic potential consequences of future climate change impacts to our region's natural resources, built infrastructure and public health.

Finally, this plan is not a strict road map through the year 2050. As we learn more, we will be prepared to change elements of this plan over time.

The 2007 King County Climate Plan

The 2007 King County Climate Plan represents the continuation of an innovative work plan for both reducing greenhouse gas emissions – "mitigation" -- and preparing the King County region for the physical impacts of climate change – "adaptation." It describes the anticipated impacts of climate change on the region and on King County government, and it gives an overview of how King County plans to reduce climate-altering greenhouse gas emissions while preparing for the regional impacts that are already underway.

This year's plan is the first effort to incorporate climate change mitigation and adaptation systematically into King County agency activities, plans, policies and imminent or major investments. This year's plan accomplishes the following objectives:

- To set more ambitious goals for King County's actions on climate change mitigation and adaptation;
- To formalize and guide the process of incorporating climate change mitigation and adaptation goals into all relevant King County plans and policies;
- To encourage other agencies and governments to incorporate climate change mitigation and adaptation goals into their plans and policies;
- To place high priority on the emissions reduction strategies concluded to be most effective;
- To place high priority on the county's most urgent adaptation needs and the county's major planning and investment decisions that are currently up for consideration;

- To establish a long-term scope of work, including a statement of purpose and a "checklist" for mitigation and adaptation in management and program decisions; and

- To provide an initial process for tracking accomplishments.

Future annual reports will measure the county's progress on building climate change mitigation and adaptation into our management and programs, through establishing the following:

- More specific assumptions about greenhouse gas emissions and climate change scenarios in the decades to come;

- A framework to accommodate significant future changes and uncertainty;

- Current management objectives in light of projected emissions and climate change impacts;

- Revised management objectives and decision-making criteria in light of emerging climate change information; and

- Application of cost-effectiveness and risk criteria to guide decisions about timing and continuation of adaptive investments.

Unique Leadership Opportunities for King County

King County officials have the opportunity to pave the way on climate change mitigation and adaptation for other local and regional governments with the publication and sharing of this plan:

- King County is the largest regional government in the Northwest, with a nationally recognized record of environmental protection;

- King County is the 14th largest county in the country, by population;

- The King County region has extraordinary intellectual talent in climate science, clean energy technology, clean fuel development and engineering;

- The region has one of the world's leading climate research centers, the Climate Impacts Group at the University of Washington, which provides information on local climate impacts;

- The region has outstanding entrepreneurial leadership with biotech, software and corporate retail leadership; and

- The King County region per capita wealth is among the highest in the United States and the world.

Given this unique mix of talent, information, money, history and commitment, King County has an unprecedented opportunity to demonstrate leadership on municipal and regional climate change mitigation and adaptation. The King County Executive and the King County Council are responding to this challenge.

King County's Authority to Take Action

The first step for a government or agency to take in a climate change action plan is for its leaders to identify which elements of a climate change solution fall under its jurisdiction.

King County has broad authority to take the actions necessary to combat climate change. If built strategically into a climate change action plan, King County's numerous operational responsibilities, planning authorities, regulatory powers and opportunities for investment can influence and motivate both climate change emissions reduction and climate change adaptation.

The following matrix briefly describes the functions of King County in land use and growth management, transportation, water and clean energy, as related to this climate change action plan. Responsibilities in a given area are marked with an "x." Particularly important responsibilities are marked with an "xx."

	Planning	Regulatory Oversight (Permitting)	Operations and Maintenance	Opportunity for Investment
Land Use and Growth Management	xx	xx		x
Transportation	x		xx	x
Water / Environmental Management	xx	xx	x	xx
Clean Energy			x	xx

Here are some examples of the authority King County uses currently to *reduce* greenhouse gas emissions ("mitigation"):

- King County has a role in **regional land use and transportation planning and growth management,** including planning, maintenance and preservation of unincorporated areas' road and arterial system, maintenance of parks and trails, and purchase of property, all of which will help to make communities more walkable and healthier, and ultimately encourage people to drive less;

- King County operates **Cedar Hills Landfill, the region's largest transit fleet, several major wastewater treatment plants, and numerous buildings and facilities** that provide the opportunity for the county to reduce its operational greenhouse gas emissions and produce clean energy from waste gases;

- King County offers and markets **public transit service**, as well as other travel options for the region's residents, making it possible for commuters to carpool and thereby reduce greenhouse gases emissions from personal vehicle travel;

- King County, as a large urban regional government with a significant budget, has an opportunity to **advocate for and shape future federal legislation on mandatory nationwide reduction of greenhouse gas emissions**, both by developing carbon accounting expertise and by joining with other governments to advocate for a carbon market; and

- King County has significant **purchasing power as the manager of a major bus transit agency, a sizable passenger vehicle fleet, and numerous buildings and facilities**, such that its investment decisions and purchasing partnerships can help to stimulate important markets for clean energy fuels, clean energy bus technologies, waste-to-energy innovations, and green building products.

Here are some examples of the authority King County uses currently to *prepare for* climate change impacts ("adaptation"):

- King County employs a **world-class workforce of scientists** able to understand, evaluate and communicate important technical information about projected regional climate change impacts to policymakers and managers;

- King County's activities in **planning for, advising and investing in major public works projects** such as roads, bridges, seawalls, new office facilities, stormwater management systems and wastewater treatment plants represent critical decisions in which to consider future climate change impacts;

- King County's **public health and emergency preparedness** activities will become increasingly important to keeping the region's residents safe from climate change impacts such as new diseases, hotter summers, drought, and changes in regional hazards;

- King County's management of **flood hazards and shorelines** is necessary to help the region adapt to anticipated increases in fall and winter flooding, as well as anticipated coastal flooding from rises in sea level, exacting costs that are expected to increase with climate change;

- King County's responsibility for **stormwater management, wastewater operations, the Regional Wastewater Services Plan and facilitation of other regional water planning processes** ensures the county's role not only in protecting marine and freshwater quality from the impacts of climate change, but also in offering new opportunities (e.g. reclaimed water) for enhancing regional freshwater supply in the face of climate change-driven water decline; and

- King County's programs in **salmon recovery, biodiversity protection, forest stewardship, open space conservation, historic and cultural preservation, and agricultural support** provide opportunities to help the region protect its natural, historic and cultural resources, as well as related economic livelihoods, from the impacts of climate change.

As a result of this unique combination of responsibilities and opportunities, King County's potential for national and international impact—by **educating and partnering with residents, businesses, other levels of government and other governments worldwide** on its experience in any and all of these topics—is truly unparalleled.

In sum, King County's ability to direct climate-friendly policy, plans and investments in these areas is both a duty and a tremendous opportunity for the county to reduce climate change emissions and prepare for and adapt to the regional impacts of climate change.

King County's History of Climate Leadership

King County officials have shown concern for and leadership on climate change and related issues for over 15 years:

In 1988, King County Councilmembers Bruce Laing and Ron Sims proposed an ordinance to establish a county office of global warming. Sims and others followed this ambitious though ultimately unsuccessful effort with a number of initiatives that have helped King County reduce greenhouse gas emissions and prepare for climate change impacts. The March 2006 Executive Orders outlined these initiatives, the highlights of which include:

- Executive Order PHL 10-1 (AEO) of 2002 and Council Ordinance 11364 of 2000 approved King County's entrance into the Cities for Climate Protection and establishment of a greenhouse gas emissions inventory. The first King County inventory was published in 2002 and updated in

2003. The updated inventory is available at http://dnr.metrokc.gov/dnrp/air-quality/.

- Executive Order FES 9-3 (AEP) of 2001 directed departments to adopt green building practices and to form an internal "Green Team" responsible for development of countywide green policies. The Council also passed Green Building Ordinance 15118 in 2005.

- During a period of high energy prices in 2001, King County set a target reduction of 10 percent in energy usage. Related energy initiatives and conservation investments included: energy efficient lighting; modifications in heating, ventilating and air conditioning; and removal of portable electric space heaters. Although these initiatives were recalled once the energy prices returned to normal, the county experienced dramatic energy and financial savings during this period.

From History into the Future

With increasing concern at all levels of government for about climate change, King County has gained significant momentum on taking action to mitigate and adapt to the impacts of climate change in its region.

On October 27, 2005, King County and regional partners hosted a climate change conference. The goal of the conference was to engage a broad cross-section of Washington State governments, businesses, tribes, farmers, non-profits, and the community-at-large in a dialogue about climate change impacts and potential adaptations. With over 650 in attendance and follow-up activities underway, the 2005 Climate Change Conference delivered a road map for local governments to anticipate and adapt to changes in the following areas: agriculture, coastal areas, fisheries and shellfishing, flooding, stormwater and wastewater, forestry, hydropower and water supply. The Climate Impacts Group at the University of Washington developed materials for this conference.

In January 2006, Executive Sims convened the county's interdepartmental global warming action team, charged with reviewing every policy, plan and infrastructure investment in light of global warming emissions and impacts. This team's work plan resulted in the following:

- Executive Sims launched his "Acting Locally" initiative for global warming preparedness, and issued Executive Orders 7-5 through 7-8, which directed production of this 2007 Climate Plan (March 2006);

- King County announced a partnership with the Climate Impacts Group to write a guidebook for regional governments on how to adapt to climate change impacts, which will be published in 2007 by ICLEI – Local Governments for Sustainability (July 2006);

- King County began developing a mitigation "toolkit" for other regional governments, based on its experience investing in and using hybrid vehicles and buses, biofuels, waste-to-energy innovations, water reclamation and green building as elements of a comprehensive strategy to reduce operational greenhouse gas emissions (July 2006; available in 2007);

- King County was the first bus transit agency in the United States to join the Chicago Climate Exchange (CCX), a voluntary market in which members commit to reduce greenhouse gas emissions, and works actively with other government members of the CCX to advocate for a United States federal cap on greenhouse gas emissions (July 2006);

- The global warming action team actively collaborated with the King County Council to develop the motion resulting in Motion 12362, ensuring that climate change will be incorporated into King County's programs and functional activities (October 2006);

- Executive Sims convened an interdepartmental advisory team on climate change adaptation to develop this 2007 Climate Plan and hired a "global warming coordinator" to manage the plan's production (October 2006);

- King County and the Center for Clean Air Policy in Washington, D.C. launched an Urban Leaders Initiative to exchange lessons about dealing with global warming emissions and impacts among leaders of large urban regional governments (December 2006); and

- The Executive's Deputy Chief of Staff and lead for the global warming action team, Jim Lopez, was formally trained to deliver Al Gore's Keynote presentation from the film, "An Inconvenient Truth," and the global warming team is actively developing a calendar for the presentation (January 2007).

In 2007 and beyond, King County remains committed to demonstrating leadership and innovation in reducing greenhouse gas emissions and preparing for climate change impacts to this region.

How the 2007 King County Climate Plan is Organized

Following this first section of background, Section 2, "Reasons for Optimism," provides information on King County's unique leadership opportunity and history of action on this global issue.

Section 3, “Global Climate Change,” explains the problem, cause and anticipated progression of global climate change.

Section 4, “Impacts to the Pacific Northwest,” describes the best available information, as of publication of this , on anticipated climate change impacts to the Pacific Northwest, the Puget Sound region, and King County.

Section 5, “Greenhouse Gas Emissions,” provides an overview of the greenhouse gas emissions and limitations in greenhouse gas accounting.

Section 6, “Goals and Actions,” outlines goals and actions developed by King County departments as part of a work plan to reduce greenhouse gas emissions on operational, regional, state and national levels (as described in “Mitigation”), and to anticipate, prepare for and limit the risks and consequences of regional climate change impacts (as described in “Adaptation”).

Please see Appendices A and B for the full text of Executive Orders PUT 7-5 through 7-8 and the King County Council Motion 12362, respectively, and Appendix C for a list of departments participating in the interdepartmental global warming action team. The content of other appendices is noted throughout the document.

2. Reasons for Optimism

The 2007 King County Climate Plan sets the King County region on a path toward a more optimistic future.

Climate Change is a Problem…

Climate change is real and human-caused, and poses a threat to all living organisms. The Earth's surface and oceans are warming rapidly. Human burning of fossil fuels and deforestation are causing an increase in greenhouse gases in the Earth's atmosphere, and there is a broad consensus among scientists that this is driving unprecedented climate change. The consequences are dramatic, they are already underway, and the time to act is now.

At present, fossil fuel use is still widespread. Transformation of our global economy to be run on power sources that do not cause greenhouse gas emissions will take political will and time. Currently, major sources of these gases include electricity generation, transportation, manufacturing, construction, and residential and commercial heating processes. The United States government presently has no regulatory framework to mandate reduction of greenhouse gas emissions.

At the same time, regions are on the front lines of climate change impacts. If regional governments do not prepare for these impacts now, their residents and businesses will bear the incalculable costs of facing climate crisis after climate crisis for years to come. Given the potential for and likely impacts of climate change on future generations, poor planning or failure to start planning now would not be prudent.

It is true that a single government or agency does not have control over every action or strategy necessary to stop climate change or prepare for its impacts. However, a single government agency can and must collaborate with individuals, businesses, other agencies and other levels of government to implement lasting solutions.

… And It Is an Opportunity

While greenhouse gas emissions produced within the King County region constitute only a small percentage of national and global quantities, King County has a unique opportunity to demonstrate leadership on this global issue by pioneering the critical policies, practices and investments that will eventually drive reductions of greenhouse gas emissions in economies across the world. King County government recognizes its responsibility to help minimize and reverse these consequences, to be a leader for its citizens, and to provide support and encouragement to others throughout the country and the world. King County government and the King County region must do their part to slow, stop and reverse the growth of global greenhouse gas emissions.

While metropolitan county leaders cannot do this alone, it is important to remember that all major shifts in thought and action are the result of small incremental steps that have cumulative effects much greater in scope and consequence. In short, the response to climate change can and must start at home, one step at a time. King County's large land area, mix of urban and rural land uses, regional transportation system, and regional infrastructure—as described in King County Council Motion 12362 —are where a change can start when it comes to putting clean, climate-friendly solutions to work.

We do have a chance now to prevent the worst impacts of climate change. If we act effectively during the next ten years—to reduce global greenhouse gas emissions and to prepare our region for the physical impacts of climate change—we should be able to limit both the magnitude of climate change and the severity of its impacts.

Climate Change Action Has Other Benefits

It is important to note that climate change action will have added benefits in other areas. A clean-energy, climate-friendly future benefits all communities, in terms of public health, jobs, and community engagement. Despite the many negative outcomes of climate change, action on climate change mitigation and adaptation can have additional economic, social and environmental benefits to the King County region.

Our actions to mitigate and adapt to climate change is expected to result in additional positive outcomes. Healthier air to breathe as a result of the use of alternative fuels means less respiratory disease; more physical activity through pedestrian-scale development and construction of active transportation infrastructure means lower rates of certain chronic diseases; greater economic stability for agriculture means better public health with robust locally-based food systems and food sources; and development of a new markets means new jobs in clean energy and other related sectors. Water conservation efforts outlined here will help us not only adapt to future climate change, but also to take pressure off of water supply yields today.

It is clear that climate change is one of the most important challenges facing our world and regions today, but our realization of the problem now represents a significant opportunity for change. Thus, this plan carries an even stronger message of optimism than a work plan limited only to addressing the worst impacts of climate change. The vision behind this plan is one of a better future for the King County community, economy and environment.

In the meantime, however, In order to make decisions that match the urgency of our situation, move us toward a more climate-friendly global economy and prepare us for inevitable climate change impacts, policymakers must consider what lies ahead.

3. Global Climate Change

The Earth's surface has experienced extraordinary and rapid warming -- about 1 degree Fahrenheit since the late 1800s. In recent years, temperature increases have been observed in regions across the world. Eleven of the last twelve years have been among the twelve warmest on record, and 2006 was the warmest year on record in the United States, according to the National Climatic Data Center.

To develop a scientific consensus about the cause and effects of this warming, the Intergovernmental Panel on Climate Change (IPCC) was convened by the United Nations in the early 1990s. The IPCC has since released four major "assessment reports" with the following conclusions, based on peer-reviewed scientific and technical literature. (The content of this section is based heavily on a summary of the Intergovernmental Panel on Climate Change Fourth Assessment Report provided for policymakers, available at: http://www.ipcc.ch/SPM2feb07.pdf. An abbreviated bibliography of scientific papers used in the development of this plan is included at the end of this document.)

Human Drivers of Climate Change

On February 2, 2007, the IPCC released its Fourth Assessment Report, which stated with unprecedented confidence that human emissions of greenhouse gases are causing a rise in global average temperatures, as well as a cascade of other effects. It has been widely and authoritatively recognized, therefore, that climate changes being observed and predicted are not merely part of a cycle of nature. Human behaviors -- specifically, fossil fuel burning and land use patterns such as deforestation -- are driving global warming and related climate changes.

Direct Observations of Climate Change

Based on direct observations, the IPCC February 2007 report stated that both air and water temperatures have shown evidence of warming, that ocean warming in particular has caused seawater to expand, contributing to sea level rise, and that warmer air temperatures have led to decline of mountain glaciers and snow cover in both hemispheres. In turn, widespread decreases in glaciers and ice caps (which do not include contributions from the Greenland and Antarctic ice sheets) have contributed to sea level rise.

The IPCC February 2007 report also stated that many long-term climate changes have been observed, including "changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones (hurricanes and typhoons)." Widespread changes have also been noted in extreme

temperatures, with “cold days, cold nights and frost [becoming] less frequent, while hot days, hot nights, and heat waves [becoming] more frequent.” (IPCC, 2007)

These observed impacts have been different by places and times; they are not uniform. Regionalized predictions are thus critically important for local officials in crafting preparedness policies. This point is addressed thoroughly in later sections.

Projections of Climate Change

According to most scenarios, continued human emissions of greenhouse gas emissions at current and projected levels will lead to even more dramatic, potentially catastrophic changes in the natural climate patterns of the Earth. Given the continued rate of emissions and the atmospheric lifetime of those emissions, global temperatures are expected to rise and climate change is expected to worsen even if we stopped emitting greenhouse gases immediately and completely. Specifically, as reported by the IPCC in February 2007, a warming of about 0.2℃ per decade is expected for the foreseeable future, and even if greenhouse gases had been “kept constant at year 2000 levels, a further warming of about 0.1℃ per decade would be expected.”

This statement means that the Earth’s temperature is expected to rise another 3 to 10 degrees Fahrenheit by the year 2100 - a rapid and profound change. Moreover, as recognized by the IPCC, temperature change is already leading to a cascade of climate changes already in motion, including: reduction of snow cover; shrinking of sea ice; a “very likely” increased frequency of hot extremes, heat waves, and heavy precipitation events; a “likely” increase in intensity of future tropical cyclones (typhoons and hurricanes); and “very likely” increases in the amount of precipitation in high-latitudes.

Many of these changes described in that report will have—or are already having—disruptive effects on people’s lives and safety, and our broader political stability and prosperity.

4. Impacts of Climate Change to the Pacific Northwest

In fifty years, the climate of the Pacific Northwest could be dramatically different from what we know today. Our lifestyle, prosperity, comfort and health in King County and the Puget Sound region will depend on how well we prepare for future changes and respond to them as they occur. This will require "planning backwards" from likely future scenarios, based on best available information.

We cannot know exactly what the future will hold in terms of climate change impacts. To a large degree, the magnitude of future climate change impacts to this region will depend on how well -- and how soon -- we curb our global greenhouse gas emissions. However, working with experts on the cutting edge of climate science, we can develop a general picture of regional climate changes, update our understanding while more reliable information is developed, and apply climate change information to our policies and planning to the extent possible.

A Brief Note on Sources of Climate Science and Information

The primary sources of information contained in this section are: the Intergovernmental Panel on Climate Change; the Climate Impacts Group at the University of Washington; the technical subcommittee of the Regional Water Supply Planning Process; the Washington State Department of Ecology; King County experts; and numerous conferences, workshops and briefings on climate change held by King County.

Please note that specific sources for the information in this section are included in a bibliography at the end of this document; they are not cited directly in the text. A list of the conferences, workshops and briefings to King County decision-makers on climate change information is provided in Appendix D. A list of general informational resources on climate change impacts is provided in Appendix E.

This general overview is organized according to the following areas:

- Changes in temperature, precipitation, extreme weather and sea level rise;
- Major impacts to snowpack and glaciers, and major impacts to streamflows;
- Impacts to public health and safety;
- Impacts to land use, buildings and transportation infrastructure;
- Impacts to water supply, management and quality;
- Impacts to biodiversity and ecosystems; and
- Economic impacts.

Changes in Temperature

Average annual temperatures in the Pacific Northwest are projected to increase 2°F by the 2020s and 3°F by the 2040s, compared with the average climate of 1970 to 1999.

- The temperature of the Pacific Northwest is projected to warm at a rate of 0.2-1.0°F (~ 0.5ºF average) per decade through at least 2050. In contrast, the region warmed only 1.5°F over the entire 20th century, or 0.15°F per decade. According to this projection, the average annual temperature of the 2020s could be 1.9°F warmer than the average of 1970-1999, and the average annual temperature of the 2040s would be 2.9°F warmer than that same period.

- By the 2020s, the average annual temperature of the Pacific Northwest could increase beyond the range of annual average temperatures observed during the 20th-century year-to-year. This has serious implications for species that are particularly sensitive to temperature.

Temperature in the Pacific Northwest is projected to increase across all seasons; most models project the largest temperature increases in summer (June-August).

- In the 2020s, temperature in the winter period of October through March is projected to be 1.7°F warmer than the 1970 -1999 period, and temperature in the April through September period is projected to be 2.1°F warmer than that period. More detail is available at http://www.cses.washington.edu/cig/fpt/ccscenarios.shtml.

Temperature in the Puget Sound region is increasing more quickly than the global average.

- Warming in the Puget Sound Region has increased at a faster rate during the 20th century than the global average and increases in temperature are predicted to continue.

Warmer temperatures in the Pacific Northwest will lead to an increased loss of moisture from soil, vegetation and water bodies.

- Warmer temperatures in the Pacific Northwest will increase the rates of evaporation and transpiration (evapotranspiration) in both freshwater and salt water bodies of water.

Changes in Precipitation

At present, climate experts have higher confidence in projected temperature changes than they do in precipitation changes.

- Trends in average 20th-Century Pacific Northwest precipitation are difficult to detect, given how variable precipitation is on a year-to-year basis. Most climate models project a slight (less than 10 percent) increase in average annual precipitation for the Pacific Northwest, with most of the increase occurring during the fall and winter.

Increases in precipitation and changes in type of precipitation are possible in the Pacific Northwest.

- Future increases in average precipitation can be attributed at a general level to warmer temperatures and a potential shift in the atmospheric circulation patterns that bring rain to the Pacific Northwest.

- Warmer air masses hold more moisture, increasing the overall potential for more rain. Additionally, warmer winter temperatures cause more winter precipitation to fall as rain rather than snow.

More detail is available at: http://www.cses.washington.edu/cig/fpt/ccscenarios.shtml.

Changes in Extreme Weather

Climate change effects on the frequency and intensity of storms and extreme precipitation events in the Pacific Northwest are unknown at this time.

- Research and modeling is underway at the Climate Impacts Group to develop greater certainty in this area, especially with regard to windstorms.

- In the late 21st century, an intensification, widening and shift of the Pacific storm track could result in the Pacific Northwest experiencing increases in winter precipitation. According to modeling currently underway, higher temperatures at higher levels of the atmosphere could result in greater energy and water vapor in the atmosphere, potentially giving storms more strength. A westerly shift of the storm track could also enhance the "mountain effect," leading to greater precipitation on the western side of the mountains, and less on the eastern side.

Sea Level Rise

Sea level rise will not be uniform across Puget Sound; relative sea level rise may be greatest in South Puget Sound, which could experience a 3.3-foot rise by 2100.

- Regional sea level rise will depend on global sea level rise, coastal sea level rise driven by winds, and a combination of regional land movements (e.g. subsidence and local bathymetry).

- According to scenarios developed by Climate Impacts Group, South Puget Sound could experience a 3.3-foot sea level rise by the year 2100. This is in contrast to Neah Bay, which could experience a 1.3-foot rise in the same period.

Catastrophic sea level rise is possible if the Greenland or Antarctic ice sheets collapse.

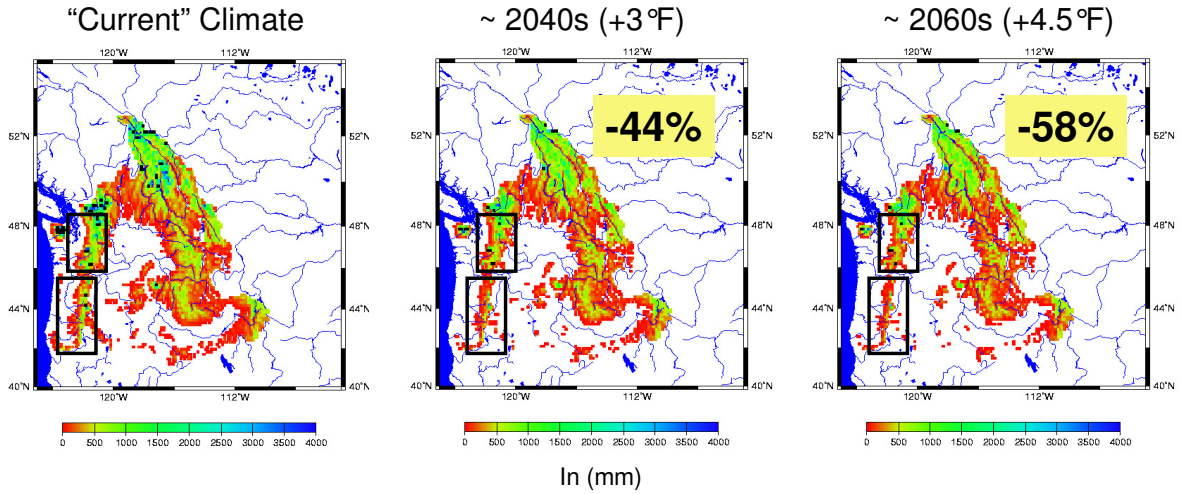
- If global temperatures reach a certain point, abrupt climate changes such as the melting of the Earth's major ice sheets and drastic sea level rise are possible sooner than expected. In the worst case scenario, catastrophic sea level rise is possible before the end of this century. In the best case scenario, it could be avoided with a dramatic and immediate reduction in greenhouse gas emissions.

Major Impacts to Snowpack and Glaciers

Predicted increases in temperatures and changes in precipitation associated with climate change will further reduce snowpack and glaciers in the Pacific Northwest mountains.

- Warmer winter temperatures contribute to more winter precipitation falling as rain rather than snow, particularly in mid-elevation basins.
- As a consequence of 20th-century warming, spring snowpack throughout the Western United States has been in decline during the 20th century. Most monitoring stations in the Cascade Mountains show losses in April 1 snowpack of 30 percent or more since 1950.
- Snowpack areas that are close to freezing in mid-winter will be most sensitive to warmer temperatures. Based on projected temperature increases, April 1 snowpack could experience a 44 percent loss by the 2040s, and a 58 percent loss by the 2060s.
- The effects of warmer temperatures on snowpack will not be uniform across the Pacific Northwest. Snowpack loss is and will be most pronounced in the Cascades and the Snake River Basin.
- Snowpack loss is and will be most pronounced in the Cascades and the Snake River Basin.

Changes in Simulated April 1 Snowpack for the Cascade Range in WA and OR



(Graphic from the Climate Impacts Group, University of Washington)

Major Impacts to Streamflow

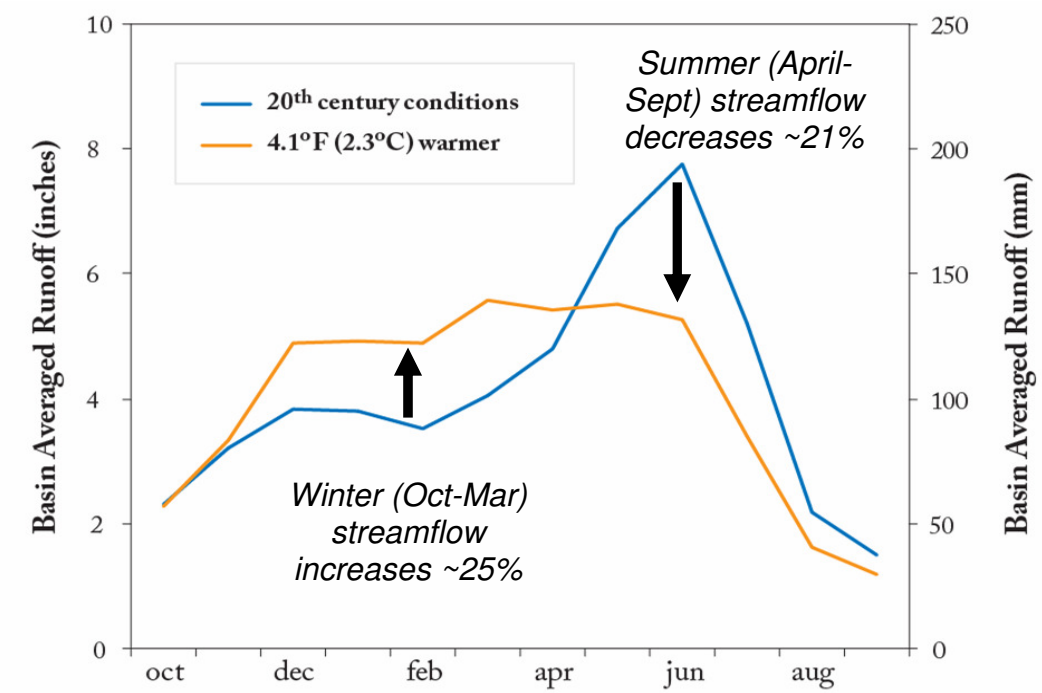
If more winter precipitation falls as rain and less accumulates as snow, snowmelt-dominant and mid-elevation "transient" (rain/snow mix) river basins in the Pacific Northwest will experience higher winter streamflows and lower summer streamflows.

- Peak spring runoff is moving earlier into the spring throughout the Western United States and Canada, with some of the greatest trends in the 20th-century (1948-2000) occurring in the Pacific Northwest.

- With a 4.1ºF warming (as of mid-21st century), winter streamflow in the Puget Sound Basin could increase by 25 percent, and summer streamflow in the Puget Sound Basin could decrease by 21 percent, as compared to 20th century conditions.

Warmer temperatures are projected to lead to earlier spring snowmelt and a shift in the timing of peak runoff.

- Projected warmer temperatures will lead to earlier spring snowmelt, and a shift in the peak flows of snow-fed rivers and streams away from summer and towards winter and spring.



Simulated average runoff for the Puget Sound Basin for 20th century climate (blue) and +4.1°F warming (approximately mid-21st century) (Graphic from the Climate Impacts Group, University of Washington)

We are still learning how instream flow impacts of climate change will affect specific bodies of water in King County's river system.

- King County Department of Natural Resources and Parks, Water and Land Resources Division will develop an in-depth technical analysis of the projected impacts of streamflows to large rivers and tributaries in King County. Below is a preliminary evaluation.

Preliminary evaluation of streamflow impacts in large rivers and tributaries.

Instream flow impact	Large rivers	Tributaries
Winter peak flows will be higher on average, and higher flows will be more frequent.	• Higher flood risk, with impacts to life, property, infrastructure. • More frequent mobilization of flood-related emergency resources. • Higher scour risk (i.e., lower egg-to-fry survival) for salmonids spawning in mainstem rivers. • More active channel migration in unconfined river reaches.	• Higher flood risk, with impacts to county roads and infrastructure. • Bank erosion in streams, with impacts to buried utilities, loss of farmland, water quality. • Lower egg-to-fry survival for tributary spawning salmonids due to siltation, scour and entombment.
Spring peak flows lower on average in snowmelt-dominated basins.	• Reduced risk of spring flooding. • Potentially negative impact on spring outmigration of juvenile salmonids.	• Lower average flows for steelhead spawning. May reduce spawner capacity in some streams and reduce access to certain streams. • Potentially negative impact on spring outmigration of juvenile salmonids.
Lower late-summer and fall flows.	• Exceedance of water temperature standards will be more frequent. • Exacerbation of the effects of pollutant concentration. • Reduced ability to meet instream flow requirements. • Reduced ability to meet out-of-stream demand (i.e., irrigation, municipal, industrial). • Reduced habitat capacity for stream-rearing salmonids.	• Reduced availability of surface- and groundwater for future development in basins where hydraulic continuity likely or evident. • Exceedance of water temperature standards more frequent. Lethal temperatures for salmonids likely in small, lowland tributaries. • Exacerbation of pollutant concentration. • Tributary access to fish compromised during low flow periods. • Reduced habitat capacity for stream-rearing salmonids.

(Preliminary analysis by King County Water and Land Resources Division)

Impacts to Public Health and Safety

Natural Hazards

Warmer temperatures and changes in precipitation will change the frequency, intensity and type of natural hazards faced by the Pacific Northwest.

- We will likely experience more frequent and more intense severe weather; flooding; landslides; drought; and forest fires. Climate change impacts already underway include an observed increase in the frequency and severity of river flooding.

- Climate change could also lead to the rise of hazards not historically experienced in this region, such as some associated with extreme weather (e.g. heat emergencies), reduced snowpack (e.g. drought), and others associated with sea level rise (e.g. coastal flooding, shoreline erosion and landslides).

Public Health

Climate change exacerbates existing threats and creates new threats to public health.

- As of 2000, the effects of climate change were already affecting public health throughout the world, according to the World Health Organization (WHO). The WHO estimated that 150,000 deaths were attributable to climate change across the planet, and that substantially more people who did not die, were experiencing a diminished quality of life due to non-fatal illnesses linked to climate change.

- The Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report highlighted early evidence of climate change impacts to public health, and evaluated some potential future health effects. This information has also been summarized in publications by numerous organizations, including the World Health Organization - United Nations Environment Program. It is likely that the Intergovernmental Panel on Climate Change Fourth Assessment Report, due this month, will have additional information on this topic.

- Current information on regional trends of climate change impacts to public health is also based partially on the January 2007 Washington State Department of Ecology report.

We are still learning about the effects of climate change on extreme weather and climate variability, as well as related impacts to public health.

- Climate change could lead to summertime weather substantially hotter than average, but we are still learning how this change could increase the risk of heat stress in the Pacific Northwest.

- Heat waves in August 2003 that affected all of Western Europe resulted in more than 15,000 deaths in France alone. In July 1995, "excessive heat" conditions were blamed for more than 700 deaths in Cook County, Illinois. In July 1993, similar temperature extremes led to roughly 120 deaths in Philadelphia, Pennsylvania.

Warmer average temperatures have direct effects on our natural and built environments in ways that adversely affect public health.

- Warmer average summer temperatures experienced in cities across the United States and elsewhere have led to premature death among certain populations including those who are elderly, very young, poor, or already burdened with chronic disease (e.g. hypertension, diabetes). The same populations are also adversely affected by temperature extremes and other climate change-driven hazards.

- Heat cramps, heat exhaustion and heat stroke incidence are examples of negative health effects associated with both average warmer summer temperatures and temperature extremes.

- Hotter temperatures may make people with certain heath conditions (e.g., diabetes and obesity) less likely to pursue physical activity critical to management and improvement of their health conditions.

- Again, we do not yet know how climate change will change the risk of heat stress in the Pacific Northwest.

Warmer temperatures affect air quality in multiple ways, potentially creating a range of negative health impacts.

- Warmer temperatures are typically associated with precursors of air pollutants, which are in turn linked to respiratory disease and reduced lung function.

- High carbon dioxide concentrations in the atmosphere -- independent of causing climate change -- are also associated with production of

allergens, such as ragweed pollen, which in turn can contribute to asthma cases by combining with fossil fuel pollutants (especially diesel exhaust).

Warmer temperatures and modest changes in precipitation will likely affect the spread and distribution of zoonotic diseases (diseases spread through animals).

- Infectious disease carriers, such as mosquitoes and ticks, are sensitive to temperature and moisture levels, as are their complex patterns of carrying and spreading disease. The expected changes in regional temperatures due to climate change will likewise change the distribution and dynamics of these species and their habitats.

- It is possible that emerging zoonotic diseases, such as West Nile Virus or the hanta viruses, which are carried and spread by rodents, may gain wider distribution in the region. Or, diseases that have been eradicated, like malaria, could return depending on environmental conditions.

Fall and winter flooding is expected to increase in the Pacific Northwest; urban flooding impacts are unclear.

- Flooding can affect public health directly through an increase in injuries and fatalities, and indirectly through loss of livelihood and property, and in turn degraded mental and social health conditions.

Climate change will affect the organisms that cause water and food-borne diseases.

- The population dynamics and distribution of microorganisms (i.e, certain viruses and protozoa) responsible for water and food-borne disease are expected to change in accordance with changes in temperature, precipitation, water salinity, and wind resulting from climate change.

- Disease incidence could increase through a variety of pathways, including human consumption of seafood and shellfish carrying *Vibrio* sp., water contaminated with *Cryptosporidium;* and food or water tainted with *Escherichia coli*.

- Another public health risk associated with increased flooding is the co-mingling of floodwaters with septic systems and toxics (e.g., various industrial and household maintenance products). In the event that these flood-borne pollutants repeatedly find their way to individual well systems, natural water bodies, or otherwise come in contact with people, there is a high likelihood of negative impacts to public health.

Climate change effects could worsen health inequalities.

- At the root of many public health problems are "social determinants." Examples of social determinants include, socio-economic status, stress, quality of early life care, earning potential, social support networks, food choices, and transportation options. These lifestyle characteristics and living and working conditions strongly influence health in terms of risk and burden. Populations in which these determinants are sub-optimal typically have poorer health, and thus experience health inequalities relative to the larger population.

- Populations already experiencing health inequalities will likely have far less resilience and adaptive capacity to respond to the myriad and interacting effects of climate change. With limited or no access to technological, medical, material, or information sources, these populations are not expected to fare well in the face of climate change.

Climate change will affect our global and regional food systems.

- Climate change impacts to food production in other parts of the world and country, as well as here in King County, will in turn affect our food and nutrition sources.

- Temperature changes and increased competition among irrigators for a smaller water supply will affect our agricultural economy (see "Agriculture" section). Warmer summers may cause the incidence of some pest species to increase, while causing others to decrease.

- The emerging concept of "food systems" combined with agroecological practices adapted to a changing climate, may come into greater play. Reducing "food miles" and other fossil fuel inputs to agriculture could mean higher quality nutrition choices, less processed foods, and more locally available fruits and vegetables.

Climate change will have direct adverse effects on workforce health in the region, which in turn has negative consequences for economic stability and growth.

- As a result of climate change impacts, premature death and disability, sick days, health care expenses and insurance claims are all expected to increase in frequency and cost.

- Changes in the range and spread of vector, food- and water-borne diseases will increase the costs of disease surveillance and monitoring, as well as the direct cost of medical treatment for disease outbreaks.

Impacts to Land use, Buildings and Transportation

Flooding Impacts and Costs

Climate change is projected to increase the frequency of flood events in most western Washington river basins.

- Current weather patterns and subsequent flooding events often exceed the protective capacity of King County's system of 500 levees and revetments. In their current condition, King County's flood protection infrastructure will not be able to withstand increases in flood frequency and severity. These facilities will experience accelerated rates of deterioration and diminished functionality, thereby increasing risks to human safety, public infrastructure and private property.

- Increased flooding frequencies and intensities may also pose risks to floodplain land uses not currently protected by flood protection infrastructure. Channel migration, riverbank failure, channel overtopping, inundation and other flood-related hazards will possibly affect portions of King County's floodplains that do not, or are rarely, affected by historical and present flood conditions.

- Increased precipitation in the form of rain could also have an impact on dam operations and associated ability to manage or control flows in major rivers.

We are still learning about the potential effects of climate change on urban flooding.

- The effect of increased frequency and intensity of flood events upon urbanized watersheds is currently being evaluated, with a specific focus on urban stream capacity, streambank erosion and stability, and deposition processes.

If climate change results in more frequent or longer duration flood events, infrastructure damage and economic losses will increase.

- Increased flood frequency and intensity will increase public investment needed, over time, to ensure public safety and functioning flood protection infrastructure.

- The impacts of flooding in King County are far-ranging and pose significant threats to public safety and regional economic viability. Flooding affects private properties, businesses, commercial activities, transportation corridors, and can directly or indirectly result in loss of life. For over 40 years, King County has undertaken significant mitigation and response actions to reduce the likelihood of flood related losses to citizens, property and infrastructure, and worked to prevent the creation of new flood risks. At the same time, funding constraint have compromised the county's ability to maintain, repair, and retrofit hundreds of aging levees, revetments, and flood protection facilities that citizens and businesses depend upon for public safety. (See "Flooding Impacts and Costs" text of "Goals and Actions" section for more information.)

- In King County, there are 37,000 acres of floodplain properties with a total assessed value of nearly $7 billion. In addition to property values, many commercial and industrial businesses are located within or proximate to King County's mapped floodplains. For example, Boeing's Renton Plant is located within the Cedar River floodplain and generates $5.3 billion in direct output annually. If flooding were to close the plant, it is estimated that there would be a $15 million loss in direct output per day that the plant was closed.

- Other regionally significant infrastructure and projects that are vulnerable to river flooding include:

  - The Tolt Pipeline, which carries 30 percent of Seattle's water supply;

  - The Snoqualmie Valley, including North Bend, Carnation, the City of Snoqualmie business district, areas of unincorporated King County, and 1,880 floodplain properties that are assessed at over $450 million;

  - The Lower Green River, including Auburn, Kent, Renton, Tukwila, areas of unincorporated King County, and 550 floodplain properties that are assessed at $1 billion;

  - SR 169, which carriers 51,000 vehicles per day;

  - The Renton Boeing plant, which provides 11,000 jobs to Renton and 22,000 jobs to the region, and, if flooded, could lose a direct output of $15 million per day;

  - The Southcenter Mall, which serves 20 million shoppers a year.

Catastrophic sea level rise would cause flooding of coastal areas, displacing both population and infrastructure.

- As mentioned previously, the extent of sea level rise will depend on how much water is displaced by melting of polar ice sheets, and how quickly that process occurs.

Shoreline Resources and Infrastructure

Sea level rise is likely to change the contours of the shoreline

- Sea level rise will change the shoreline ordinary high water mark and tidal zones.

- Catastrophic sea level rise is possible due to accelerated melting of land-borne ice in the Arctic and Antarctic. This could cause a change in sea levels by as much as 80 feet; such a change would take centuries to millennia to unfold. Prior to the 2007 report, the Intergovernmental Panel on Climate Change has estimated that sea level rise in this century will be most likely between four and 35 inches.

Sea level rise is likely to increase the rate and extent of coastal flooding, shoreline erosion and nearshore habitat loss.

- Flow changes and coastal flood frequency could affect the contours of 100-year floodplains.

- Sea level rise and storm events could make development and shoreline and marine infrastructure (e.g. ports, docks and seawalls) more susceptible to flooding.

- Wave encroachment further onto low-lying marine beaches could cause greater beach erosion.

- Increased moisture on steep slopes could result in more landslides.

- Along marine shoreline transport zones, composed of mostly stable bluffs and gentle sloping shorelines, a rise in sea level will likely cause the bluffs to become active feeder bluffs. A rise in sea level also will likely cause current feeder bluffs to become more active and increase erosion rates.

- If combined with increased storm occurrence and intensity (e.g. an intensification of the Pacific storm track), sea level rise of 1.3 feet to 3.3 feet during this century could lead to greater erosion of areas bordering

marine waters. Actual sea levels may exceed this range due to geological motions that affect different parts of the state's shoreline, so impacts will likely differ across the region as well.

- Inundation along the connection between Vashon and islands, a low-lying, narrow isthmus of land called the "Portage," could increase. This could affect the road and sever the connection between the islands. Other roads along beaches could require substantial infrastructure improvements to protect them from sea level rise.

- The Climate Impacts Group is currently conducting a technical review of climate change impacts to shorelines, with focus on the potential for coastal flooding, erosion and landslides.

- Sea level rise will lead to increased inundation of low-lying areas, increased risk of saltwater intrusion into coastal aquifers, increased risk to septic systems located in coastal areas, and increased risk of contamination from old landfills and hazardous waste sites located within areas affected by changes in sea level, high tide marks, and storm surges.

Sea level rise may lead to further loss of salt marshes, which provide important habitat for a variety of species

- Salt marshes are particularly vulnerable to loss where land areas are sinking (e.g. south Puget Sound) and/or where landward migration of marsh species is inhibited by development. Human development has already significantly reduced extent of salt marshes and eelgrass habitat.

Parks and Recreational Facilities

Climate change could have impacts to maintenance of parks and recreational facilities in King County.

- Parks and facilities along rivers could face damage from flooding and loss of property.

- The Parks Division could experience a shortage of water for irrigation.

Climate change could have impacts to operations of King County's buildings and facilities, depending on size, location and physical characteristics.

- Warmer temperatures are likely to lead to increased need for building cooling in the summer and decreased need for heating in the winter.

- Increased frequency of rain and extreme weather would require heavier use of stormwater systems in buildings and facilities.

Historical and Cultural Sites

King County's historical and cultural sites are vulnerable to a variety of projected climate change impacts.

- Changes in shoreline levels, tidal flows and storm intensity will impact historic resources such as steamer landings, sites associated with waterfront industries such as canneries and boatyards, and residential developments such as summer cabins.

- Shoreline changes and storm events will also potentially impact shell middens and other Native American archaeological sites, exposing them to potential destruction from increased erosion as well as increased vandalism due to their visibility.

- Changes in annual snow pack and snow melt have the potential to expose previously undocumented archaeological resources in alpine and sub-alpine areas.

- Flooding in historic agricultural areas may impact barns and other vernacular architectural resources as well as cultural landscapes associated with farming, ranching and orchards.

- Flooding along streams and rivers may impact historic commercial districts adjacent to the region's rivers, such as the towns of Skykomish, Snoqualmie and Duvall.

- Riparian flooding also has the potential to impact archaeological sites, often located at river confluences.

- Increases in extreme temperatures will require upgrades in historic residential, commercial and civic buildings such as weatherization and building systems.

- Extreme weather events are likely to damage fragile historic building material, such as wood shingle roofs, and buildings lacking foundations or reinforced structural systems.

- Environmental threats to historic wood buildings, such as pest infestations and rot, are likely to be altered or accelerated as temperature and weather patterns change.

- Increases in forest fires will affect cultural resources in the region's forests, including Native American Traditional Cultural Properties, historic industrial sites associated with mining, logging and railroads, and other historic resources such as ranger stations, cabins, and fire lookouts.

Climate change and related policy will have impacts to transit operations in King County.

- Changes in weather may increase storm events (e.g., flooding, ice, wind, snow) that may disrupt bus service and impede regional mobility.

- Increased summer temperatures could reduce the comfort level and public health of buses that lack air conditioning. (See "Public Health" section.)

Climate change will have impacts to roads and related infrastructure in King County.

- Changes in precipitation patterns and sea level rise may cause greater damage to roadways, bridges and seawalls from erosion, landslides, and flooding.

- Increased temperatures will not have a direct effect on transportation infrastructure. However, increased summer droughts could decrease the survivability of plantings used in wetland and stream mitigation or roadside landscaping, and could increase fire danger along roadways.

- Change in weather may increase other storm events (e.g., ice, wind, snow) that also require ongoing responses from road maintenance crews in order to maintain public safety and mobility.

- Increased demands on staff in response to storm damaged infrastructure reduces the available staff and equipment resources available to carry out normal day-to-day operations.

- Construction of infrastructure projects relies on predictable and reliable weather patterns in order to schedule and complete weather sensitive types of work. Variable and unpredictable patterns of weather will create scheduling conflicts for critical project work and will impact available resources. This will necessitate longer contract durations to complete

project work resulting in longer delays for the traveling public and a potential increase in project cost.

- Greater weather variations could result in the need for increased Temporary Erosion and Sedimentation Control (TESC) measures and their resulting associated costs. These measures are necessary in order to prevent damage to project work damage and to protect the environment from associated construction impacts.

Impacts to Water Supply, Management and Quality

Water Supply

Climate change is projected to increase the frequency of drought events in the Pacific Northwest, and to result in a decline in firm yields from the region's water supply reservoirs, based on existing operating guidelines.

- The bottom line is that the Pacific Northwest will experience increased competition for water and increased vulnerability to drought in the future. Reduced snowpack, which acts as a natural "reservoir" for storing water, will continue a long-term decline. Combined with earlier runoffs, this will depress critical summer streamflows.

Warmer temperatures in the Pacific Northwest are projected to lead to greater demand for water in the summer and fall, while reduced snowpack and lower summer streamflow are projected to lead to less reliability of water supplies during that time.

- Water systems must manage longer and more extreme drawdown periods over this high usage period of summer through fall than in the past.

We are still learning about the effects of climate change on groundwater aquifers.

- During low streamflow and high usage periods of summer and fall, groundwater aquifers may experience increased withdrawals and reduced recharge. However, information on this topic is not complete at this time.

Wastewater Operations

More fall and winter flooding and potentially greater intensity of rain would make ongoing wastewater operations more challenging.

- More fall and winter flooding and potentially greater intensity of rain lead to larger peak conveyance and treatment events. The large peak events, especially those that occur back-to-back over the wet season, are more difficult to manage.

- Increased volumes of rain, under evaluation at this time, can increase infiltration and inflow (I/I) into the wastewater system. I/I take up volume in the conveyance system, which can lead to wastewater back ups and

overflows. Reduction of I/I could become harder if rains continue to be as severe as in fall 2006.

- Possible increase in rain intensity, as is currently being studied, could lead to more combined sewer overflows in low and mid-elevation basins.

- If unchecked, more frequent floods and high groundwater will result in decreased capacity in the conveyance system and increased frequency of untreated overflows into nearby surface waters.

Sea level rise may cause damage and operational challenges for effluent outfall and combined sewer overflow equipment.

- Flooding into combined sewer overflow control facilities could cause damage to those facilities. Higher water levels can also reduce head pressure, which would in turn reduce the ability of combined sewer overflow equipment to push wastewater into receiving waters also reduce head pressure. This can lead to sewer system surcharges, back-ups, and eventually higher system costs.

- The location of existing and planned future facilities along shorelines may make the facilities more vulnerable to damage and underperformance due to storm surges, tidal action and limited shoreline access.

Operational impacts will result in higher operating costs and greater capital investment to replace equipment or add capacity into the system.

- Increased capital costs will be incurred when dealing with the impacts of higher sea levels on the effluent discharge systems and combined sewer overflow equipment. For instance, rehabilitation and/or relocation of combined sewer overflow equipment might be necessary, depending on sea level rise.

- The strain on regional financial resources in responding to other infrastructure needs could affect the Division's ability to respond to its own needed infrastructure improvements.

Stormwater Operations

Significant increase in rainfall intensity, which is under study at this time, would affect the quantity and quality of stormwater runoff, and may make ongoing stormwater management more challenging.

- Due to a possible increase in precipitation intensity associated with climate change, which is still being evaluated, stormwater facilities constructed in the past may fall short of achieving required protection levels in the future.

- Most King County facilities are currently constructed with a "design safety factor" that already requires significant capacity, so possible intensity of precipitation may not cause a problem for these facilities, at least in the near term.

- In general, we are still learning about the ways in which climate change will affect precipitation. The extent to which facilities will fall short is unclear at present due to insufficient information about how rainfall intensity will be affected. With research and monitoring now underway, King County will be better informed for decisions about stormwater facility design and management in the future.

Freshwater Quality

In the snowmelt rivers of the Pacific Northwest, lower summer streamflows and drought events associated with climate change will lead to a decline in freshwater quality.

- Lower water volumes due to lower average streamflow and more frequent droughts would concentrate pollutants, thereby reducing freshwater quality.

Climate change is projected to lead to changes in freshwater temperature, salinity and other physical characteristics.

- Warmer air temperatures and lower summer streamflows are projected to lead to warmer summer water temperatures.

- Estuary temperature range is expected to "narrow," based on warmer air temperatures and lower summer streamflows. This may be mitigated or amplified depending upon climatic impacts on Pacific source water flowing into Puget Sound.

- Increased winter streamflows and lower summer streamflows are projected to lead to larger changes in salinity.

- Freshwater is projected to have increased density stratification in the summer.

- Increased water temperature and density stratification could cause dissolved oxygen levels to decrease with depth.

Freshwater quality will depend on climate change impacts to wastewater operations and stormwater runoff.

- Increased winter precipitation and streamflows, if resulting in increased stormwater runoff, combined sewer overflows and / or leaking septic systems, could lead to increased winter counts of fecal coliform.

- Nutrient and sediment loading could vary. For instance, depending on the circumstances, runoff could lead to either an increase or a decrease in contamination by phosphorous and nitrogen.

Climate change impacts to freshwater quality will stress the plant and animal species of King County's lakes and rivers.

- Warmer waters in lakes and rivers have effects on plant and animal life (e.g. causing stresses to planktonic species) and can result in impacts on spawning success. For instance, warmer waters can pose barriers to adults to spawning areas and washout or exposure of eggs and smolts, which must be offset by strong recovery efforts that help to make populations more resilient.

- The frequency of moderate floods is expected to increase in basins dominated by transient snow zones, which include the majority of King County's rivers. Impacts associated with flooding (e.g. potential runoff and increased water speed and bed scouring) will have negative consequences for a number of species living in or near rivers, including salmon.

- Lower summer base flows of streams that are fed by snowmelt in the summer will have major effects on fish and other biota living in and near those streams.

Impacts to Biodiversity and Ecosystems

Salmon and Coldwater Fish

Climate change will likely have negative impacts to salmon during most life stages. Given these pressures, a diverse and robust salmon recovery effort will be paramount in limiting the effects of climate change.

- Warmer, decreased summer and fall streamflows will affect the spatial and temporal distribution of spawning salmon migrations. In many cases, the migration corridor may be affected, although changes to the spawning groups themselves may not be apparent.

- Increased winter flooding and resulting bed scour would exacerbate mortality rates of salmon during egg incubation and fry emergence.

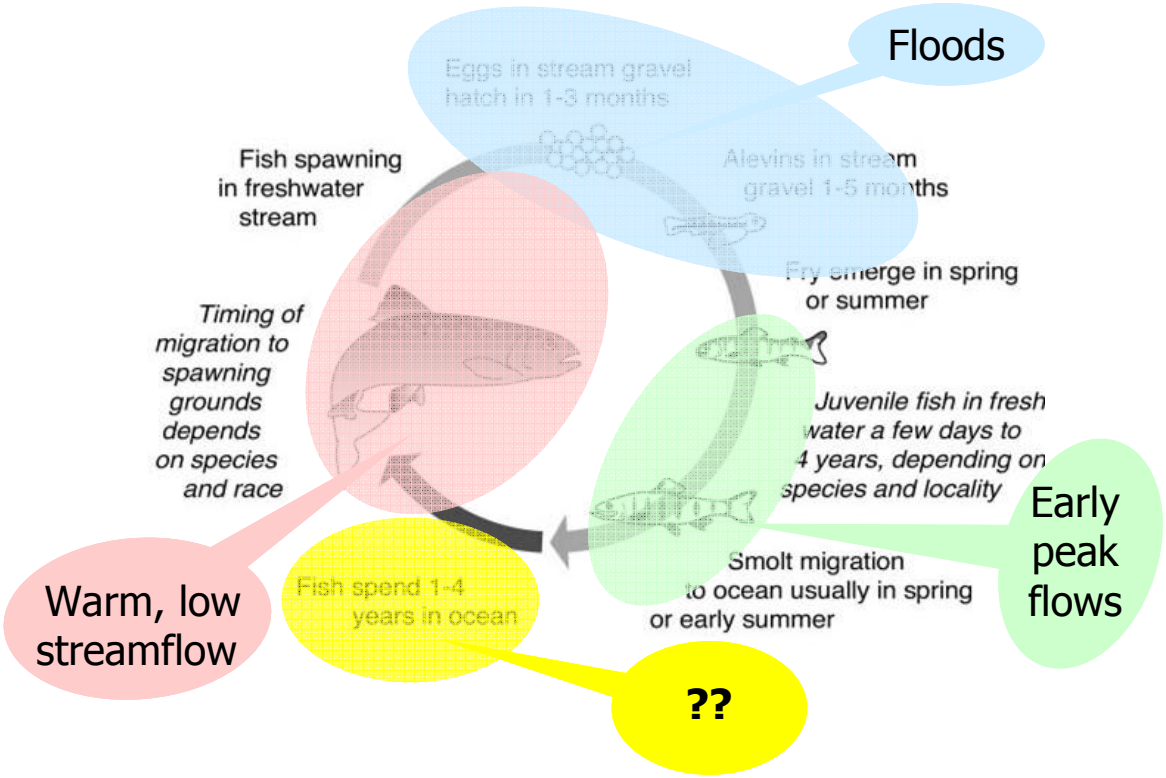
- Significantly earlier peak flows and higher temperatures for streams could disrupt the growth, survival and out-migration of juveniles in early spring and summer.

- Increased ocean temperatures will likely have impacts on salmon during the time that they spend in the ocean through changes to predator-prey relationships and food-web dynamics. Canadian scientists predict that some salmon species, notably sockeye and steelhead, will shift their ranges northward in response to oceanic warming in the north Pacific.

- To the extent that species are temperature-sensitive (as most species are to some degree), climate change will likely have the greatest adverse impact on fish, wildlife and plant species at the warmest (most southerly) edge of their range and most positive effect on those species at the coldest (most northerly) edge of their range.

- To the extent that it is temperature-driven, biodiversity may change as a function of southerly-oriented species expanding their range northward while more northerly-oriented species relocate or die off. The most likely scenario is for biodiversity to stay about the same or increase in the short-term, but decrease on longer time scales. Future biodiversity will likely become increasingly dominated by invasive, non-native, pollution-tolerant, edge-adapted and generally less-desirable species, as they expand or establish new ranges northward.

- Disease and fire effects on native fish, wildlife and plants will likely be exacerbated as all are related to temperature patterns.



Projected climate change stresses across the salmon life cycle
(Graphic from the Climate Impacts Group)

Warmer temperatures will increasingly stress coldwater fish in the warmest parts of our region.

- Increased air temperatures are well-correlated with increased surface water temperatures. The optimal water temperature range for most coldwater fish species in the Pacific Northwest region is 12-16 ^{o} Celsius. Projected increases in air temperatures will likely result in warmer water surface temperatures during spring and summer months. This increase in air temperature will not necessarily eliminate salmon and other coldwater fish from these regions. However, it will likely stress certain salmon species (e.g. summer and fall Chinook, summer steelhead, and sockeye salmon) during critical periods of their life cycle (i.e. freshwater migration, spawning and rearing).

Climate change will reduce water supplies at critical times and make salmon restoration more difficult.

- Warmer temperatures are projected to alter Pacific Northwest streamflows and lead to increased demand for water in the late summer and early fall, when water is expected to be in even shorter supply than now. This change could in turn cause greater conflict between already competing

interests of hydropower, habitat management and water supply management.

The cumulative effects of climate change on salmon and other fish could lead to a variety of broader consequences for biodiversity.

- Individual species could experience:
  - increases in direct mortality due to warmer temperatures, and indirect mortality due to reduced streamflow, fire, and disease;
  - altered growth rates;
  - altered local distributions;
  - regional range shifts;
  - biological invasions;
  - biological productivity;
  - altered timing of migration; and
  - spawning.

- Climate change will modify the broader food web and regional biodiversity in ways that we do not fully understand.

Biodiversity

Climate change effects on vegetation and wildlife will differ according to species.

- Sea level rise will adversely affect coastal wintering and migratory stopover sites for many bird species.

- Climate change on biodiversity (e.g., vegetation, wildlife) will affect species that have a restricted range and are closely linked to climate, vegetation or other factors the most.

- Climate change is predicted to hasten species extinction, especially for isolated populations already threatened by habitat loss and fragmentation. Disturbance can also create the opportunities for the establishment of new species, including invasive alien species.

- Wetland species will be disproportionately affected, as whole water-dependent ecosystems are altered by climate change. Amphibian-breeding chronology has already been shifted earlier in spring, causing a new overlap between salamander (predator) with larval frog (prey). Also, increasing temperatures will skew the sex ratio of reptiles such as painted turtles, with males increasing.

- In general, terrestrial habitats will move poleward (latitudinally) or upward (elevationally), and habitat fragmentation will block terrestrial wildlife attempts to migrate in response to such shifting habitats.

- Insects and other invertebrate populations will likely move northward, as is already being observed.

Marine Environment and Marine Water Quality

Climate change will lead to warmer water temperatures and other physical changes in the marine environment.

- Marine waters are projected to become warmer, and ranges in daily and seasonal water temperature ranges are projected to become smaller

- Increased winter and decreased summer freshwater runoff to Puget Sound will disrupt seasonal salinity and circulation, stratification, and mixing processes and patterns critical for maintaining current nutrient and productivity cycles.

- Increased winter freshwater runoff and sea level rise are projected to change inputs of biologically important nutrients to Puget Sound.

Climate change in regional marine waters and other parts of the Pacific Ocean will affect our fisheries.

- Warmer marine water temperatures may affect salmon migration patterns.

- Changes in the seasonal ice edge melt in the Bering Sea are already leading to shifts in fish species distribution. We are still learning about how these changes will affect Puget Sound-based fisheries.

Climate change may disrupt the marine food web, with significant potential consequences for marine biodiversity.

- Climate change may profoundly affect the Puget Sound ecosystem, affecting all levels of the food web, from phytoplankton to salmon and marine mammals. Effects will be both direct through temperature and salinity changes and indirect through shifts in species and food-web dynamics.

- Climate change will modify the food webs and regional biodiversity in ways that we do not fully understand yet, including: possible introduction

of exotic and/or invasive species; changes in eelgrass abundance; possible increases in shellfish toxin-producing algae; and changes in intertidal community structure and diversity.

- Impacts of climate change on individual species will depend on the individual species' and the marine ecosystem's ability to adapt to rapidly changing conditions, as well as our ability to limit climate change effects. Possible impacts to individual species include: altered growth rates, changes in survival rates, reduced reproductive output, compromised immune systems for fish and other marine animals due to warmer temperatures, and changes in food and habitat availability for migratory birds.

- Climate change impacts could further undermine important eelgrass habitat, depending on other factors. Climate change impacts could also damage important salt marsh habitat. Warming may favor growth due to shifts in streamflow, but could also lead to loss if water temperature exceeds the tolerance of eelgrass, or if sea level rise reduces the sunlight available photosynthesis.

- We can learn what to expect from climate change based on past experiences with sources of climate variability (e.g. ENSO, Pacific Decadal Oscillation), which already cause broad reorganization of marine ecosystems.

- Some species on the northern limit of their range may become more dominant.

Forests and Open Space

Warmer summer temperatures will have a negative impact on forest productivity, tree growth and forest water needs.

- Tree growth impacts from climate change will differ according to elevation. Subalpine forests could benefit from longer, warmer growing seasons and shorter snowpack duration. In mid-elevation forests, the impact of warmer summers and lower snowpack on growth will depend on precipitation change. In contrast, in low-elevation forests, warmer summers and potentially less summer precipitation could lead to a large growth decline.

- Changes in the range of insects as a result of climate change will have adverse effects on forest health.

- In the next 10 to 20 years, mortality of plants and trees are projected to increase due to insects, increased temperature and lack of groundwater in summer.

Regional forests face increased fire risk as a result of hotter and drier summers, dead trees, summer groundwater shortage and reduced soil moisture.

- In the next 10 to 20 years, Pacific Northwest forests are projected to experience increasing area and severity of forest fires, and in the next 20 to 50 years, Pacific Northwest forests are expected to have increases in fire frequency.

- Increases in forest fires will affect cultural resources in the region's forests, including Native American Traditional Cultural Properties, historic industrial sites associated with mining, logging and railroads, and other historic resources such as ranger stations, cabins, and fire lookouts.

- According to the Washington State economic impacts report, federal and state costs of fighting wildfires may exceed $75 million per year by the 2020s (a 2ºF warming), which is 50 percent higher than current expenditures. Similar figures for King County are not currently available.

- Tourism and recreation revenues may be reduced in some localities due to forest closures and smoke intrusion associated with larger, more frequent wildfires.

- Residences located within or in close proximity to the Forest Production District could face greater danger from wildfires.

Increased drought in the Pacific Northwest is projected to have negative impacts on regional forests.

- In the next 10 to 20 years, Pacific Northwest forests are expected to face increasing drought mortality, and increased difficulty in getting seedlings established in reforestation.

We are still learning about long-term impacts of climate change to forest biodiversity.

- In the next 30 years, changes are projected in forest communities, especially after expected disturbance from harvest, fire and insects.

- In the coming century, Pacific Northwest forests are projected to experience changes in the composition and density of species of trees, shrubs and herbaceous plants. The density of invasive plant species within forests is also likely to increase. It is also possible that fir, hemlock and other Northwestern coniferous forests will be replaced by pines that are more tolerant of drier conditions.

In time, climate change impacts to forest health will have further adverse effects on other systems.

- Open space and forested parks and trails could face an increase in threats from pests and fires.

- Salmon and wildlife will suffer adverse effects from reduced tree shade along rivers and lakes.

Economic Impacts

Insurance Industry

Climate change impacts are already having fiduciary, financial and economic consequences for businesses, consumers and industry.

- While the connection between climate change and extreme weather is still being studied (see "Changes in Extreme Weather" section), insurance industry leaders have begun to consider the physical and financial impacts of coastal storms and windstorms to "natural peril insurability." Reinsurers such as Swiss Re, Munich Re and General Re have also voiced concern about their financial exposure to climate change-related events.

- Lloyd's of London has published a major report, "Adapt or Bust," in response to concerns about climate-related risks for the insurance industry, in areas of: property, crops and livestock; health and life; business disruption; greenhouse gas emissions liability; and invested assets. That report urged insurers "to consider the impact that an unstable climate could have on global asset value," to evaluate potential impacts of climate change to business, and to inform underwriting with that climate change information.

- In conjunction with the Federal Emergency Management Agency, the insurance industry has begun to examine predictive models to determine new, currently "unrecognized" flooding and wind risks. New insurance models have predicted significantly higher losses in the coming five years. Lloyd's of London has specifically said that "industry needs to take a new approach to underwriting, by looking ahead and not just basing decisions on historical patterns."

- This widespread concern means that insurance availability and affordability are already becoming problematic for coastal homeowners in Florida, Louisiana, Texas and New York.

Agriculture

Projected impacts of temperature and precipitation on agriculture vary, depending on, type of crop, outbreak of pests and availability of water.

- Changes in seasonal temperatures, precipitation and resulting disruptions in natural predator-prey dynamics may cause the incidence of some pest, pathogen and weed species to increase, while causing others to decrease.

- In summer, agricultural lands are likely to face a lack of available water for irrigation, as peak flows in rivers and streams are projected to come earlier in the year, and precipitation during the summer season is projected to decline. The impact of this change on a crop's growing season will vary by crop type.

- In general, the extent to which climate change will affect groundwater is still unclear. More research and monitoring are necessary for King County to be well-informed about this issue.

Climate change will have unknown economic impacts to agriculture.

- The region's agricultural economy could see a change in what crops and livestock can be produced successfully, due to changes in temperature, precipitation and soil moisture. These changes could bring new opportunities, while making old practices more difficult. Therefore, both negative and positive impacts can be expected for the broader agricultural, landscape and horticultural industries.

- Farmers could experience increased flood damage to crops, livestock, soil, infrastructure, and machinery.

- The adverse impacts of climate change on local networks for food production, distribution and consumption (e.g. farmers' markets and related community-supported agriculture programs) have not been fully explored.

- The adverse impacts of climate change on local development of biofuels have not been explored.

Energy

Climate change could lead to shifts in power demand and production.

- Warmer temperatures are likely to lead to increased energy demand in the summer (i.e. for air conditioning) and decreased energy demand in the winter (i.e. for heating).

- Snowpack reduction and related shifts in peak streamflows is likely to shift peak hydropower production to earlier in the year. Projected higher winter, earlier peak- and lower summer streamflows would increase electricity production during the winter/spring but decrease production in the summer. As a result, it may be more difficult to satisfy competing summer water demands for hydropower, fish, irrigation and recreation.

- King County could feel impacts to energy demand and hydropower directly, in the form of higher energy costs for its facilities.

- It is worth considering whether a rise in intense winter storms could incur costs to the region's energy grid. This issue is currently being monitored; related information will be useful for long-term energy planning.

Workforce Impacts

Climate change will have direct adverse effects on the health of our workforce, in turn having negative economic impacts.

- As a result of climate change impacts to public health (see "Public Health" section), premature mortality, sick days, health care expenses and insurance claims are all expected to increase in frequency and cost.

5. Greenhouse Gas Emissions

Regional governments and nations across the world can only manage what they measure. The first step in managing greenhouse gas emissions, therefore, is to establish an inventory of those emissions.

Below is a chart of global greenhouse gas emissions, which includes the amount of metric tons of carbon dioxide (MTCO2e) that is generated worldwide, within the United States, the State of Washington, King County and King County government operations.

Table 1: Greenhouse Gas Emissions of the World, United States, Washington State, King County Region and King County Government Operations

Locations	Metric Tons Carbon Dioxide Equivalent (MTCO2e) – Annual	Percent World GHG Emissions
World	27,000,000,000	100.0000%
United States	7,100,000,000	26.3000%
Washington State	84,000,000	0.3100%
King County Region	23,000,000	0.0800%
King County Government	420,000	0.0015%

Most greenhouse gas emissions in the United States come from burning of fossil fuel, which creates carbon dioxide emissions. Coal, oil and natural gas are together responsible for approximately 84 percent of United States emissions. Decomposing biomass and fuel processing generates methane, which constitutes another 9 percent. Nitrous oxide, mostly from nitrogen in agricultural applications, contributes 5 percent. Synthetic chemicals account for the remaining 2 percent.

Table 2: Types of Greenhouse Gases Emitted in the United States (By Percentage of Total)

Types of GHGs (%)	Carbon Dioxide	Methane	Nitrous Oxide	Other
United States	84	9	5	2

These gases come from a variety of sources and can be categorized by sector: electricity, industry, transportation and other.

Table 3: Sources of Greenhouse Gas Emissions by Sector for the United States, Washington State, King County Region and King County Operations

Sources of GHGs (%)	Electricity	Industrial	Transport	Other
United States	39	18	32	10
Washington State	17	21	50	12
King County	10	10	60	20
King County (Govt Ops)	15	0	38	47

As shown in Table 3, the emissions profile of King County and its government operations are different from most emissions profiles for other regions and governments in the United States.

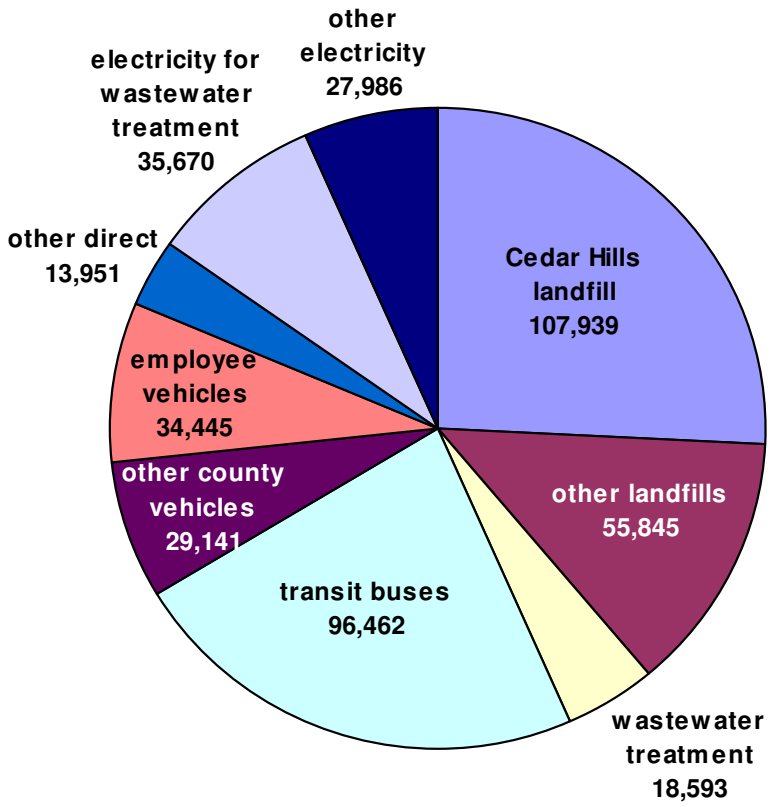
Two fundamental points should be derived from this chart. First and foremost, unlike the national profile, most of the greenhouse gas emissions in King County come from transportation. Unlike other parts of the United States, the King County region does not generate coal-powered electricity and has comparatively little heavy industry. Moreover, King County has nearly twice the national average of transportation-related emissions. These facts place a unique focus on transportation as the largest regional source of greenhouse gas emissions.

Second, in King County Government Operations, a large percentage of emissions comes from the "Other" category. These "other" emissions are largely attributable to the un-captured methane from our landfills and wastewater treatment plants. (Two of King County's primary functions are managing human and solid waste; waste management of biological material, or "biomass," generates methane from biological decay. Methane is 23 times more powerful in its greenhouse effect than carbon dioxide, so small amounts of un-captured methane can create large greenhouse gas emissions liability, in the form of carbon dioxide-equivalent tons.) Of the County's approximate 420,000 MTCO2e of greenhouse gas emissions, 182,000 MTCO2e come from Cedar Hills, other landfills and wastewater treatment.

Below is the 2003 King County Greenhouse Gas Inventory, which totals 420,000 MTCO2e. This 2003 King County Greenhouse Gas Emissions Inventory used

accounting software that was developed by the ICLEI – Local Governments for Sustainability and the National Association of Clean Air Authorities (NACAA).

Chart 1: 2003 King County Greenhouse Gas Inventory



In this pie chart, "other landfills" mean inactive landfills owned by the county; "other direct" means natural gas and fuel oil for heating buildings; and "other county vehicles" means non-transit vehicles.

While methane emissions from landfills and wastewater treatment constitute a large portion of King County's operational greenhouse gas emissions profile, there are limits to the reductions that can be achieved for these particular sources. This point has been addressed in development of mitigation goals and actions; more details are available in the 2003 King County Greenhouse Gas Inventory.

Limits to Greenhouse Gas Accounting

Accounting for greenhouse gas emissions is a young, evolving science and specific quantification for some emissions is very difficult. On one hand, quantifying carbon dioxide emissions for tailpipes and smokestacks is clear and straightforward, while quantifying methane emissions from landfills and wastewater is extremely difficult. Similarly, accounting for "sequestration" values – the ability of plants or forests to

absorb carbon dioxide – is also difficult. In addition, the greenhouse gas potency or "global warming potential" for individual greenhouse gases – specifically methane, nitrous oxide and others – are regularly adjusted by the United Nations' Intergovernmental Panel on Climate Change. In conducting emissions inventories, King County staff members must also pay particular attention to avoid double-counting emissions from both supply and demand sides of consumption.

Continued progress in developing accounting protocols is essential. For the purposes of this plan, most calculations should be considered approximate.

6. Goals and Actions

Information about the predicted impacts of climate change to the Pacific Northwest demonstrates that King County, like other regions across the world, is on the front lines of climate change. The reality that public health, property, economic prosperity and biodiversity are at risk from direct climate change impacts adds urgency to proposed actions to reduce human emissions of greenhouse gases that cause climate change.

Many extraordinary efforts are already underway in King County departments to reduce greenhouse gas emissions and take steps to prepare for regional climate change impacts. The following two sections provide information on both existing efforts and new goals and actions.

A. Mitigation

One common problem that arises when confronting the magnitude of worldwide greenhouse gas emissions is that the global total may seem to dwarf a single region's emissions, a contrast which could undermine the critical importance of local actions. For instance, because King County and its government operations numerically represent such a small percentage of total global emissions, citizens may feel that any action, however big or small, cannot be good enough to make a difference.

While rational, this attitude ignores the reality that many regions in the United States produce more greenhouse gas emissions per capita than most other regions of the world. King County fares better than the national average, but like all large metropolitan areas in the United States, still emits far more than other parts of the world. It is rational to say that these regions, including King County, thus have a responsibility to reduce their collective greenhouse gas emissions, in order to curb climate change and minimize its profound local impacts.

King County recognizes that it must first address greenhouse emissions from its own government operations. At the same time, King County recognizes that it must also do its utmost to try to affect climate initiatives at the regional, state and national level. As such, this mitigation section identifies the roles the County can play for each sphere of influence that it can affect: King County operations, King County region, Washington State and United States.

Elements of the mitigation section are thus organized into four sections:

1. King County Government Operations
2. King County Region
3. Washington State
4. Federal Government

Strategic Focus Areas

To plan for greenhouse gas emissions reduction, King County has further developed four strategic focus areas, which have guided policy, planning and investment in climate change mitigation solutions:

- Greenhouse Gas Accountability and Limits
- Climate-Friendly Transportation Choices
- Clean Fuels, Clean Energy and Energy Efficiency
- Land Use, Building Design and Materials

This section provides a series of goals and actions for King County to undertake in each of these strategic focus areas. Some activities clearly relate to more than one of these focus areas. However, we find it helpful to communicate with these broad themes, as we consider them to be the "critical levers of change" available to the county government.

Principles of Mitigation Planning

In planning for emissions reduction, the King County global warming action team kept several values in mind: focus on innovation and best practices, cost savings, practicality of solutions, and a commitment to collective advocacy.

King County Operational Emissions 420,031 MTCO2e

Table 4 describes King County's **operational** greenhouse gas emissions by clear emission-related sectors and in order of magnitude, to provide context for the mitigation actions outlined in this section. This emissions inventory was updated by King County in 2003, as directed by the King County Executive and King County Council.

Greenhouse gas "offsets" or "credits," such as landfill sequestration values, are not included. Furthermore, King County does not currently measure upstream, on-site or downstream greenhouse gas emissions related to major capital projects, such as emissions from the production and use of cement.

Table 4: King County Operational Emissions

	MTCO2e	% Total
Methane from biomass	**182,377**	**43.4%**
Cedar Hills	107,939	
Other Landfills	55,845	
Wastewater	18,593	
Transportation	**160,048**	**38.1%**
Transit Buses	96,462	
County Vehicles	29,141	
Employee Vehicles	34,445	
Electricity	**63,656**	**15.1%**
Wastewater	35,670	
All other sources	27,986	
On-site heating	**13,951**	**3.3%**
Total GHG Emissions	**420,031**	**100%**

More information on the King County operational greenhouse gas emissions inventory can be found at: http://dnr.metrokc.gov/dnrp/air-quality/.

STRATEGIC FOCUS:

Greenhouse Gas Accountability and Limits

Goal:

King County will achieve a climate stabilization target in government operations by reducing greenhouse gas emissions 80 percent below current levels by 2050.

More information about the nature and value of the climate stabilization target reduction of 80% below current levels by 2050 can be found in "Greenhouse Gas Accountability and Limits" in the regional section.

Action:

Based on King County Executive Orders PUT 7-5 through 7-8 on Global Warming Preparedness, King County Council Motion 12362, and the King County Energy Plan, King County will set an internal timetable to achieve the climate stabilization target in its operations.

The King County Executive, Council and departments have identified near-term targets to start the government on a long-term path of reducing operational greenhouse gas emissions to 80 percent below current levels by 2050. These targets have already been outlined in the "Acting Locally" package of initiatives that King County Executive Ron Sims launched as Executive Orders PUT 7-5 through 7-8 in March 2006 and the King County Council Motion 12362 of October 2006.

These Executive Orders and Council Motion set the following numerical targets for county departments to:

- Increase the amount of biodiesel used in all County diesel vehicles to 20 percent;
- Acquire land or development rights for an additional 100,000 acres of forestlands by 2010; and
- Ensure that at least 50 percent of King County's total non-transit energy use come from renewable energy sources by the year 2012, that at least 35 percent of transit energy use come from efficiencies and renewable energy sources by the year 2015, and that at least 50 percent of transit energy use come from efficiencies and renewable energy sources by the year 2020.

In response to those Executive Orders and Council Motion, the 2007 King County Energy Plan outlines activities for the county to reach a target of 50 percent renewable use across operations; for the county to be a leader in testing new, clean energy and climate-friendly fuels and technologies; and for the county to conserve 10 percent of energy across operations. This document, the 2007 King County Climate Plan, now details further activities that will help King County departments to achieve those near-term target reductions. With implementation of these activities, updated mid-term targets, and development of new activities over time, King County will be well in reach of achieving an 80 percent reduction of greenhouse gas emissions by 2050.

The full text of King County Executive Orders PUT 7-5 through 7-8 and King County Council Motion 12362 can be found in Appendix A and Appendix B.

Goal:

King County will be a leader in greenhouse gas emissions accounting and target-setting for reduction of operational greenhouse gas emissions.

Accounting principles for greenhouse gas emissions will continue to evolve. In the past, King County has been a leader in adopting and improving upon best practices for regional emissions calculations. In the future, it will be important for King County to stay up-to-date on developments, to understand the greenhouse gas implications of its programs, projects and policies, and to set an example of accounting that has integrity and transparency.

Action:

King County will meet its Chicago Climate Exchange operational greenhouse gas emissions reduction target of 6 percent below baseline year 2000 emissions by the year 2010.

In 2006, King County became the first county and the first major bus transit agency in the United States to join the Chicago Climate Exchange, as proposed by King County Executive Ron Sims and adopted by the King County Council.

The Chicago Climate Exchange is North America's only voluntary, legally binding market for reducing and trading greenhouse gas emissions, and is the most active carbon exchange in the United States. The Chicago Climate Exchange contract obligates King County to reduce emissions by 6 percent from a baseline of its year 2000 emissions.

The county took this step of entering the Chicago Climate Exchange in recognition of the need to make an immediate, legally binding commitment to reduce greenhouse gas emissions, based on measurement of emissions through a standardized inventory process. King County government is already on the way to achieving the Chicago Climate Exchange's reduction target, based on the activities outlined here and in the Energy Plan.

Action:

King County will complete and update its greenhouse gas emissions inventory on a regular basis using established greenhouse gas emissions accounting protocols.

Based on the Clean Air Initiative started in 2000, published in 2002, and updated in 2005, King County has developed significant expertise in greenhouse gas emissions inventories. King County experts have provided information and advice on best practices for greenhouse gas accounting to other specialists nationwide.

Well-recognized accounting systems have been developed throughout Europe. Within the United States, greenhouse gas accounting systems have been developed by the World Resources Institute, the California Climate Action Registry, the Chicago Climate Exchange, and the Regional Greenhouse Gas Initiative in the Northeast states, among others.

King County's experience in greenhouse gas emissions inventories have positioned it well to become a member of the Chicago Climate Exchange, and have also enabled King County staff to provide advice on the inventory process to other governments taking these first steps to measure and manage their operational greenhouse gas emissions.

Action:

King County will seek to assess upstream, on-site and downstream greenhouse gas emissions for major capital projects.

STRATEGIC FOCUS:

Climate-Friendly Transportation Choices

Goal:

King County will promote the use of climate-friendly modes of transportation by King County employees.

As described in the operational emissions table (Table 4), transportation is the second-largest source of King County's total operational emissions. This calculation of the county's operational transportation emissions includes emissions from employee vehicles (i.e. when used in commuting to work). Actions that reduce greenhouse gas emissions from King County's transit and non-transit fleets are described in "Clean fuels, clean energy and energy efficiency."

Action:

King County will continue to offer transportation benefits to all eligible employees.

King County already provides multiple incentives for employees to use alternative modes of transportation, most notably by providing benefits through King County's Employee Transportation Program. These transportation benefits include an employee "Flexpass" for free rides on Metro Transit buses, a vanpool fare subsidy, and incentives to employees who carpool (with at least one other person of driver age), bike, or walk to work at least 51% of all workdays and commute miles. Incentives currently include vouchers for discounts at a variety of businesses downtown.

King County Employee Transportation Program also offers the opportunity to participate in contests and promotions of Wheel Options, a statewide campaign of the Washington State Ridesharing Organization that encourages commuters to reduce their driving. More information on King County current employee transportation benefits can be found at: http://www.metrokc.gov/employees/transportation/default.aspx.

Achieving the reduction in single-occupancy vehicle rates called for in the Washington State's Commute Trip Reduction program will require increased support. According to current data, highest rates of single-occupancy vehicle trips are represented by commutes to employment sites in non-downtown Seattle and areas outside of Seattle; these commute trips should be targeted by further efforts.

In the near future, King County will also explore the possibility of providing parking preference or benefits for employees whose vehicles have low or no greenhouse gas emissions, based on fuel economy standards to be determined.

STRATEGIC FOCUS:

Clean Fuels, Clean Energy and Energy Efficiency

As described in the King County greenhouse gas emissions inventory: methane from biomass represents 43.4 percent of county operational emissions (182,377 MTCO2e); and transportation (county transit and non-transit fleets and employee vehicles) represents 38.1 percent of county operational emissions (160,048 MTCO2e).

Electricity use (with wastewater treatment operations as the major consumer) represents 15.1 percent of county operational emissions (63,656 MTCO2e); and on-site heating represents 3.3 percent of county operational emissions (13,951 MTCO2e). King County's electricity comes from Seattle City Light, Puget Sound Energy (PSE) and Snohomish Public Utilities District (PUD). When Brightwater Wastewater Treatment Division comes on line in 2011, 10 percent of the county's total load will be from the Snohomish PUD.

Goal:

King County will implement the 2007 King County Energy Plan.

The 2007 King County Energy Plan provides a blueprint for conserving energy, achieving greater energy efficiency and reducing greenhouse gas emissions from the County's government operations. Specifically, the 2007 King County Energy Plan outlines activities for the county to reach a target of 50 percent renewable energy use across operations; for the county to be a leader in testing new, clean energy and climate-friendly fuels and technologies; and for the county to conserve 10 percent of energy across operations.

As described in the 2007 Energy Plan, King County already undertakes numerous strategies that reduce greenhouse gas emissions while also conserving energy, reusing waste as resources, and saving money through waste reduction.

King County global warming action team will work with the newly proposed Energy Task Force to implement the recommendations of the 2007 Energy Plan that further reduce operational greenhouse gas emissions.

Goal:

King County will be a leader in the use of waste-to-energy and other technologies that reduce operational methane emissions.

As described in the operational emissions table (Table 4) above, methane is the greenhouse gas that King County emits in the largest volume. Primary sources of methane from King County operations are the Cedar Hills Landfill and King County wastewater treatment.

Action:

King County will continue to minimize methane emissions by maximizing use of best practice landfill management and waste-to-energy technologies.

Based on years of experience, King County has been able not only to limit emissions of methane, one of the most potent greenhouse gases, but also use methane as a source of energy for its operations.

To date, King County Department of Natural Resources and Parks' (DNRP) management of the Cedar Hills Landfill has far exceeded the national landfill average of methane gas capture (with current capture at approximately 90-95 percent). This high capture prevents over 200,000 metric tons of methane-based greenhouse gas emissions from entering the atmosphere. If continued, effective management by King County of the Cedar Hills Landfill will provide the additional benefit of storing carbon-based plant matter for more than 100 years, sequestering over 270,000 metric tons of greenhouse gases a year, and serving as a carbon "sink" as long as the landfill is open.

In order to determine the appropriate value of landfill sequestration in a potential "carbon market," King County is already working with experts within the waste management, government and academic communities to further refine accounting protocols for landfill sequestration.

King County is also now in the process of developing a program that will convert this high capture of landfill methane into energy, thus achieving a co-benefit of displacing fossil fuel energy use for operations and creating additional greenhouse gas reductions of more than 100,000 metric tons.

At the same time, King County's management of wastewater operations at South Treatment Plan has enabled recapture of methane for heat and energy use within the plant that would otherwise have been released as 12,000 tons of greenhouse gas emissions. This recaptured methane is used for the operation of a hydrogen fuel cell within the plant, which was designed and operated as the first of its kind, on an $8,500,000 grant over eight years from the United States Environmental Protection Agency. This demonstration project, in partnership with the private organization Fuel Cell Energy, is considered to be an advancement of public sector use of hydrogen fuel cell stationary technology.

Moving forward, King County staff will research, evaluate and report to the Executive on best practices, innovations, trends and developments in landfill sequestration practices,

as well as technologies that can help divert methane from emissions into valuable energy.

For greater details on King County's actions to reduce methane emissions, please see Appendix G.

Goal:

King County will be a leader in the use of transportation fuels and technologies that reduce operational greenhouse gas emissions from its fleets (both transit and non-transit).

As described in operational emissions table (Table 4), transportation is the second-largest source of King County's total operational emissions. This calculation of the county's operational transportation emissions includes emissions from King County fleets (both transit and non-transit). Reduction of emissions from employee vehicles is addressed in "Climate-Friendly Transportation Choices."

Action:

King County will maximize the use of hybrid-electric, electric and other clean transportation technologies in its fleets (both transit and non-transit).

King County accomplishments in use of clean transportation technologies in its transit and non-transit fleets have been recognized nationally, by awards or grants from the American Lung Association, the Environmental and Energy Study Institute, the United States Department of Energy, and the United States Environmental Protection Agency. More information on the extensive work of King County Metro Transit and King County Fleet Administration Division can be found in Executive Order 7-5 in Appendix A.

Additionally, in late 2006, King County was among the first in the nation to purchase hybrid diesel-electric trucks, and created a consortium of 14 fleet departments in Washington State to buy even more -- leveraging the collective purchasing power of those fleets. The purchases will be funded with the help of a $250,000 grant from the Environmental Protection Agency (EPA), and another $150,000 grant recently awarded by the Puget Sound Regional Council. At this point, the hybrid trucks cost approximately $40,000 more than regular diesel trucks, but consortium members expect prices to drop as more orders are placed.

King County's continued use of electrified transportation will be a core element of its activities to reduce greenhouse gas emissions. Historically, King County has used electric trolleys in urban areas of King County, with the co-benefits of minimize emissions of greenhouse gases and particulate matter, and reducing noise pollution. King County's experience with electric trolleys has demonstrated that electrified transportation can be beneficial not only in terms of climate change mitigation, but also

improvement of urban on-street air and sound quality. King County Fleet Administration Division has also been a participant in Austin Energy's Plug-in Partners National Campaign, and has made a "soft order" for 430 plug-in hybrid-electric vehicles.

Action:

King County will maximize the use of clean transportation fuels in its fleets (both transit and non-transit).

King County Metro Transit has been on the cutting edge of use of biodiesel and ultra-low sulfur diesel in both transit and non-transit vehicles, as described in Executive Order 7-5. At present, using a blend of 20 percent biodiesel in all appropriate vehicles, King County Metro Transit is the largest single user of biodiesel in Washington State.

King County's experience has demonstrated that clean fuels can be beneficial not only in terms of climate change mitigation, but also improvement of urban on-street air quality and, consequently, public health. In addition, King County's significant purchase of biodiesel helps create support for in-state production of biodiesel and oilseed crops.

King County Metro Transit and Fleet Administration Division will continue to purchase biofuel and flex-fuel vehicles, as they are available.

Action:

King County will implement demonstration projects that use electric and hybrid-electric transportation technologies and biofuels, hydrogen, and other clean transportation fuels, to showcase new applications for both public and private sector.

King County has a long history of demonstrating early innovations in transportation fuels and technologies. One notably successful example has been the continued application of General Motors hybrid-electric bus technology, which was initiated as a demonstration and has since helped to stimulate adoption of the technology by governments nationwide.

In the future, King County has also begun to explore the possibility of a hydrogen fuel cell vehicle station demonstration project, building on its experience with a stationary hydrogen fuel cell demonstration project. Fleet Division is also actively pursuing the purchase of plug-in and electric vehicles, as possible demonstration projects in its passenger fleet.

Action:

King County will purchase locally-produced energy sources when available and financially feasible.

Purchase of energy from local sources has multiple benefits: it keeps money and jobs in the region, while also reducing greenhouse gas emissions from long-distance transportation of fossil fuels.

Action:

King County will seek local and federal support to expand the use of alternative fuels and clean energy technologies in transportation.

King County has over time won numerous local and federal grants, in support of a long list of demonstration projects and clean fuel and energy investments in transportation. A number of these are listed in Executive Order 7-5, in Appendix A.

Most recently, in fall 2006, the United States Environmental Protection Agency awarded a $250,000 grant to the Northwest Hybrid Truck Consortium, a group of fleets organized by the King County Fleet Administration Division to use joint purchasing power to buy hybrid trucks in bulk and at lower unit price.

King County will continue to advocate for expanded tax incentives, bulk pricing formulas, and other mechanisms to expand the market and reduce prices for alternative fuels and clean energy technologies for transportation.

Action:

King County departments will research, evaluate and report to the Executive and Council on best practices, innovations, trends and developments in transportation fuels and technologies that reduce operational greenhouse gas emissions.

STRATEGIC FOCUS:

Land use, Building Design and Materials

Goal:

King County will continue to reduce greenhouse gas emissions from its buildings and infrastructure investments through climate-friendly design, development, use and demolition.

As described in the operational emissions table (Table 4) greenhouse gas emissions from electricity use represent 15.1 percent of total county emissions; under half of these emissions are from non-wastewater building sources. Also described in Table 4, on-site heating is responsible for 3.3 percent of the county's total operational emissions.

King County actions to reduce energy consumption and greenhouse gas emissions specifically from electricity use and on-site heating can be found in the 2007 King County Energy Plan. The goals and actions outlined here complement those activities outlined in the Energy Plan, by providing broader information and direction on King County's work in green building practices and capital projects.

King County Executive and staff have a history of accomplishments in reducing greenhouse gas emissions from the county's buildings, facilities and infrastructure investments, and leading the region in green building practices. Highlights include: creation of an internal countywide Green Team, passage of the 2005 Green Building Ordinance, and development of a Green Building Strategic Plan. In 2006, King County Executive Ron Sims won the Built Green Hammer Award from the Master Builders' Association of King and Snohomish Counties.

To achieve further reductions of greenhouse gas emissions from buildings, facilities and material use, King County departments must work together to facilitate greater internal adoption of climate-friendly design and materials, such as are used in green building practices.

Action:

King County departments will work together to renew the King County Green Building Ordinance, seeking new opportunities to reduce operational greenhouse gas emissions.

The cross-departmental team working to renew the Green Building Ordinance will include in their workplan the following topics: achievement of LEED-Gold certification for new King County buildings; Forestry Stewardship Council-certified wood and salvaged wood products; strengthening of the Environmentally Preferable Purchasing Program to include a broader scope of materials; and use of recycled petroleum products where appropriate. The team will also work to support complementary

objectives, such as the "Three Rs" (Reducing, Reusing and Recycling), which not only reduce emissions related to manufacturing consumer products, but also benefit the county in other ways, such as reducing the costly need for landfill space.

Action:

King County will develop a concept paper on how to account for greenhouse gas emissions voluntarily into cost-benefit evaluations of county capital projects.

As a major regional consumer of building materials in its capital projects, King County has a significant opportunity to be proactive in demonstrating how to account for greenhouse gas emissions across stages of capital design and construction.

Action:

King County will develop written guidelines and training to facilitate more consistent and effective incorporation of green building measures into infrastructure projects.

Based on a recent internal survey and related research, the Green Building Team has developed an understanding of: the effectiveness of past green building programs, information and training, as well as a sense of the remaining barriers to adoption of green building practices across county departments.

The results of this survey have informed internal programming and training on green building practices, as well as a *Green Tools* CD that will serve both internal and external customers. This training CD, ready for release in 2007, is intended to help make internal adoption of green building practices easier to understand and pursue. More information about this CD is also in the regional section ("Land Use, Building and Design").

King County has an opportunity to reduce barriers to the use of green building materials and practices for county capital projects, to ensure that green building practices are applied more effectively in the planning, design and construction of such infrastructure projects.

Goal:

King County will be a leader in the development and use of technologies, materials and waste reduction practices that reduce operational greenhouse gas emissions.

Information about greenhouse gas emissions from the production and use of cement and other materials is not currently reflected in King County's operational inventory. However, it is important to recognize that cement is a particularly greenhouse gas-intensive material to produce, with every pound of cement that is manufactured resulting in approximately one pound of greenhouse gas emissions.

Cement substitutes presently available to King County can provide almost 100-percent reduction of greenhouse gas emissions on a pound-for-pound basis.

Action:

King County will continue to implement construction projects that demonstrate higher percentages of cement substitutes.

King County has used small amounts of fly ash in its buildings for decades. Three years ago, King County began a concerted effort to increase cement substitutes of fly ash and slag. Please see Appendix H for more information on cement substitutes.

In 2003, King County held a training seminar on cement substitutes for many of its construction engineers and capital improvement project managers. The following year, two more training seminars were held. Over 100 engineers and project managers participated in the three training seminars. In 2005, the King County's material lab conducted tests on slag. The testing confirmed the efficacy of slag as an excellent substitute. Now, King County Roads Division has successfully done its first project with a 35 percent blend of slag.

King County is now exploring a number of additional projects to demonstrate the efficacy of cement substitutes. The Department of Transportation (DOT) is reviewing additional projects that could contain higher percentages of cement substitutes. The Department of Natural Resources and Parks (DNRP) is exploring a 50 percent blend for a new solid waste transfer station. Additional construction projects will be explored in the Transit Division (DOT) and the Parks Division (DNRP).

Finally, King County adopted of a "Silver LEED" standard for building construction. This standard provides incentives for using cement substitutes by awarding "innovation points" to projects that reach this higher benchmark of environmental and energy design. Collectively, these efforts have laid significant groundwork in helping design engineers, capital improvement project managers and construction contractors to make good progress in overcoming decades of traditional use of cement in construction projects.

Action:

King County staff will research, evaluate and report to the Executive and Council on best practices, innovations, trends and developments in waste-to-energy, climate-friendly materials, and waste reduction practices, as relevant to greenhouse gas emissions reduction.

King County Community Emissions 23,000,000 MTCO2e

Table 5 describes King County and Puget Sound's **regional** greenhouse gas emissions by clear emission-related sectors and in order of magnitude, to provide context for the mitigation actions outlined in this section. This inventory was provided by the Puget Sound Clean Air Agency.

Table 5: King County Community Greenhouse Gas Emissions (23,000,000 MTCO2e)

On-Road Transportation	11,500,000	50%
Off-Road Transportation	2,300,000	10%
Commercial / Residential	4,600,000	20%
Industry or "Point Source"	2,300,000	10%
Electricity	2,300,000	10%

More information on King County and Puget Sound's regional greenhouse gas emissions inventory can be found at: http://www.pscleanair.org.

STRATEGIC FOCUS:

Greenhouse Gas Accountability and Limits

Goal:

King County will work with federal, state and local governments and leaders to achieve a climate stabilization target for the region by reducing greenhouse gas emissions to 80 percent below current levels by 2050.

Some scientists suggest that governments and leading businesses of the world have a very short window of opportunity to start on a path of permanent and long-term reductions of greenhouse gas emissions, before global temperatures rise to a dangerous level. King County recognizes that this timeframe is in fact an opportunity for development of consensus among federal, state and local governments and business leaders on the best, most economically healthy ways to reduce greenhouse gas emissions in our region. King County also recognizes that the region must act quickly, and decisively, to set bold targets for regional reduction of emissions.

In scientific terms, "climate stabilization" means sufficiently reducing global greenhouse gas emissions to avoid dangerous climate change impacts such as large increases in sea level rise, more intense hurricanes, prolonged droughts, devastating floods and world-wide loss of freshwater. Leading experts generally agree that for the United States this means an 80 percent reduction below current 2007 greenhouse gas emission levels by 2050.

In late 2006, the State of California and Governor Arnold Schwarzenegger adopted A.B.32, setting immediate targets for reduction of greenhouse gas emissions, which were intended to set the state on a path to climate stabilization.

Federal lawmakers have introduced and voiced support for reductions necessary for climate stabilization. As of 2007, proposed United States federal legislation that set reduction targets for or near climate stabilization included:

- S.3698, introduced by Senators Jeffords (I-VT) and Boxer (D-CA), requiring an 80 percent reduction in greenhouse gas emissions below *1990 levels* by 2050

- H.R.5642, introduced by Representative Waxman (D-CA), requiring an 80 percent reduction in greenhouse gas emissions below *1990 levels* by 2050

- S.4039, introduced by Senators Snowe (R-ME) and Kerry (D-MA), requiring a 65 percent reduction in greenhouse gas emissions below 2000 levels by 2050.

Business coalitions have voiced collective support for mandatory reductions of greenhouse gas emissions nationwide. Alcoa, BP America, Caterpillar, Duke Energy,

DuPont, FPL Group, PG&E Corporation and PNM Resources coalesced with environmental organizations to propose: "Mandatory approaches to reduce greenhouse gas emissions from major emitting sectors including emissions from large stationary sources, transportation, and energy use in commercial and residential buildings that could be phased in over time, with attention to near-, mid- and long-term time horizons."

The environmental community is actively supporting legislation that will put the United States on a path to climate stabilization targets. The Union of Concerned Scientists, Environmental Defense, the Natural Resource Defense Council, the World Wildlife Federation and the Sierra Club support the Jeffords-Boxer and Waxman bills for climate stabilization. The National Wildlife Federation proposes 2 percent reductions per year starting in 2010 and reaching 80 percent reductions by 2050.

Locally, the National Wildlife Federation, Climate Solutions, Sierra Club, the Northwest Energy Coalition and WashPIRG, among others, support legislation requiring long-term greenhouse gas reductions to achieve climate stabilization.

The Puget Sound Clean Air Agency has included the climate stabilization target of 80 percent below current levels by 2050 in its proposed Ten-Year Strategic Plan.

Action:

In 2007, King County will organize efforts to develop regional consensus on a target year by which to stop growth of regional greenhouse gas emissions.

The first step in getting on this path of long-term reductions is for the region to work together to develop an immediate target year for a "turning point" in the upward trend of greenhouse gas emissions.

Leaders of this region and others across the country have called to stop making climate change worse by stopping the increase of greenhouse gas emissions as soon as possible. The Puget Sound Clean Air Agency's stakeholder process called for our region to "crest the hill" of greenhouse gas emissions. The ten northeastern states formed a Regional Greenhouse Gas Initiative (RGGI) intended to "freeze" emissions from power plants by 2009, and subsequently begin to reduce emissions.

However, no reduction targets can be achieved unless all regional parties are clear about when we will aim to stop increasing emissions. Furthermore, given that the majority of our regional emissions comes from the transportation sector (see above), this should be a primary focus of our efforts to develop regional consensus on when to reduce emissions.

Within this context, King County will work with the Seattle Climate Partnership to aggressively help implement the recommendations of Seattle's Green Ribbon Commission.

Action:

King County will collaborate with federal, state and local partners to develop a blueprint for near-, mid-, and long-term regional reductions, with clear and accountable benchmarks and timetables.

Given that the majority of our regional emissions comes from the transportation sector (see above), this should be a primary focus of our efforts to develop regional consensus on how to reduce emissions.

Action:

King County will take the lead in organizing efforts to standardize regional greenhouse gas emissions calculations.

As described in "Greenhouse Gas Accountability and Limits" of the operational section, King County has developed significant expertise in greenhouse gas emissions inventories. King County experts have provided information and advice on best practices for greenhouse gas accounting to other specialists nationwide.

In the past, King County has been a leader in adopting and improving upon best practices for regional emissions calculations. In the future, it will be important for King County to stay up-to-date on developments, to understand the greenhouse gas implications of its programs, projects and policies, and to set an example of accounting that has integrity and transparency.

STRATEGIC FOCUS:

Climate-Friendly Transportation Choices

As described in the regional emissions table (Table 5) above, transportation is the single largest source of the region's emissions, at 60 percent of the total and 13.8 million MTCO2e annually. This calculation of regional transportation emissions includes both on-road and off-road sources.

Transportation emissions in this region are expected to grow, despite Washington State adoption of "clean car" regulations, such as the "California tailpipe standards," which require a 30 percent reduction in greenhouse gas emissions from vehicles by model year 2016, and a strong biofuel standard, which requires that small percentages of ethanol and biodiesel be blended with gasoline and diesel. Although these two regulations are known to be among the boldest "clean car" measures in the United States, even their full implementation will not curb transportation emissions.

King County therefore recognizes the importance of building a stronger "fewer car" strategy, to complement these "clean car" approaches already underway. Indeed, as the region's largest transit agency, King County plays several critical roles in reducing regional greenhouse gas emissions from transportation, by:

- providing the best transit service possible; promoting the use of public transit and other alternatives to driving alone;
- accounting for greenhouse gas emissions in regional transportation infrastructure investments; and
- working with government partners to develop road and transportation pricing on regional roads.

In support of continued "clean car" approaches, King County's goals and actions related to regional development and use of clean transportation fuels can be found in "Clean Fuels, Clean Energy and Energy Efficiency."

Goal:

King County will expand and encourage use of alternative modes of transportation such as public transit, carpooling, car-sharing, bicycle and pedestrian trails, sidewalks and non-motorized travel.

Based on a history of leadership and innovative transportation planning, King County has recently sought designation as a Federal Highway Works Administration "Urban Partner." This designation would make King County a priority recipient of potential

federal transportation investments in bus rapid transit and transportation technology, among other areas.

Action:

King County will provide and promote the use of increased and improved public transit service.

King County plans to expand transit service by 15 percent to 20 percent over the next 10 years, with its "Transit Now" initiative approved by King County voters in the November 2006 general election. Service increases in Transit Now are estimated to add 18 to 21 million new annual rides system-wide by 2016. These service increases are estimated to promote the switch of 50,000 to 60,000 commuters from single-occupancy vehicles into buses each weekday.

Implementation of Link Light Rail will also allow Metro Transit to redeploy a significant amount of service hours to increase access to service along the Link corridor.

King County will also work with the Puget Sound Regional Council, Washington State Department of Transportation and other local governments on implementation of ITS technologies and signal system synchronization to improve the speed and efficiency of transit service in busy urban areas. Improving the flow of bus traffic in downtown areas can save fuel and reduce greenhouse gas emissions, by reducing the amount of time that buses are spent idling at intersection signals.

As described below, King County will also work to make smart transit investments and innovative transportation planning part of major regional transportation infrastructure investments, including any final Viaduct solution.

Action:

King County will continue to provide and promote the use of bicycle and pedestrian trails and sidewalks, through capital projects and strategic partnerships.

King County Parks system already has over 175 miles of the best trails in the nation for hiking, biking and walking. In the years to come, King County plans to expand this pedestrian and bike trail footprint to over 300 miles, with the ground-breaking airport-for-trail swap underway with the Port of Seattle.

King County already works to enhance the connectivity of these trails and bike routes, by investing in transit-oriented and non-motorized development projects that promote urban density, economic vitality, street connectivity, and attractive public transportation choices. Trail system linkages to roads and park-and-ride facilities, sidewalk projects that create more walkable communities, and safe bicycle lanes continue to be particular focus areas for the county. This work is further complemented by current efforts to: outfit all bus coaches with bicycle racks that have the capacity to carry three bikes; work with government partners to build the Bikestation into the new rail facility at King Street

Station; incorporate additional bicycle amenities in new transit facilities; and, when possible, improve bicycle racks and/or lockers. These efforts to promote bicycling as an appealing downtown commute option also have the co-benefit of improving public health.

More information on the Bikestation can be found at:
http://transit.metrokc.gov/tops/bike/bikestation.html.

Action:

King County will provide and promote use of commute trip reduction programs, ridesharing, carpooling and car-sharing, across the region and in its workforce.

King County Metro Transit will continue to promote a switch from cars to transit and other alternative modes of travel, with programs such as: commute trip reduction support services to over 450 major employment sites; residential-based In Motion; implementation of the ORCA smart card; promotion of ridesharing, through Rideshareonline.com; support of carpooling on the region's major roads; and support of car-sharing programs such as FlexCar. King County Metro Transit will aim to increase the number of rideshare vans in its fleet to 1,600 by 2016.

More information on the programs that King County offers to promote alternative commute options can be found at:
http://www.metrokc.gov/kcdot/alts/employer/options/commute_options.htm.

As a major regional employer with a workforce of approximately 13,000, King County's actions to promote transportation alternatives among its employees can also help reduce the region's greenhouse gas emissions (Table 5). As described in "Climate-Friendly Transportation Choices" of the operational section, King County already provides multiple incentives for employees to use alternative modes of transportation, most notably by providing benefits through King County's Employee Transportation Program. These transportation benefits include an employee "Flexpass" for free rides on Metro Transit buses, a vanpool fare subsidy, and incentives to employees who carpool (with at least one other person of driver age), bike, or walk to work at least 51% of all workdays and commute miles. Incentives currently include vouchers for discounts at a variety of businesses downtown. Building on past efforts, King County Metro Transit will continue to work with employers and business associations to coordinate promotions that increase ridership of public transit by employees across the region.

Partnerships with Washington State Department of Transportation will focus on Regional Transit Mobility grants and an expanded commute trip reduction effort, as described above.

Goal:

King County will promote greenhouse gas accountability and reduction of greenhouse gas emissions in regional transportation infrastructure investments.

Action:

King County will work with local and state government to account for greenhouse gas emissions in evaluations of land use and regional transportation infrastructure investments.

Including an evaluation of the greenhouse gas emissions into land use and transportation decisions takes a step towards reducing emissions. When built without transit investment or congestion pricing, increased road and highway capacity is associated with an increase in vehicle miles traveled and therefore in greenhouse gas emissions.

To promote greater greenhouse gas accountability in state and regional transportation infrastructure investments, King County will work with the Puget Sound Regional Council, Sound Transit, the Puget Sound Clean Air Agency, the Regional Transportation Infrastructure District and others to account systematically for expected greenhouse gas emissions in criteria for transportation funding and choices.

Action:

King County will work with government partners to include smart transit investments in final solutions for regional transportation infrastructure.

Transit investments must be partnered with major transportation infrastructure expenditures. For example, a smart transit investment must be a part of any Viaduct solution or major transportation infrastructure investment. Transit can be implemented quickly, will save money, will increase Viaduct options and will reduce total greenhouse gas emissions from any Viaduct-related choice. As demonstrated in the case of Metro Transit bus tunnel closure for light rail construction, highly detailed and innovative planning by Metro Transit and its partners can actually reduce 30 percent of all travel (35,000 car trips) on the Viaduct. When drivers switch to public transit, this reduction can mean a decrease in regional greenhouse gas emissions from the transportation sector.

The planning and capital improvements necessary to achieve this aim will require a partnership between King County, the City of Seattle and Washington State. More information on King County Metro Transit's detailed planning for the tunnel closure and for the Viaduct is available at http://www.metrokc.gov or in the King County Executive's recent *Seattle Times* editorial, "49 reasons to relax about the Viaduct."

Similar transit actions should be linked to all major road investments.

Goal:

King County will work with federal, state and local governments to develop a system of congestion pricing and other pricing mechanisms on regional roads.

King County's joint application with the Washington State Department of Transportation and the Puget Sound Regional Council for designation as an "Urban Partner" of the United States Department of Transportation could give our area priority funding for congestion pricing, transit, and new technology projects.

King County's application for designation an "Urban Partner" of the Federal Highway Works Administration could give King County priority funding for tolling and congestion pricing efforts.

Action:

King County will work with government partners to evaluate and establish best-practice congestion pricing on regional roads.

King County recognizes the critical importance of road pricing as part of the solution to reducing greenhouse gas emissions from transportation. Road pricing was recommended with this intent in the Green Ribbon Commission report of early 2006, and has been successfully implemented in other areas of the world, such as the City of London. King County intends to work with federal, state and local governments and leaders on exploring congestion pricing mechanisms for the region.

Action:

King County will implement a "Pay-As-You-Drive" vehicle insurance demonstration project, and will expand it as additional funding becomes available.

The demonstration project will explore changing vehicle insurance premiums so that the number of vehicles miles traveled (VMT) has a more direct correlation to the cost of vehicle insurance. Studies indicate that the more VMT is reflected in the cost of vehicle insurance, the less people will drive.

STRATEGIC FOCUS:

Land Use, Building Design and Materials

Goal:

King County will continue to promote land use and transportation patterns that foster healthy and climate-friendly community design and healthy agricultural and forest economies.

Coordinated land use and transportation planning represents an important tool with which King County and its partners already work to promote the reduction of regional greenhouse gas emissions not only from the transportation sector, but also from commercial and residential sources. When combined, these efforts therefore have the potential to tackle over 60 percent of the region's greenhouse gas emissions. (The transportation sector is responsible for 60 percent of the region's total. Commercial and residential greenhouse gas emissions represent 20 percent, and electricity use represents 10 percent. While this document does not attribute commercial, residential or electricity emissions to specific sources, it is considered that land use and transportation planning can influence at least some reduction in these areas.)

By promoting the direction of population growth, development and employment in designated urban areas, King County already helps to create conditions for government services (e.g. transportation and water) to be provided with greatest energy efficiency to a large percentage of the region's population. Urban density thus helps to reduce regional greenhouse gas emissions from transportation and housing, while also bringing significant positive benefits to public health, such as the increased appeal of physical activity fostered by pedestrian- and bike-friendly neighborhoods.

Greater urban density and land use also enable farming and forests to flourish without pressure from development. In turn, a healthy local agricultural and rural economy can provide greater choice of food for local consumption. Importantly, the development of stronger local food networks can not only help to reduce greenhouse gas emissions from the transportation of food, but also create an additional important benefit of improved local food security.

The county's leadership and experience in these areas are being recognized and shared with other regional governments as part of the Urban Leaders Initiative, a collaboration of local governments recently founded by King County and the Center for Clean Air Policy in Washington, DC. More information on these efforts is available at: http://www.ccap.org.

The county's cross-departmental Healthscape program (formerly known as the LUTAQH study), supported by the Executive Office, the King County Department of

Transportation and Seattle-King County Public Health, also works to demonstrate and enhance the additional health benefits of climate-friendly land use and building design.

Action:

King County will continue to work with local governments and the Puget Sound Regional Council to promote growth in designated, transit-oriented urban areas of the county.

Working to promote the location of employment, businesses and residences in urban areas well-served by transit has been a core component of King County's decade-plus land use and transportation planning.

In the last ten years, King County and local government efforts to implement the Washington State Growth Management Act and King County Comprehensive Plan have led to reduced growth in the rural area, from a high of 15 percent per year to approximately 4 percent per year (as a percentage of countywide growth).

An important part of this work has been the Transfer of Development Rights program, which uses market-based incentives for developers to add density to urban areas while leaving rural areas protected. As a result of these efforts, new city centers are forming in suburban areas and existing centers are being revitalized with a mix of housing, shopping, and jobs.

In the same vein, King County Department of Transportation places priority on new investments in service and demand management programs in designated urban and manufacturing centers, as shown in implementation of both "Transit Now" and programs related to the 2006 Commute Trip Reduction Efficiency Act. In these efforts, King County is committed to supporting the urban center concept as a growth management tool, to promote reduction of single-occupancy vehicle trips and related greenhouse gas emissions.

King County also collaborates with staff of the Puget Sound Regional Council, the region's metropolitan planning organization, to develop greenhouse gas emissions reduction goals for land use and transportation policies and funding. Most recently, King County staff members have participated in the Puget Sound Regional Council staff committee that prepares documents for review by decision-making boards for the "Vision 2020" Update. During this update process, King County staff members have provided both formal and informal comments on the Countywide Planning Policies and the Preferred Growth Alternative, with particular attention to the role that "smart growth" can play in reducing regional greenhouse gas emissions.

As part of the 2008 King County Comprehensive Plan update, King County will review and update policies related to land use and transportation to reduce greenhouse gas emissions. King County will also continue to enhance its Transfer of Development Rights program. Finally, King County's Healthscape program will continue to develop

on-the-ground solutions that enhance the walkability, health and climate-friendliness of the region's neighborhoods.

Action:

King County will continue to promote understanding of the importance of agricultural lands and a healthy agricultural economy to reducing greenhouse gas emissions.

Through efforts to maintain the region's Urban Growth Area Boundary, King County and local government partners have been successful in protecting more than 40,000 acres of agricultural land. This acreage has remained virtually unchanged in the past fifteen years, due to effective "smart growth" strategies that implement the Growth Management Act.

For over twenty years, King County has implemented the Farmland Preservation Program to protect economically important farms and reduce energy-intensive sprawl. More recently, King County's Transfer of Development Rights program has also offered economically appealing solutions for developers to build in urban areas, rather than agricultural areas.

King County has long recognized the important value of agricultural land for development of climate-friendly energy sources, such as manure biogas digesters, and strengthening of climate-friendly local networks of food production and consumption. Through collaborative outreach with Cascade Harvest Coalition's Puget Sound Fresh and Washington State University Extension's Harvest Celebration Farm Tour, King County has helped to: raise consumer awareness about where food is produced, the distance food travels from producer to consumer, and related greenhouse gas emissions; and provided critical public education about the value of purchasing local food.

As the state's largest single purchaser of biofuel, King County has also helped to raise public interest and stimulate demand for biofuels, which can eventually benefit state producers of biofuel and, in turn, the state's rural economy. Even more recently, King County has also worked to establish a manure biogas digester on the Enumclaw Plateau, to reduce methane from manure lagoons and produce renewable energy.

Moving forward, King County will continue to support and develop local farming programs and farmers' market networks to reduce greenhouse gas emissions associated with long-distance travel of food; and develop and showcase possible uses for biogas from manure lagoons.

King County will also seek ways to partner with Washington State University Extension's Climate Friendly Farming program to promote options for local producers to farm a more climate-friendly manner, such as alternatives to fossil fuel-based fertilizers and selection of crops that cause lower life-cycle greenhouse gas emissions.

Action:

King County will continue to promote understanding of the importance of healthy forests to reducing greenhouse gas emissions.

Between 25 and 30 percent of annual global greenhouse gas emissions are caused by deforestation, as the carbon dioxide stored in live trees is released into the air when they are felled or burned. While forests of the Pacific Northwest may only represent a small percentage of the world's forestland, our region can play a critical role in pioneering the healthy forest stewardship policies and healthy forestry techniques that inform forest protection worldwide.

Through efforts to maintain the region's Urban Growth Area Boundary, King County and local government partners have been successful in protecting approximately 825,000 acres of forestland. This acreage has remained virtually unchanged in the past fifteen years, due to acquisition and protection of forestland and effective "smart growth" strategies that implement the Growth Management Act, such as the Transfer of Development Rights program.

King County recognizes the value of land use cover, and particularly healthy forests, with regard to "carbon sequestration," a natural process that keeps carbon dioxide in biomass and therefore out of the atmosphere. In September 2004, King County signed a historic document that will keep 90,000 acres of the Snoqualmie Tree Farm as a working forest. Furthermore, as described in the Executive Orders of March 2006, King County has set an even more ambitious goal to acquire and protect 100,000 more acres of forestland by 2010.

Moving forward, King County will continue to support forestry technical assistance, incentive programs such as the Transfer of Development Rights program, property acquisitions, and biosolids programs that use biomass to fertilize the growth of trees in a coordinated strategy to reduce greenhouse gas emissions through carbon sequestration. To explore carbon sequestration benefits of regional forests in even more detail, King County also plans to: evaluate scenarios of land use cover with regard to carbon sequestration; and explore the possible establishment of a forest carbon inventory and accounting system, including determination of best-practice protocols for ensuring optimal carbon sequestration while also certifying that wood products come from sources that have not caused deforestation.

Understanding the importance of active management and forestry to keep these forests healthy, King County will collaborate with state government and regional partners to ensure that the region has sufficient staff resources and expertise to support these efforts.

Goal:

King County will promote design and construction practices that help to reduce greenhouse gas emissions from residential, commercial and other facilities.

As described in the regional emissions table (Table 5), residential and commercial sources represent 20 percent of the region's total emissions, and electricity use represents 10 percent. In complement to climate-friendly land use and transportation planning tools detailed above, green building practices represent an important menu of solutions for making these sectors more climate-friendly. Again, while this document does not attribute commercial, residential or electricity emissions to specific sources, it is considered that widespread adoption of green building practices can influence reduction in these areas. In particular, green building practices have multiple benefits of reducing facilities' greenhouse gas emissions related to energy use, minimizing water pollution from stormwater runoff, and limiting the amount of waste generated by building and demolition practices.

King County departments and King County Executive Ron Sims have shown leadership in both internal application and regional promotion of green building practices, as recognized in the Master Builders' Association presentation of the Built Green™ "Hammer" Award to Executive Sims in 2006. Based on its long history of experience and experience in application of green building practices, King County is uniquely positioned to help its constituent cities and others incorporate green building practices into their capital projects.

Action:

King County will develop a toolkit of resources that can facilitate adoption of green building policies and programs by suburban cities.

In 2006, King County received a $50,000 grant from the Washington State Department of Ecology to provide outreach and direct technical assistance to constituent suburban cities. In 2007, the county will launch and implement its "Green Tools" toolkit as the core element of this outreach.

Action:

King County will continue to foster local and regional partnerships to increase green building market share and awareness across the development community and county residents.

King County already works with Master Builders Association Built Green™ program, the Cascadia Region Green Building Council, the American Institute of Architects and the Urban Land Institute to build on its experience in the green building industry, and to promote green building practices across the region.

Goal:

King County will work with major regional emitters in industry and materials production to achieve reduction targets.

Action:

King County will work with industry to foster the use of cement substitutes in regional construction projects.

Cement substitutes can provide close to 100 percent reduction on a pound-for-pound basis. As described in the operational section, King County has used small amounts of fly ash in its buildings for decades. Three years ago, King County began a concerted effort to increase cement substitutes of fly ash and slag, and King County connected potential contractors with cement substitute providers to expand the use of substitutes regionally. King County is now exploring a number of additional projects to demonstrate the efficacy of cement substitutes. More information on the value of cement substitutes in reducing industrial greenhouse gas emissions is available in Appendix H.

STRATEGIC FOCUS:

Clean Fuels, Clean Energy and Energy Efficiency

Goal:

King County will seek to foster broader regional use of renewable fuels and efficient transportation technologies.

The actions outlined here represent an ambitious effort to build on existing clean fuel measures, by transforming the region's transportation sector to be powered by plug-in hybrid and electrified transportation technology.

In combination with King County's "fewer car" strategy detailed in "Climate-Friendly Transportation Choices," these market-based "clean car" solutions will make significant headway in reducing regional transportation emissions.

Action:

King County will collaborate with other governments and businesses to purchase and use clean and renewable fuels and efficient transportation technologies.

King County Metro Transit's early adoption of clean transportation technologies, such as hybrid-articulated buses, and clean fuels, such as biodiesel, has stimulated demand for new technologies and fuels, as described in Executive Order 7-5 in Appendix A. As the largest single purchaser of biodiesel in Washington State, King County is helping to stimulate demand in this emerging clean fuel market.

In late 2006, King County Fleet Administration Division was among the first in the nation to purchase hybrid diesel-electric trucks, and created a consortium of 14 fleet departments in Washington State to buy even more -- leveraging the collective purchasing power of those fleets. The purchases will be funded with the help of a $250,000 grant from the Environmental Protection Agency (EPA), and another $150,000 grant recently awarded by the Puget Sound Regional Council. At this point, the hybrid trucks cost approximately $40,000 more than regular diesel trucks, but consortium members expect prices to drop as more orders are placed.

King County Fleet Administration Division is also seeking to stimulate demand for plug-in hybrid and electric vehicles by placing early orders for these cars.

Action:

King County staff will research, evaluate and report to the Executive and Council on best practices, innovations, trends and developments in regional travel patterns, renewable fuel use and efficient transportation technologies.

Goal:

King County will foster the regional development and use of waste-to-energy technologies, waste reduction and climate-friendly materials.

Action:

King County will promote regional development and use of new waste-to-energy technologies, waste reduction and climate-friendly materials.

As described in the operational section, King County is currently exploring waste-to-energy technologies in wastewater treatment and landfill management that can reduce methane emissions and generate heat and/or energy for further operational use. Though not addressed in the regional emissions profile provided here, these efforts can help to reduce methane emissions regionwide.

To this point, King County has completed a demonstration project of a hydrogen fuel cell at the South Treatment Plant, uses biosolids widely, and is in the process of launching a program that will convert methane to energy at Cedar Hills Landfill. King County is also developing a biogas digester on the Enumclaw Plateau that will convert manure methane into energy sources and prevent this potent gas from being released into the atmosphere.

Moving forward, King County is currently exploring the possibility of establishing a hydrogen fueling station in collaboration with the University of Washington, at the university's campus.

Goal:

King County will promote energy conservation among businesses and residents as a means to reduce regional greenhouse gas emissions.

Action:

Based on its own experience, King County will raise regional awareness about easy ways to conserve energy and reduce regional greenhouse gas emissions.

Useful tools for climate-friendly design and use of homes and businesses are already available through Built Green™ and Energy Star™. In workshops, conferences, demonstration projects and newsletters, including the Solid Waste Division's regular *EcoConsumer* column, King County will provide further tips and tools for residents and businesses to reduce greenhouse gas emissions from their individual homes and facilities.

Goal:

King County will foster the development of clean, distributed energy in the region.

Action:

King County will invest in demonstration projects of energy technologies that are conducive to a distributed system.

King County's demonstration of a stationary hydrogen fuel cell at its South Treatment Plant is one example of a project conducive to clean, distributed regional energy. This project was funded by the Environmental Protection Agency; King County continues to collect data on this demonstration in order to determine the usefulness of this application for future regional energy efforts.

Moving forward, King County is also exploring photovoltaic technology and small-scale wind energy. These efforts are detailed in the 2007 King County Energy Plan.

Washington State 84,000,000 MTCO2e

Table 6 describes Washington State's greenhouse gas emissions by clear emission-related sectors and in order of magnitude, to provide context for the mitigation actions outlined in this section. **Table 6A** compares Washington State emissions by sector (as percentages of total) to King County emissions by sector.

Table 6: Washington State Greenhouse Gas Emissions

84,000,000 MTCO2e		
Source	MTCO2e	Percent
Transport	42,000,000	50
Industrial	17,640,000	21
Electricity	14,280,000	17
Other	10,080,000	12

Table 6A: Comparison of Washington State and King County Greenhouse Gas Emissions (As Percentages of Total)

Sources of GHGs (%)	Electricity	Industrial	Transport	Other
Washington State	17	21	50	12
King County	10	10	60	20

STRATEGIC FOCUS:

Greenhouse Gas Accountability and Limits

Goal:

King County will work with state, federal and local governments and leaders to establish a statewide climate stabilization target with meaningful near-term reductions in greenhouse gas emissions.

As described in the regional section, King County plans to work with federal, state and local governments and leaders to establish a climate stabilization target for the region. In scientific terms, "climate stabilization" means sufficiently reducing global greenhouse gas emissions to avoid dangerous climate change impacts such as large increases in sea level rise, more intense hurricanes, prolonged droughts, devastating floods and world-wide loss of freshwater. Scientists generally agree that for the United States this means an 80 percent reduction below current 2007 greenhouse gas emission levels by 2050.

Goal:

King County will work with state, federal and local governments and leaders to establish a statewide standardized inventory of greenhouse gas emissions.

As described in previous sections, the first step toward a climate stabilization target is to measure emissions by completing a greenhouse gas emissions inventory. Models of statewide measurement of greenhouse gas emissions in the United States include the California Climate Action Registry and the Regional Greenhouse Gas Initiative in the northeastern United States.

Action:

King County will work with state and local government and leaders to promote statewide standardization of greenhouse gas emissions calculations.

King County's experience and expertise in greenhouse gas emissions inventories positions it well to provide support to state and local government and leaders in a process of developing a best-practice statewide greenhouse gas emissions inventory.

STRATEGIC FOCUS:

Climate-Friendly Transportation Choices

Goal:

King County will work to promote statewide reduction of greenhouse gas emissions from the transportation sector.

As described in the state emissions table (Tables 6 and 6A), Washington State has a similar greenhouse gas emissions profile to that of King County; transportation is the largest source of greenhouse gas emissions, with 50 percent of statewide regional greenhouse gas emissions coming from that sector.

Transportation should therefore be a focus of discussion and action on how Washington State can move to a statewide target of climate stabilization.

Action:

King County will work with state and local government to account for greenhouse emissions in evaluations of state and regional transportation infrastructure projects, and will work to include smart transit investments in final solutions for regional transportation infrastructure.

As described in the regional section, when built without transit investment or congestion pricing, increased road and highway capacity is associated with an increase in vehicle miles traveled and therefore in greenhouse gas emissions.

To promote greater greenhouse gas accountability in state and regional transportation infrastructure investments, King County will work with the Washington State Department of Transportation and local governments to account systematically for expected greenhouse gas emissions in criteria for transportation funding and choices.

Please see the regional section and the King County Executive's recent *Seattle Times* editorial, "49 reasons to relax about the Viaduct" for more information.

STRATEGIC FOCUS:

Clean Fuels, Clean Energy and Energy Efficiency

Goal:

King County will work to promote statewide clean fuel and waste-to-energy development and use.

King County will continue to seek statewide support for biofuels, hybrid-electric and electric vehicle technology, hydrogen fuel cell projects, landfill sequestration and manure digester projects.

Goal:

King County will work to promote statewide reduction of greenhouse gas emissions through the use of renewable energy and energy efficiency.

Action:

King County will continue to promote accountability for greenhouse gas emissions from electricity production.

King County will also support strong implementation of the statewide energy efficiency and renewable energy initiative.

STRATEGIC FOCUS:

Land Use, Building Design and Materials

Goal:

King County will support climate-friendly land use and building design practices at the state level.

King County will continue to support and implement the Washington State Growth Management Act.

King County will also promote the use of green building practices and cement substitutes across Washington State.

Goal:

King County will work to promote sequestration of greenhouse gas emissions statewide.

King County will support development of a registry for forest carbon sequestration.

King County will also support use of wastewater biosolids to enhance biomass sequestration.

United States 7,100,000,000 MTCO2e

Table 7 describes the United States' greenhouse gas emissions by clear emission-related sectors and in order of magnitude, to provide context for the mitigation actions outlined in this section. More information is available from the Energy Information Administration, at the following website: http://www.eia.doe.gov/oiaf/1605/1605a.html.

Table 7: United States Greenhouse Gas Emissions By Sector (As a Percentage of Total)

7,100,000,000 MTCO2e		
Source	MTCO2e	Percent
Electricity	2,769,000,000	39
Industrial	1,278,000,000	18
Transport	2,272,000,000	32
Other	710,000,000	10

STRATEGIC FOCUS:

Greenhouse Gas Accountability and Limits

Goal:

King County will be a leader in the development of federal policy solutions that slow, stop and reverse nationwide greenhouse gas emissions.

Action:

King County will promote and support long-term sustained reductions of greenhouse gas emissions to achieve climate stabilization.

According to the Intergovernmental Panel on Climate Change, governments and leading businesses of the world have a very short window of opportunity to start on a path of permanent and long-term reductions of greenhouse gas emissions, before climate change becomes significantly worse. King County recognizes that this timeframe is in fact an opportunity for development of consensus among federal, state and local governments and business leaders on the best, most economically healthy ways to reduce greenhouse gas emissions in our region. King County also recognizes that the region must act quickly, and decisively, to set bold targets for regional reduction of emissions.

In scientific terms, "climate stabilization" means sufficiently reducing global greenhouse gas emissions to avoid dangerous climate change impacts such as large increases in sea level rise, more intense hurricanes, prolonged droughts, devastating floods and world-wide loss of freshwater. Leading experts generally agree that for the United States this means an 80 percent reduction below current 2007 greenhouse gas emission levels by 2050.

Action:

King County will promote and support market flexibility, such as "cap-and-trade" legislation.

Leading scientists and economic experts agree that the most effective, efficient way to achieve these goals is the development of an international carbon market, with a foundation of mandatory limits.

Officials in the federal government have also increasingly called for mandatory emissions reductions in the United States via a federal cap. In June 2005 the United States Senate stated in an amendment to its version of the Energy Policy Act of 2005, "It is the sense of the Senate that Congress should enact a comprehensive and effective national program of mandatory, market-based limits and incentives on emissions of greenhouse gases that slow, stop, and reverse the growth of such

emissions at a rate and in a manner that—(1) will not significantly harm the United States economy; and (2) will encourage comparable action by other nations that are major trading partners and key contributors to global emissions.

In May 2006, the United States House of Representatives Appropriations Committee accepted a nonbinding climate change amendment that endorsed a mandatory carbon cap as a measure to reduce global warming, as long as such a program would not harm the United States economy.

The State of California and northeastern states in the Regional Greenhouse Gas Initiative have also recently established policy direction for mandatory limits such as these.

Action:

King County will promote and support standards and incentives for energy efficiency and renewable energy.

The United States will only be able to achieve a climate stabilization target with the appropriate policies in place to stimulate adaptation of the national economy to one that is based on clean fuel, clean energy and energy efficiency.

These policies will also be critical to maximizing the upside of capping greenhouse gas emissions – such as job growth and public health benefits from cleaner transportation and electricity.

Washington State has adopted at least three regulations of this nature, which are considered to be among the boldest and best practices in the nation: the "California tail pipe standard," the recent minimum biofuel standard passed by the legislature, and the renewable energy and energy efficiency standard approved in November 2006. King County will continue to support Washington State in implementation of these standards.

Action:

King County will promote and support protection for adversely impacted communities from climate-related initiatives.

King County recognizes that greenhouse gas emissions cap-and-trade legislation will have economic costs. King County therefore commits to promoting and supporting programs such as job training in clean energy technology and clean fuel development, among other important efforts to protect residents from job loss and other costs.

King County leaders also understand that the earlier this region takes action to prepare economically for anticipated cap-and-trade legislation, by being an early adopter of clean fuels, clean energy technology and energy efficient measures, the less adversely its regional economy will be impacted in the long-term.

Goal:

King County will serve as an essential resource for local governments seeking to apply their unique influence on regional land development and infrastructure decisions that contribute to greenhouse gas emissions.

Action:

King County will serve as a model for local and regional action on greenhouse gas reduction strategies and provide expertise to other local and regional governments.

King County recognizes that its experience in employing the measures described in this plan – in the areas of greenhouse gas emissions inventories, climate-friendly transportation choices, land use, building design and materials, and clean fuels, waste-to-energy and energy efficiency measures – will be of increasing use to other local and regional governments nationwide.

Action:

King County will work with other local and regional governments to assess federal and state programs and their impact on greenhouse gas emissions and mitigation efforts.

In December 2006, King County and the Center for Clean Air Policy in Washington, DC launched the Urban Leaders Initiative, a group of local and regional government leaders focused on evaluating federal and state programs and the opportunities or barriers they pose to local and regional efforts to reduce greenhouse gas emissions. Members of the Urban Leaders Initiative currently exchange lessons and information about their experiences, and are developing a white paper on how federal and state programs can be improved to support local and regional climate change mitigation efforts most effectively. The initiative is also intended to develop tools for other governments based on success stories and lessons learned from King County and similar jurisdictions nationwide.

Goal:

King County will organize local, regional and national efforts to reduce greenhouse gas pollution.

Action:

King County will promote early initiatives that include binding commitments for greenhouse gas reduction, such as those embodied by the Chicago Climate Exchange.

King County joined the Chicago Climate Exchange in October 2006, committing to track and reduce countywide greenhouse gas emissions from a year 2000 baseline. Related efforts will help prepare government leaders to excel in the carbon-constrained economy of the future.

Action:

King County will assist in efforts to harmonize greenhouse gas accounting protocols across the nation.

Based on King County's experience and expertise in completing its own greenhouse gas emissions inventory and setting best practices in emissions inventories, it is well-positioned to advise efforts to harmonize greenhouse gas accounting protocols across the nation.

Action:

King County will organize efforts in the National Association of Counties and other national organizations to slow, stop, and reverse greenhouse gas emissions.

King County is currently developing companion resolutions for members of the National Association of Counties and the Washington State Association of Counties to advocate for mandatory federal limits on carbon emissions. As Council Motion 12362 directed, "This proposed resolution is a companion with the climate action commitment signed by the United States Conference of Mayors."

King County Metro Transit will sponsor a sustainability conference with the American Public Transit Association in mid-2007 to highlight its environmental efforts. The King County Fleet Administration Division will also sponsor a clean vehicle conference in late 2007.

B. Adaptation

Even if the world stopped emitting greenhouse gases immediately and completely, it is expected that global temperatures would still rise and climate change would still worsen. As detailed in "Impacts to the Pacific Northwest," climate change is already having impacts to the King County region and government services.

How to Plan with Evolving Information

Some aspects of future climate change in the Pacific Northwest are well-known, while others are less certain. For instance, climate scientists in the King County region know that climate change will be associated with warmer average temperatures, some range of sea level rise in the Puget Sound, a likely increase of flooding frequency in the fall and winter, and lower streamflow in snowmelt-dominated streamflows in the summer and early fall. On the other hand, climate change impacts to precipitation intensity and windstorm potential are less known.

Based on the potential consequences of climate change to public health, property and economic prosperity in the King County region, the need for prudent planning by King County officials is great. In context of this evolving information, it is important to address that prudent planning would not ignore an area that could be greatly impacted by climate change simply because predictions are uncertain. When information about climate change impacts is relatively certain and impacts are anticipated to be great, King County should act with a degree of urgency. In cases of less certainty, planning can and should include early and low-cost provisions.

King County government services and the King County region do have vulnerabilities to climate change. History can no longer be a guide for the future. Decision-makers should be aware that abrupt climate change and sea level rise could bring catastrophic consequences, especially for coastal regions like King County. King County officials will respond to the range of known risks according to best available science, probability and likely magnitude, in order to minimize risks to public health, property and economic prosperity.

The Need for Regional Coordination

As a region on the front lines of climate change impacts, King County and its partners are already beginning to implement and learn from practical preparedness steps, so that King County can lead the way for adaptation in other governments across the world. But King County government and officials cannot alone ensure that the King County region will be resilient to climate change impacts. Resilience to climate change impacts will require a high degree of coordination among state, regional and local governments, business leaders, and residents.

In some areas of regional vulnerability, such as surface water management, freshwater quality and water supply, the need for coordination is especially high. The goals and actions in this plan thus simply represent King County's actions in context of these necessary partnerships. King County officials do not intend for the county to act unilaterally, but instead that the actions in this workplan will guide the way to collaboration.

Strategic Focus Areas

Initial discussion about adaptation activities was initiated at the King County Climate Conference of October 2005. A questionnaire on climate change impacts was circulated to a small group of department and division representatives was circulated in summer 2006. Presentations and break-out sessions at the conference and the completed questionnaires served as the initial common knowledge base that guided development of these adaptation goals and actions. A copy of the questionnaire is available in Appendix I.

Many adaptation activities are already underway in King County departments; both these ongoing and new efforts are described here. They can be grouped in several general strategic focus areas:

- Climate Science
- Public Health, Safety and Emergency Preparedness
- Surface Water Management, Freshwater Quality and Water Supply
- Land Use, Buildings and Transportation
- Economic Impacts
- Biodiversity and Ecosystems

This section provides a series of goals and actions for King County to undertake in each of these strategic focus areas. Some activities clearly relate to more than one of these focus areas. However, we find it helpful to communicate with these broad themes.

STRATEGIC FOCUS:

Climate Science

Goal:

King County will be a primary leader in research, monitoring and use of climate science in public policy decisions.

Action:

King County will continue the work of its interdepartmental climate change adaptation team.

The King County climate change adaptation team was created in 2006, with volunteer participation from county employees of the Executive Office, Department of Natural Resources and Parks, Department of Development and Environmental Services, Department of Public Health, Department of Transportation and Washington State University Extension. Experts from the Climate Impacts Group have also observed and provided input to the team meetings.

This team has been responsible for advising departments on development of strategies to adapt to climate change impacts in King County, and contributing to the King County Climate Plan. The team has met regularly to discuss new climate change science and information about climate change impacts to the region.

In selecting members for the future, special effort will be made to ensure that the team continues to have significant scientific expertise and ability to understand and explain climate science. The team will continue to be considered an advisory group to the interdepartmental action team led by the Executive Office.

Action:

King County will create a climate change technical advisory group within the climate change adaptation team.

King County scientists, engineers and other experts will provide scientific and technical advice to other departmental representatives on the climate change adaptation team. The purpose of this group will be to translate and communicate climate change technical information from the Climate Impacts Group and other sources and to help decision-makers consider implications of emerging information for county decisions. The team will also collaborate with the Climate Impacts Group and Washington State University Extension.

Through information provided by this group and other members of the adaptation team, King County also intends to stay on the cutting edge of key research areas in public health, which is currently not researched by the Climate Impacts Group. Another

particular focus of this group will be to provide advice to the King County Department of Transportation Road Services Division on developing and planning technology and infrastructure which adapts to climate change.

Action:

King County Water and Land Resources Division's Science, Monitoring and Data Management Section (Science Section) will place particular emphasis on understanding climate change impacts on environmental conditions in King County.

The King County region offers a unique pool of scientific expertise and on-the-ground policy experience in climate change. Moreover, in the past decade and a half, King County government has established enough scientific talent within its own workforce to examine policy, planning and capital investment decisions through the lens of climate change. This capability is crucial for the process of building communities resilient to climate change impacts, and yet very few local and regional government workforces now have it.

The King County Water and Land Resources Division's Science, Monitoring and Data Management Section (Science Section) already has considerable scientific expertise. The Science Section conducts ongoing ambient monitoring throughout King County of:

- Weather;
- Land use and land cover;
- Stream and river flows, water quality, sediment quality, benthic macroinvertebrate populations, and Chinook salmon escapement;
- Lake water quality, sediment quality, phytoplankton and zooplankton populations, and swimming beach water quality;
- Groundwater quality and water levels; and
- Puget Sound water quality, sediment quality, chemical accumulations in clams.

As part of this program, hydrologic and water quality models have been developed for streams, rivers, and lakes in the greater Lake Washington and Green-Duwamish watersheds. Hydrologic and hydrogeologic models have also been developed for Vashon-Maury Islands. These models allow for testing of impacts of possible future land use, population growth, and climate change scenarios on water quality and quantity.

Additionally, the Science Section routinely monitors water and sediment quality at point-source locations, including wastewater treatment outfalls and combined sewer overflows.

The Science Section also uses its knowledge of environmental conditions to assist with preparation of various regulations and plans, including critical area regulations, salmon recovery plans, water quality implementation plans, shoreline management plans, and flood management plans.

In the past two years, Science Section staff members have:

- Exchanged information with scientists at the Climate Impacts Group to educate Science Section staff members on the status of the climate change knowledge worldwide, with particular emphasis on changes already occurring and expected to occur in the Puget Sound region;

- Analyzed trends over time of temperature in air, streams, rivers, lakes and Puget Sound;

- Analyzed water quality trends over time in streams, rivers, and Puget Sound;

- Begun analyzing precipitation patterns to understand how these might be changing over time;

- Cooperated with scientists at the Climate Impacts Group, an interdisciplinary research group studying the impacts of natural climate variability and global climate change on the Pacific Northwest, to develop climate-impacted weather datasets that can be used in hydrological and water quality models; and

- Presented work at local, regional, national, and international scientific conferences.

Action:

King County Water and Land Resources Division's Science Section will provide climate change science to policymakers for consideration in policy and regulation.

Science Section staff members are currently assisting with several policy and regulatory development projects, such as the Shoreline Master Program and regional Salmon Recovery Plan. On these projects, Science Section staff members serve as conduits of climate change information, helping to ensure that climate change issues are identified and understood so that policymakers recognize the implications of their decisions in context of climate change impacts.

Action:

King County Water and Land Division's Science Section will develop additional research areas for its ambient monitoring program and collaborations with the Climate Impacts Group.

The Science Section is committed to continuing its ongoing, ambient monitoring program already in place. This program allows for assessment of the degree of direct impacts of climate change on the King County environment. The Science Section is also committed to continuing its close collaboration with scientists from the Climate Impacts Group.

Additional areas recommended for future research in these contexts include:

- Impacts of climate change on groundwater resources. Little research has been conducted on this topic, and with about one-third of county residents reliant on groundwater as a potable water source, this constitutes a large area of uncertainty.

- Impacts of climate change on Puget Sound lowland surface water flows and temperatures. Little research has been conducted on this topic, with the majority of the research to date focusing on changes in mountain areas. Recommended key focus areas include Lake Sammamish, the Sammamish River, Lake Washington and the Ship Canal/Lake Union.

- Impacts of climate change on precipitation patterns. King County is responsible for the stormwater design manual in unincorporated King County, wastewater treatment throughout the county's wastewater service area, and floodplain management. These responsibilities are all influenced by precipitation patterns. Little research has been conducted to assess the likelihood of changes in storm frequencies or intensities.

- Operation of Ballard Locks. No research has been conducted to assess availability of surface waters for continued operation of the Ballard Locks under climate change conditions.

- Impacts of climate change on diversity and distributions of local animals and plants.

- Impacts of climate change on invasive plant, insect infestations, and pathogens.

- Impacts of climate change on Puget Sound circulation.

- Impacts of climate change on soil conditions, including carbon and nitrogen turnover, moisture gradient, and organic content.

- Storm event specific point source monitoring.

- Phytoplankton and zooplankton monitoring in both freshwater and Puget Sound.

and

- Bioindicator monitoring.

Goal:

King County departments will raise awareness about climate change impacts, adaptation and mitigation, and will collaborate interdepartmentally, with climate science experts, other agencies and other governments to adapt to climate change.

Action:

King County's climate change adaptation team will create a climate change outreach database to link appropriate King County experts to speaking engagements on climate change adaptation.

This database will be available countywide, to provide names and contact information of climate change adaptation team members and other King County employees available for public presentations and meetings on specific topics of climate change adaptation.

Action:

King County departments will invest in education and outreach strategies to raise awareness and build engagement on adapting to climate change impacts in the region.

King County departments cannot adapt to climate change impacts by working alone. Success in the strategies detailed in the previous section depends on significant education and outreach to partner governments, agencies, organizations and residents of the region.

In the near term, King County will:

- Continue developing collaborative projects with Climate Impacts Group and the ICLEI – Local Governments for Sustainability, such as the guidebook or "toolkit" for how regional governments can adapt to climate change;

- Collaborate with Indian Tribes, federal, state and local government agencies, the UW Climate Impacts Group and Washington State University Extension, among others, to develop practical trainings that engage public officials, residents and businesses of King County and surrounding counties on the topic of adapting to climate change impacts;

- Continue to organize conferences and workshops on climate change, on topics of both emissions reduction and adaptation;

- Continue to develop education for the building industry, suburban cities and residents of the county to understand how green building and low-

impact design and operations can help adapt to projected climate change impacts; and

- Develop more in-depth web portal that highlights King County data, information and knowledge about climate change mitigation and adaptation, and seeks to engage residents and businesses in King County activities.

- Design an outreach and communication strategy focused on mitigation and adaptation actions that urban and rural landowners and citizens can undertake.

The Washington State University Extension Program will also collaborate with King County to provide outreach across neighboring counties, in public events and programs such as Harvest Celebration, Small Farm Expo (alternative energy track), Extension Education Events (Reducing Reliance on Fossil Fuels/Conserving Energy), Master Gardeners and Beach Watchers.

Action:

The King County climate change adaptation team will provide information and resources about the development and implementation of this plan to other governments across the United States and worldwide.

This plan will serve as important companion material for the guidebook now being developed by King County and the Climate Impacts Group, and being published by ICLEI – Local Governments for Sustainability. King County can provide great benefit to other local and regional governments worldwide, by sharing this product and related materials, whenever possible.

Additional opportunities will exist to partner with Washington State University. As part of the Land Grant University system, Washington State University can help King County extend this work through the Land Grant University system via its companion Extension offices in every county of the nation.

Goal:

King County will raise awareness with the public and other critical stakeholders on progress in climate change adaptation.

King County will identify the top ten performance measures by which to track progress on climate change mitigation and adaptation, and will publish and promote the use of this data.

STRATEGIC FOCUS:

Public Health, Safety and Emergency Preparedness

Goal:

Seattle - King County Public Health and other King County departments will be leaders in protecting public health from climate change impacts.

Action:

Seattle – King County Public Health will seek collaboration with the academic community, public agencies, private sector, and non-profits to share information and enhance understanding and visibility of climate change impacts to public health.

At present, the UW Climate Impacts Group does not currently pursue research on climate change impacts to public health. There is widespread agreement among public health professionals nationally and internationally of the key pathways by which climate change will affect public health. Collaborative research and information sharing are needed in all of the following areas to form a coherent adaptive public health strategy in the face of climate change:

- Thermal stress;
- Physical effects of extreme weather and climate events;
- Synergies and interactions with environmental quality, e.g., air, water, and soil quality and air-borne allergens;
- Infectious diseases (water-and animal vector-borne), changing distribution patterns, new emergences, and re-emergence of previously eradicated diseases;
- Changes in food quality, food supply, and nutrition;
- Equity, demographic, economic, and social aspects of climate change impacts and resultant implications for population health; and
- Cumulative effects and multiple stresses.

There are opportunities to partner with national and local non-profit organizations to develop this research. As of early 2007, the current representative of the public health department on King County's climate change adaptation team will serve on the Climate Change Workgroup of the National Association of County and City Health Officials (NACCHO). The same representative is also involved with efforts of the Collaborative on Health and the Environment--Washington to enhance understanding about climate change impacts to public health and make the topic generally more visible and well understood among the public and policy-makers.

Action:

Seattle -- King County Public Health will convene an internal departmental group to increase understanding about climate change impacts to public health.

The climate change adaptation team perceives a need for better dissemination of climate change information and impacts on public health to other groups and programs within Seattle-King County Public Health. This departmental group should include the areas of emergency preparedness, community health, and zoonotic (animal-borne) disease, at a minimum.

Action:

Seattle – King County Public Health will continue to work with other departments to develop proactive strategies to reduce known public health risks of climate change.

In conjunction with the climate change adaptation team, Seattle – King County Public Health plans to:

- Work with the King County Office of Emergency Management, hospitals, and providers to develop response protocols for anticipated climate change impacts (e.g., West Nile virus outbreak, extreme heat events, drought and food supply disruptions);

- Through the Built Environment and Land Use Program, integrate and incorporate climate change adaptation strategies into comments and input regarding land use and transportation planning, urban design, utilities, building practices, and infrastructure development;

- Work with the King County Green Building Program to develop new criteria that keep our government and region's buildings healthy in warmer summers and wetter winters;

- Continue to collaborate with flood hazard management, stormwater and wastewater planners in the Department of Natural Resources and Parks to minimize exposure to toxics in water, address the health implications of flooding (e.g. commingling of stormwater and wastewater), and ensure that the region has proper sanitation, proper disposal of waste and toxics, and clean water into the future;

- Work with the Department of Natural Resources and Parks and Washington State University Extension on the Seattle – King County Food Policy Council to promote concepts (e.g. the "food system" concept) and agroecological practices (e.g. development of drought-tolerant crops and promotion of eating local foods) that help the region adapt its food purchasing and consumption patterns to a changing climate; and

- Work with other departments to understand how vulnerable populations could be affected differently by climate change impacts.

Goal:

King County will help the region to understand, limit the risks and minimize damage of natural hazards associated with climate change impacts.

Action:

King County will continue to analyze the potential impacts of climate change on natural hazards, and will update emergency plans and activities to respond appropriately to projected changes.

As directed by the Executive and Council, efforts are currently underway to update the King County emergency plans to respond to projected impacts from climate change.

At present, information about the increased frequency of fall and winter flooding is relatively clear, while we are still learning about climate change impacts to the frequency and intensity of significant storms. Based on the experience of winter 2006, however, King County emergency planners are making appropriate provisions for both flooding and windstorms.

King County Office of Emergency Management will also collaborate with King County's climate change adaptation team and local climate change researchers to incorporate information about other effects of climate change on regional hazards into its activities.

In conjunction with King County's interdepartmental climate change adaptation team, the Office of Emergency Management plans to:

- Continue to work with Seattle - King County Public Health, King County departments, hospitals and providers to integrate considerations of climate change into response protocols for related public health emergencies (e.g. extreme heat events);

- Incorporate best available climate change information into discussions of and the next update to the Regional Hazard Mitigation Plan, as part of technical review in the Hazard Identification and Vulnerability Assessment stage and hazard mapping projects;

- Incorporate best available climate change information into resources provided for elected officials, residents and businesses in the region to prepare for hazard possibilities; and

- Continue to seek funding for activities that minimize regional hazards related to climate change impacts.

STRATEGIC FOCUS:

Land Use, Buildings and Transportation Infrastructure

Goal:

King County plans will guide the region to build preparedness for climate change impacts into all major investments in land and infrastructure.

Action:

King County's interdepartmental climate change adaptation team will support review of all King County plans, policies and investments, with information about predicted climate change impacts.

Information provided by the interdepartmental climate change adaptation team is intended to provide directors and departments with an understanding of the climate change "readiness" of King County's programs, by highlighting potential gaps in planning and action in light of projected climate change impacts. It is also intended to help managers craft strategies for predicted climate change impacts.

The initial list of King County plans and programs to be reviewed with this climate change information is as follows:

- The King County Comprehensive Plan, which is scheduled for an update in 2008 and reviewed every four years;
- The King County Regional Hazard Mitigation Plan;
- The King County Shoreline Master Program, which is scheduled for an update in 2008;
- The King County River and Floodplain Management Program, as guided by the King County Flood Hazard Management Plan and related implementation activities;
- King County documents and King County comments on coordinated water system plans in the Regional Water Supply Planning process, which is currently being developed;
- The King County Green Building Five-year Strategic Plan and the King County Green Building Ordinance, which is scheduled for renewal in 2007;
- King County transportation infrastructure plans listed in the transportation section, including the Roads Strategic Plan and Six-Year CIP; and

- King County major capital programs and maintenance plans not otherwise specifically mentioned above.

In the Executive Orders of March 2006 and the Council Motion of October 2006, the Executive and Council directed that King County further incorporate policies and text related to impacts of climate change into the King County Comprehensive Plan and relevant emergency plans for flooding. As described in Appendix J, the King County Comprehensive Plan and the King County Flood Hazard Management Plan have some information about recommended action on greenhouse gas reduction and impacts adaptation embedded in their text. However, it is important that these plans be updated to guide the county toward increased resilience.

An interdepartmental team is currently developing the scope of work for the 2008 update of the King County Comprehensive Plan, and participating in an ongoing effort to keep the Countywide Planning Policies up to date. This team is introducing policy goals related to climate change impacts adaptation into the four-year King County Comprehensive Plan update. As required by law, King County will also ensure that goals and text related to climate change adaptation in the Comprehensive Plan will be clear and consistent with that of its functional plans, including but not limited to the Shoreline Master Program update.

As of 2007, King County has also begun to incorporate further goals and text related to climate change adaptation into the Flood Hazard Management Plan and documents related to the Regional Water Supply Planning Process.

Goal:

King County will help the region to understand and reduce risks of fall and winter flooding associated with climate change impacts.

For over 40 years, King County has undertaken significant mitigation and response actions to reduce the likelihood of flood related losses to citizens, property and infrastructure, and worked to prevent the creation of new flood risks. At the same time, funding constraints have compromised the county's ability to maintain, repair, and retrofit hundreds of aging levees, revetments, and flood protection facilities that citizens and businesses depend upon for public safety.

Action:

King County will implement the adopted 2006 King County Flood Hazard Management Plan, work to create a Flood Control Zone District by June 1, 2007, and work to establish a countywide fee for funding of necessary investments in the areas that are most vulnerable to increased fall and winter flooding.

Additional funding levels are necessary to ensure completion of critically needed improvements to the county's flood protection facilities. In their current condition and under current weather/flood patterns, King County's system of 500 levees and revetments are not functioning adequately to protect public safety, regionally significant economic resources, major transportation corridors, and other property interests for the long term.

The King County Flood Hazard Management Plan is considered to be a model land use regulation; King County will share experiences in drafting and implementing the plan with other regional governments nationwide.

Action:

The King County River and Floodplain Management Program will work with King County departments to identify future flooding impacts to areas covered by plans and programs.

The King County River and Floodplain Management Program offers expertise and experience, and can offer robust flood information to county departments involved in infrastructure design, construction and maintenance, and response to public health threats from flooding.

Action:

King County will track and collaborate with local climate change researchers to better understand the effects of climate change upon fall and winter precipitation patterns.

As part of a continued long-term strategy, King County is already working to:

- Understand more clearly the impacts that warmer conditions will have on the frequency, duration and intensity of fall and winter storms and associated flooding events in Western Washington. Research findings will inform King County's long-term flood risk reduction strategies in response to climate change.

- Evaluate the effects of climate change-induced changes in water quantity, water supply and dam operations on flooding of major rivers in King County.

- Evaluate the effectiveness of the county's flood risk reduction strategies, as informed by emerging climate change research and/or experience gained from implementation of the 2006 King County Flood Hazard Management Plan.

Goal:

King County will help the region to understand and reduce risks of possible coastal flooding associated with climate change impacts.

Action:

King County will collaborate with climate scientists and the Federal Emergency Management Agency to evaluate and plan for the potential impacts of coastal flooding associated with sea level rise.

King County will continue to protect shoreline natural resources, water-dependent uses, and public access on shorelines, including those along Puget Sound and major lakes, rivers and streams, from climate change impacts.

King County is already collaborating with the Climate Impacts Group on a technical review of shorelines, with regard to climate change impacts. King County will also complete flood studies and flood boundary delineations to update the corresponding Federal Emergency Management Agency Flood Insurance Studies and Flood Insurance Rate Maps for marine shoreline areas in unincorporated King County.

King County will update the 1978 King County Shoreline Master Program to comply with State guidelines and will consider climate change impacts to shoreline in drafting the update. As directed by King County Council Motion 12362, King County will pay particular attention to the impacts of climate change on shoreline erosion.

Goal:

King County will adapt its operation and maintenance of parks and trails to climate change impacts, in the most cost-effective way possible.

Actions:

King County will identify projected climate change impacts to parks and trails, and will incorporate climate change considerations into the Parks Division maintenance plan.

Adaptive actions already underway at King County Parks include native and drought-resistant landscaping, and installation of synthetic turf for ball fields and reduction in landscaping irrigation, which will help make landscaping resilient in case of water shortage, and cut down on future irrigation needs and costs. King County will continue these efforts.

In the near term, King County Parks Division will also address potential changes in climate and increased flooding in its maintenance plan, and take steps to convert remaining ball fields to synthetic fields, to reduce irrigation during summer months.

In the near term, King County Parks Division will consult and coordinate with the King County River and Floodplain Management Program to consider potential flood impacts when purchasing parks and trails adjacent to major rivers, streams, and other waterways. King County Parks will also consult and coordinate with the King County Historic Preservation Program to address climate change impacts to historic buildings under its management.

Goal:

King County will promote understanding of the value of green building practices to continued resilience of buildings and health of occupants to climate change impacts.

King County recognizes that green building practices help improve building resilience and the health of building occupants. Among other benefits, green buildings can: help adapt to warmer temperatures by providing natural cooling which does not require air conditioning; and help adapt to increased stormwater runoff with natural filtration by green roofs and bioswales.

Action:

King County departments that manage capital projects and/or buildings will incorporate climate change information on the adaptive benefits of green building into plans, policies and codes.

The King County Green Building Program leads the cross-departmental effort to carry out the county's Green Building Ordinance (No. 15118) for internal capital projects and supports the Department of Development and Environmental Services green building work program. The long history and accomplishments of King County in adopting and promoting green building already help prepare government operations for future climate change impacts, such as warmer temperatures and increased stormwater runoff.

Moving forward, in both the Green Building five-year strategic plan and the King County Green Building Ordinance renewal, King County Departments will: incorporate climate change impacts information on the benefits of green building design, construction and operation in a changing climate, and expand the role for green building practices in facilities and infrastructure as a climate change adaptation strategy.

Action:

King County Department of Natural Resources and Parks Solid Waste Division will provide green building outreach and technical assistance to the building industry and county residents, as a solution to adapt to projected climate change impacts.

The Solid Waste Division already provides green building outreach and technical assistance for the building industry and county residents on sustainable practices for all types of projects, from large commercial developments to home remodeling projects.

In the near term, the Solid Waste Division will: work with suburban cities to encourage green building throughout the county; continue to develop education and training for builders and developers; and continue to provide consumer education on how green building products can help residents and businesses adapt to climate change impacts.

Goal:

King County Historic Preservation Program will identify, preserve and protect significant historic and archaeological properties in the region that are vulnerable to climate change impacts, in order to promote community, economic, and cultural development.

Action:

King County Historic Preservation Program will identify cultural resources such as historic buildings, cultural properties and archaeological sites that are vulnerable to damage caused by climate change impacts.

King County Historic Preservation Program has a natural role in developing more comprehensive cultural resources data to aid in protecting historic and cultural resources from climate change impacts. Historic and cultural resources in King County are particularly vulnerable to damage related to sea level rise, flooding, erosion and storm events.

Data such as this can help both King County and the public minimize unintended impacts to cultural resources in the course of response to climate change impacts such as shoreline erosion and flooding (e.g. shoreline and riparian armoring; demolition and relocation of flood zone buildings and infrastructure). United Nations Educational, Scientific and Cultural Organization has completed a similar worldwide inventory of World Heritage Sites that are vulnerable to climate change impacts.

Specific actions already underway by the Historic Preservation Program include:

- Working to update King County's Historic Resource Inventory to provide comprehensive data about King County's historic resources for planners and public agency officials responsible for assessing impacts of their actions on potentially significant resources; and

- Working to develop a predictive model for archaeological resources to better identify areas of the county that have a high likelihood of being

culturally sensitive due to the presence of as-yet unidentified archaeological resources, burial areas or culturally significant sites.

In the near term, King County Historic Preservation Program will: accelerate its process for updating the Historic Resource Inventory, accounting for predicted climate change impacts; accelerate its process for developing archaeological predictive models, accounting for predicted climate change impacts; and identify designated King County Landmarks which are most vulnerable to climate change.

In the long term, King County Historic Preservation Program will need support for comprehensive documentation of significant cultural resources, which will in turn allow public agencies responsible for complying with Section 106 of the National Historic Preservation Act to access better data that will support protection of cultural resources.

The Section 106 review process mandates that any undertaking by a public agency which involves federal funding or permitting should take into account potential impacts to cultural resources, including most actions by public agencies that relate to the impacts of climate change.

Action:

King County Historic Preservation Program will work to raise awareness of the need for protection of cultural resources such as historic buildings, cultural properties and archaeological sites from damage caused by climate change impacts such as flooding, erosion and storm events.

Protection activities have been traditionally conducted without explicit consideration of climate change impacts. The King County Historic Preservation Program will integrate climate change impacts information into these activities already underway:

- Working with cultural institutions and historic property owners to address basic disaster planning and to assess general emergency preparedness needs related to natural hazards;

- Partnering with 4Culture to provide annual competitive grants to assist property owners in rehabilitating historic commercial, residential and community buildings to serve contemporary purposes, to meet contemporary building codes;

- Providing technical assistance to property owners related to a range of challenges such as pest control, code compliance, environmental review and financial assistance;

- Administering a range of tax incentives to support historic preservation, to encourage rehabilitation of historic properties, and to protect cultural

resources in the context of working agricultural lands and open space conservation properties;

- Working with Indian tribes to protect areas of key plant and animal populations such as salmon, cedar, and huckleberries which have a high level of cultural significance to tribal populations and which tribes have harvest rights guaranteed by treaty;

- Working with municipal governments and other public agencies to preserve, rehabilitate and promote historic commercial districts in rural and suburban communities which fight sprawl by providing pedestrian-oriented, densely developed multi-use urban village centers.

In the near term, King County Historic Preservation Program will also:

- Work with American Institute of Architects and other groups to revise LEED standards and green building guidelines to better support and encourage historic preservation activities;

- Work with owners or stewards of King County Landmarks to develop preservation plans that account for climate change impacts; and

- Work with relevant King County departments to coordinate cultural resource protection with habitat improvement, surface water management, protection of agricultural lands and other natural resource management efforts.

- Work with relevant King County departments to evaluate impacts to and coordinate protection of historic and cultural resources that are owned by King County, such as landmark buildings and historic bridges.

In the long term, King County should also provide new funding or other incentives supporting the rehabilitation of historic buildings, to help stabilize vulnerable buildings, increase efficiency of outdated building systems and comply with new design requirements, as a proactive measure to ensure that historic buildings can be reused in ways that adapt to a changing climate.

King County Historic Preservation Program will also continue to create a broader understanding of the economic consequences of climate change impacts to historic and cultural resources. These materials will include information on the value of cultural tourism in rural communities, and the role of historic preservation in supporting affordable housing and incubation of small businesses, through rehabilitation and adaptive reuse of historic properties.

Goal:

King County will protect the integrity and safe operation of regional transportation infrastructure from climate change impacts.

Action:

King County Road Services Division will incorporate climate change impacts information into construction, operations and maintenance of infrastructure projects.

The greatest long-term priority for transportation planners and managers with regard to climate change impacts is to maintain an operational roadway network that will be resilient to future changes. A robust transportation system should experience minimal damage from weather extremes and would be able to respond quickly to disruptions in roadway operations.

Actions already underway by King County Road Services Division include:

- Evaluation of higher flows on bridge and culvert design as well as seawall modifications;
- Participation in King County's interdepartmental climate change adaptation team; and
- Initiation of educational efforts to facilitate the sharing of information among staff on the projected impacts of climate change.

In the near term, King County Road Services Division will incorporate climate change into its own planning and design documents, and comments on others' planning and design documents, as they come up for revision. These documents include but are not limited to:

- Road Services Section Strategic Plan,
- Transportation Needs Report,
- Six Year CIP,
- King County Road Standards,
- Project Management Manual,
- Design Procedure Manual,
- Intelligent Transportation System (ITS) Strategic Plan,
- King County Surface Water Design Manual,
- Drainage Program Tracking System Report,
- Regional Road Maintenance ESA Program Guidelines,

- Bridge Priority Maintenance Program,
- Shortspan Bridge Program,
- Non-motorized Plan,
- National Environmental Protection Act and State Environmental Protection Act Environmental Review Documents,
- Project Contracts, Specifications, and Plans, and
- Capital Equipment Investments List.

King County Road Services Division also plans to identify and expand policies and plans that adjust transportation infrastructure improvements and maintenance to ongoing and anticipated climate and weather changes.

Additionally, the division is looking at ways to incorporate climate changes predicted in the future into current transportation project designs. For example, the Road Services Division is currently rebuilding over 57 bridges and 40 culverts that will need to be designed to improve steamflows and endure the most significant impacts of climate change.

In the long term, some strategies that are being considered by Road Services Division include:

- Replacing or rehabilitating bridges in order to improve floodwaters conveyance and to avoid scour during high flows;

- Using pervious pavement and other low impact development methodologies to manage stormwater through reduced runoff and on-site flow control;

- Modifying existing seawalls to avoid failures in transportation facilities;

- Evaluating roadways to minimize their vulnerability to potential risk from landslides, erosion, or other failures triggers;

- Developing new strategies to effectively respond to increasingly intense storms, including providing alternative transportation access;

- Managing construction and operations to minimize effects of seasonal weather extremes;

- Identifying opportunities to incorporate habitat improvements that buffer the effects of climate change on ecosystem health into project designs;

- Incorporating permeability in the roadway network for wildlife that may be responding to changes in climate through migration and dispersal;

- Evaluating and implementing improvements to roadway surfaces that withstand weather extremes and vehicle weight, while also reducing fuel consumption; and

- Designing projects to increase functional redundancy of transportation modes in addition to single vehicle occupancy travel.

Action:

King County climate change technical advisory subgroup will train Road Services Division staff in climate change impacts information and updates.

A high priority for the division is to educate Road Services Division staff on expected changes in climate and how these changes potentially affect the facilities they manage. Targeting funding and staff allocation to these efforts will be paramount to identifying and engaging adaptation solutions in the near and long-term.

STRATEGIC FOCUS:

Surface Water Management, Freshwater Quality and Water Supply

Goal:

King County will work to understand and share information about climate change impacts to safe and reliable drinking water supplies and protection of fish and wildlife habitat conditions.

Warmer temperatures and reduced snowpack associated with climate change are expected to lead to reduced summer and fall streamflows and lower firm yields of regional water supplies.

Action:

King County will develop a workgroup within the Department of Natural Resources and Parks to address climate change impacts to instream flows.

This workgroup will be responsible for development of a strategy that King County can undertake to address the impacts of climate change to instream flows more systematically.

As part of this effort, King County Department of Natural Resources and Parks, Water and Land Resources Division will develop an in-depth technical analysis of the projected impacts of streamflows to large rivers and tributaries in King County.

This work will support King County's understanding of streamflow reductions in context of competing water interests, such as water supply and salmon recovery and biodiversity protection.

Action:

King County will work with state, regional and local governments and leaders to address concerns of climate change impacts to safe and reliable drinking water supply and protection of fish and wildlife habitat conditions.

King County has already taken the first steps in a coordinated water supply planning process with the Cascade Water Alliance, as agreed to in Cascade's Transmission and Supply Plan, to project future regional water supply needs in the context of climate change impacts.

In October 2006 the Climate Change Technical Subcommittee of the Regional Water Supply Planning Process published "Climate Change Building Blocks," (See Appendix

K) a document that presented some of the more important conclusions from the three past Intergovernmental Panel on Climate Change reports, as well extensively peer-reviewed results from other studies. That document was an attempt to provide a series of "building blocks" to serve as a foundation for what is known about climate change and its likely impacts on water. The information in this consensus document was associated with both global trends and forecasts, and specific climate changes in the Pacific Northwest. Members of the technical committee agreed on the changes that are occurring, as the basis for agreement among regional agencies on potential impacts and strategies.

In this vein, King County will continue to collaborate with other government agencies and climate science partners on a clear process for developing and communicating best science, as it is established, on likely near-term and long-term water impacts.

Goal:

King County will work to ensure coordination of all elements of the region's water management program relating to water supply and quality, fish habitat, wastewater and surface water, and work to ensure that related activities account for projected climate change impacts.

Action:

King County will work with state, regional and local governments and leaders to promote an ethic of water use efficiency and conservation across the region.

In its role as land use and transportation planner, by promoting population growth, development and employment in designated urban areas, King County already helps to create conditions for residential water supply to be provided with the greatest efficiency to a large percentage of the region's population.

King County will continue to employ strategies in land use planning that direct growth into urban areas to maximize the efficiency of water supply provision. King County will also support water conservation in the County's own operations. King County will also encourage the use of drought tolerant landscape standards and crop selection across the region.

Action:

King County will promote water supply management structures that support resilience to climate change.

In the long term, King County will work to promote water supply management structures that will produce integrated real-time management as well as long-term strategic direction. King County will also initiate discussion of challenges associated with the

multiple jurisdictions and authorities involved in water management decisions, and work to facilitate agreement among water resource management agencies on how to recognize and begin addressing potential impacts.

Action:

King County will incorporate known climate change impacts information into documents of the Regional Water Supply Planning Process, as well as other existing King County plans related to water availability and quality.

King County has already initiated development of a regional water supply planning process with a climate change technical element. King County will continue to take other steps that encourage the consideration of climate change information in plans related to water availability and quality:

- Requesting that water and sewer agencies begin addressing climate change impacts in plans to be reviewed by King County;
- Incorporating climate change into adaptive management strategies for instream flow and water elements of salmon recovery plans; and
- Requesting that state agencies integrate known impacts from climate changes into their regulatory and planning programs, develop statewide strategies, and provide technical assistance

Additional actions that King County will take in the near term include:

- Completion of the Regional Water Supply Planning process with climate change technical work integrated across plan elements;
- Integration of climate change impacts into routine planning for key King County water-related program areas (flood management, stormwater management, wastewater management), and systematic development and implementation of program activities based on climate change analyses; and
- Incorporation of climate change technical work more thoroughly into regional salmon recovery plans.

Goal:

To promote regional water supply resilience to climate change, King County will maximize development and use of reclaimed water produced from the wastewater system, and will explore other water reuse approaches and applications.

Executive Order PUT 7-7 and Council Motion 12362 have directed King County to maximize use of reclaimed water produced from the wastewater system, consistent with the Regional Wastewater Services Plan.

Action:

King County will produce and promote the use of reclaimed water that can be used for industrial and irrigation purposes to help offset the potential impacts of climate change on summer streamflows and water supplies.

Over a decade ago, King County took the position that recycling paper was preferable to cutting down more trees for new paper production. Similarly, King County now takes the position that recycling water is preferable to removing more water from reservoirs, especially for non-potable purposes.

King County is investing $26 million in a reclaimed water "backbone" associated with Brightwater Treatment Plant, which is currently under construction. Water reclamation at this facility will produce 7 million gallons per day of reclaimed water when the plant is online in 2010, and an additional 14 million gallons per day of reclaimed water if Phases II and III of the backbone project are approved by Council.

In the near term, King County and the Cascade Water Alliance, among others, will complete the multi-jurisdictional Regional Water Supply Planning process that includes the role of reclaimed water as an alternate supply. A reclaimed water subcommittee of that planning process is currently completing its technical work, and will present a summary of its work to its members and the King County Executive in the near term.

As part of its green building program, King County will also explore the value of stormwater and grey water collection strategies for water reuse (e.g. to flush toilets and handle landscape-watering needs). King County will also explore the possibility of promoting code revisions that allow for stormwater collection for reuse.

Action:

King County will inventory all non-potable uses of water in the region for potential substitution by reclaimed water.

Moving forward, King County will also work with water utilities to secure users and customers for reclaimed water produced at the Brightwater treatment plant and secure

additional users for reclaimed water produced at the South Treatment Plant. Along these lines, King County is also developing a regional strategy for implementing the use of reclaimed water for non-potable irrigation and industry purposes that will free up tens of millions of gallons of potable water for other uses that call for potable water.

Action:

In 2007, King County will develop a Reclaimed Water Feasibility Study to inform decision makers of the current and possible future uses of reclaimed water, and discuss key considerations in developing a successful program and projects (such as revenue sources and pricing polices).

This reclaimed water feasibility study will be completed by December 31, 2007, as called for by King County Council Ordinance 15602. This ordinance specifically directed the feasibility study to address five key issues:

- Review of new technologies for feasibility and cost effectiveness, that may be applicable to future wastewater planning;
- Review of revenue sources other than the wastewater rate for distribution of reused water;
- Detailed review and update of a regional market analysis for reused water;
- Review of possible environmental benefits of reused water; and
- Review of regional benefits of reused water.

Action:

King County will work with state, regional and local governments to expand the use of reclaimed water, as a measure to reduce stresses on freshwater and marine waters and help achieve recovery of a healthy Puget Sound.

In the spirit of the Puget Sound Partnership, King County will work with other governments in the region to promote reclaimed water as a drought-resistant source of supply and solution for reducing stresses on freshwater and marine waters. King County will work to achieve this through regional planning, bilateral negotiations, and advocacy with state agencies and the state Legislature.

Among other areas and issues, this effort will focus on expanding use of reclaimed water throughout the Puget Sound area, by: sharing technical information with other potential producers of reclaimed water; developing collaborative communication approaches; developing any necessary changes in state law or regulations; and supporting additional technical studies, as needed.

Goal:

King County will support operational resilience of wastewater treatment to climate change impacts in the most cost-effective way possible.

Action:

King County Wastewater Treatment Division will collaborate with climate science experts and regional partners to understand and evaluate climate change information, and to incorporate these into planning for future wastewater treatment investments.

Some climate change impacts to wastewater operations are known, such as sea level rise; others are less clear, such as precipitation intensity. Climate change information on these and other impacts will be used to the extent possible, and the King County Wastewater Treatment Division will continue to look to the best available science to minimize its risks from climate change.

Plan updates for conveyance and combined sewer overflows are generally scheduled to occur every five years. The next updates are due in 2007 and 2010, respectively. Plan updates for treatment plants are generally scheduled to occur every 10 years. The next planning update for treatment plants is expected after the 2010 census. Plans will include future facility planning and recommendations in light of predicted climate change assumptions.

- As a first step, the Wastewater Treatment Division will conduct an inventory to determine which of its facilities are most vulnerable to climate change impacts and review this along with system-wide planned capacity needs.

- The Division will then develop a series of climate change response strategies for consideration by the King County Executive that should maximize flexibility to respond to changed conditions and assumptions.

- The Division will develop design and asset management guidelines that maximize the system's flexibility to manage peak storm flows, and improve facility locations for new assets in light of potential climate change impacts

- The Division will also assess automation improvements to maximize treatment capability system-wide.

Action:

King County Wastewater Treatment Division will develop strategies to deal with possible increases in combined sewer overflows and inflow and infiltration events as a result of increased fall and winter flooding associated with climate change.

King County continues to control combined sewer overflows, with a substantial reduction since 1960. Two major combined sewer overflow control projects have been completed, and 21 more projects are set to be constructed by 2030, to meet state standards of one untreated discharge per year on average at each combined sewer overflow location.

King County is also developing a regional strategy for inflow and infiltration (I/I) removal and control. This strategy will aim to: identify, implement and monitor cost effective I/I rehabilitation projects and propose I/I performance thresholds for contributing agencies.

Goal:

King County will support operational resilience of stormwater management to climate change impacts in the most cost-effective way possible.

Action:
King County will expand its efforts to improve stormwater management in case of increased fall and winter flooding and will make provisions for other climate change impacts, to the extent practical.

Some climate change impacts to stormwater management are known, such as increased frequency of flooding; others are less clear, such as overall precipitation intensity. Climate change information on these and other impacts will be used to the extent practical, and King County will continue to look to best available science to minimize risks to stormwater management from climate change.

King County will know more about climate change impacts to precipitation over time, and can inform future decisions accordingly. For instance, if the 100-year runoff event were to become more common, for example, then King County would need to modify facilities and design criteria in the stormwater manual.

Further adaptive efforts in stormwater management should include not only increased capital improvements, the priorities of which must be determined through subbasin-scale planning and coordination with other jurisdictions, but also increased inspection, enforcement, and education activities to further reduce pollution (as associated with stormwater protection level five). All such efforts would require more funding than is currently available for stormwater management programs.

Action:
King County will contribute knowledge and information about climate change impacts to stormwater runoff in its partnerships to keep regional waters clean.

In the Puget Sound Partnership, King County has collaborated with local, state, and federal agencies, as well as environmental groups, to reduce stresses on the waters that feed and make up Puget Sound. These agencies and groups have recognized stormwater as a major contributor to the pollution of Puget Sound, and have articulated the need to improve stormwater management in already developed areas. Doing so will not only improve the health of Puget Sound and its tributary watersheds, but also

counteract the negative effects that climate change may have on the protection provided by stormwater management in general.

The Clean Water Task Force that has grown out of the Govenor's initiative is an opportunity to address climate change impacts on stormwater and ultimately water quality. King County will contribute knowledge and information about climate change impacts on stormwater runoff to this continued effort.

Goal:

King County will help the region to ensure regional freshwater quality for drinking, irrigation and fish and wildlife.

Actions to protect marine water quality are addressed in "Marine Water and Environment."

Action:
The proposed climate change technical advisory group of King County's climate change adaptation team will continue to monitor and develop research on climate change impacts to water quality in lakes and rivers.

King County's Water and Land Resources Division Science Section already conducts regular ambient monitoring of freshwater quality, sediment quality and chemical concentrations, among other factors. Models now under development will allow for testing of impacts of possible future land use, population growth, and climate change scenarios on water quality and quantity. The Science Section also uses its knowledge of environmental conditions to assist with preparation of various regulations and plans, including critical area regulations, salmon recovery plans, water quality implementation plans, shoreline management plans, and flood management plans.

Additional detail can be found in "Climate Science and Policy."

Action:
Based on the research of the climate change technical advisory group, King County departments will work with other public agencies to address concerns of climate change impacts to water quality.

Specific actions include:

- Creation of a clear process for developing and communicating climate change information, as it is established, on likely near-term and long-term water impacts;

- Continued work within Water and Land Resources Division and with Seattle-King County Public Health to coordinate water quality protection efforts in stormwater management and wastewater treatment operations;

- Advising on code and plan revisions that coordinate water quality efforts among the relevant agencies and King County divisions; and

- Promotion of the inclusion of information on climate change impacts to water quality in water and sewer agency plans, which are reviewed by King County.

STRATEGIC FOCUS:

Financial and Economic Impacts

Goal:

King County will take steps necessary to limit financial damage and economic consequences of climate change to the region.

Action:

King County will continue to evaluate potential impacts of climate change on government operations and the region, and will disclose results to residents, businesses and partner agencies.

More information on how King County is already accounting for climate change in its regional plans and infrastructure investments can be found in previous sections.

King County's work to maintain the resilience of property and infrastructure to climate change impacts is undertaken in large part to protect the regional economy. King County's efforts also specifically support the insurance industry in fulfilling its historic role of preventing and reducing loss from natural hazards.

King County will continue to explore best practices to limit the economic risks of climate change impacts. This continued action is consistent with that of other municipal governments nationwide. In 2003, for instance, a coalition of pension funds formed the Investor Network on Climate Risk to promote investor and corporate understanding of financial consequences of climate change. Members now include: state treasurers from 13 states, including California, Iowa, Oregon and Kentucky; state and city comptrollers; public pension funds; labor pension funds; foundations, including the Rockefeller Brothers Fund; and both large and small asset managers. The collective assets represented by this network equal almost 3 trillion dollars.

Goal:

King County will consider climate change impacts in its efforts to maintain healthy, resilient forests and a productive forestry economy.

Action:

King County will continue to build expertise on the climate change impacts to forest health and forestry.

King County will continue to attend appropriate seminars and workshops and remain informed through communication with researchers and experts and through various media sources about the impacts of climate change to forest health and forestry. Staff will remain updated on emerging forest practices (e.g. reforestation techniques and pest management) that are considered most adaptive to climate change, as well as information on how to reduce risks of forest fires and insect disturbance. Representatives to the adaptation team will update the team with information as appropriate.

King County will also work with federal, state, regional and local partners to promote appreciation for the value of forests in regional climate change resilience. Healthy forest ecosystems are critically important to regional biodiversity, salmon recovery, wildlife health, and water quality, especially in context of predicted climate change impacts. Healthy forest ecosystems can help to protect water quality as a natural filter, and provide critical shade in riparian zones that make rivers suitable for salmon and other wildlife. The importance of conservation and sustainable management of forest resources will thus only increase with climate change.

Action:

King County will continue to work with its partners to provide assistance, education and planning resources to forest landowners and communities about climate change impacts to forests.

King County and Washington State University Extension already provide technical assistance and education for small forest landowners. This partnership reaches over 100 property owners a year with extensive assistance in forest planning and also assists them in implementation of forest health thinning, restoration replanting, and other technical assistance related to overall forest health.

King County also works with communities on planning to reduce risk from forest fire, actions to improve forest health, outreach to residents about forest fire hazards, and actions to make homes less susceptible to fire.

In the future, King County will work to identify county barriers in healthy forest management, and will explore the possibility of proposing code changes to improve management of healthy forests.

In the long term, King County Department of Natural Resources and Parks intends to pursue a large scale effort to promote forest health, so that forests will be resilient to the effects of climate change. This effort should promote active management of young and overstocked forests and attention to the health of all forests. This will take a change in approach by land conservation groups, who will have to recognize that active management is necessary to succeed in conservation. The effort should be multi-jurisdictional, and should involve private and public landowners. It should include education of small landowners, increased fire management planning, and sound management of public lands.

The current involvement of Washington State University Extension will allow King County to:

- Build on Washington State University expertise in managing for forest health;
- Provide outreach to neighboring counties and state and federal jurisdictions; and
- Build on Washington State University's Extension Watershed Stewardship program in working across areas of forestry, water quality and salmon.

King County and Washington State University Extension already provide extensive educational and technical assistance to residential landowners. These efforts will need to be expanded to additional outreach approaches, which specifically provide fundamental information about: the value of retained forests in "buffering" climate change impacts and helping other systems adapt to climate change impacts; easily identifiable forest health risks that make forest systems vulnerable to climate change impacts; and straightforward techniques for landowners to reduce those risks. This effort will especially target residential landowners who have retained forests on their property but who do not have the background to manage them.

Action:

King County will work with federal, state and local governments to explore the possibility of developing a multi-agency partnership to raise awareness about climate change impacts on the region's forests, to share technical information, and to actively manage to improve forest health and resiliency.

King County will work with the United States Forest Service, Washington State Department of Natural Resources, King County, Washington State University Extension, University of Washington Forestry Department, land trusts, and private owners to explore this possibility. Special attention will be paid to understanding and developing management practices to reduce risk of forest fire and insect disturbance, to the extent possible.

Goal:

King County will promote understanding of the value of agriculture and a healthy local agricultural economy for maintaining regional resilience to climate change impacts, and will consider climate change impacts in its efforts to maintain healthy productive agriculture lands and a vibrant agricultural economy,

Action:

King County will raise consumer awareness about the value of purchasing locally-produced food, and will continue to support programs that build a robust local food network.

Healthy agriculture means opportunities for development of a reliable local food supply. The value of a robust local food network will grow in importance as the true cost of greenhouse gas emissions is recognized in our economy, and/or as we experience an increase in natural disasters that affect farther sources of food (e.g. central California) or food distribution systems. Overall, a strong local food supply will make our region more resilient to climate change.

King County will continue to support Community Supported Agriculture Program, Puget Sound Fresh and farmers' markets across the region, in recognition of the importance of local food production and consumption to regional climate change resilience.

More information on the value of a robust local food network to reducing greenhouse gas emissions is available in the mitigation section.

Action:

King County will continue to support biofuel development by the region's agricultural economy, as a measure to build regional climate change resilience.

Healthy agriculture means opportunities for local development of clean fuels, such as biofuels, which can help the King County region adapt economically to a likely federal cap on greenhouse gas emissions and, in turn, expenses associated with the use of fossil fuel.

Actions:

King County will collaborate with the Climate Impacts Group, Washington State University Extension, public agencies, private sector and non-profits to develop research on climate change impacts to agriculture, and will work to educate farmers about these impacts.

King County has already begun to engage with regional partners in understanding climate change impacts to agriculture. However, collaborative research and information-sharing are needed in the following areas to form a coherent adaptive agricultural strategy in the face of climate change:

- Improvement of the resilience of irrigation systems with regard to drought;
- Consideration of crop choices (e.g. low-water varieties) and farming practices (e.g. dry farming) with regard to water requirements; and
- Consideration of drought impacts to development of a local biofuel industry.

King County and Washington State University Extension will continue to provide educational materials and outreach on climate change impacts to farmers at public

events such as Harvest Celebration, other related programs and one-on-one technical assistance.

Actions:

King County will continue to collaborate with the academic community, public agencies, private sector and non-profits to develop strategies to address climate change impacts to agricultural health.

King County will work with the regional water supply planning effort to make sure that agricultural water supply is considered. The county will also investigate alternate irrigation sources, such as reclaimed water and on-farm winter water storage for summer irrigation.

King County Agriculture Program and Washington State University Extension will work with King County River and Floodplain Management Program to help address the needs of farmers in flood management, and will continue to provide technical assistance to farmers to promote good farming practices and productivity.

In general, King County will continue to support and promote agriculture so that the region's agricultural economy can adapt to the impacts of climate change. Washington State University Extension will work on a variety of strategies for helping farmers adapt to climate change impacts.

Goal:

King County will be a leader in developing new solutions for the region's energy supply to be resilient to climate change impacts.

Action:

King County will continue to develop expertise in the projected climate change impacts to regional energy supply.

King County's climate change adaptation team will work closely with the proposed King County Energy Task Force to understand how projected climate change impacts will affect regional energy supply in the future.

More information on the proposed Energy Task Force is available in the King County 2007 Energy Plan.

STRATEGIC FOCUS:

Biodiversity and Ecosystems

Goal:

King County will work to support the resilience of salmon, fish, wildlife, habitat conditions and biodiversity to climate change impacts.

Action:

King County will collaborate with regional climate scientists and experts, in order to increase knowledge of current and projected climate change impacts to salmon, wildlife and biodiversity.

King County is already working closely with the Climate Impacts Group, the Canadian Climate Impacts and Adaptation Research Network, the Climate Working Group of the National Marine Fisheries Service, and the Department of Fisheries and Oceans—Canada.

Scientists in King County Water and Land Resources Division also work on assembling and reviewing existing scientific information—data, research literature, reports, and reviews—of current and past climate change effects, ecological signals of climate change, and predicted effects in the Pacific Northwest. Some of these staff members have established an *ad hoc* group of King County scientists with expertise and interest in climate change and adaptation science to act as interpreters of the scientific information for managers and decision makers. With the Puget Sound Technical Recovery Team, these experts are developing scientific tools to evaluate the effects of climate change on local fish and wildlife populations and habitats and on the scope and direction of salmon recovery

Action:

King County will evaluate its existing ambient monitoring program to determine whether additional biodiversity monitoring will be needed as new climate change information emerges.

As part of a currently ongoing programmatic review, King County will explore the possibility of future analyses of regional ecosystems, habitats, and certain species in light of climate change impacts. In possible analyses, staff members would work with ecologists and other scientific experts to gather, evaluate, and interpret scientific information and assist and advise the climate change adaptation team and the new instream flow workgroup. Along these lines, in the current programmatic review, King County will specifically address the capacity of the current program to:

- Develop and conduct a sensitivity and vulnerability analysis of King County ecosystems (including agro-ecosystems), habitats, and sentinel species to projected climate change;

- Develop a monitoring and adaptive management program for King County conservation and restoration programs and activities; and

- Support the proposed instream flow workgroup and other efforts.

The review will also address whether such analysis could build on the current macroinvertebrate sampling work that is already underway.

Action:

King County will work to incorporate predicted climate change impacts into King County salmon recovery plans, programs and activities.

King County has already begun to incorporate climate change technical information into science-based salmon recovery plans and the Regional Water Supply Planning Process. King County has been involved since the late 1990s in development of science-based plans to conserve salmon, in conjunction with other local governments, businesses, Indian tribes, environmental groups, and State agencies. In 2005, local partners reached a major milestone when they completed watershed-based habitat recovery plans for the major watersheds in King County. These watershed plans make up a key part of the draft Puget Sound Salmon Recovery Plan, developed by Shared Salmon Strategy, a collaborative initiative among Puget Sound communities to protect and restore salmon runs in the region. The watershed plans are intended to guide actions to improve watershed ecosystems over the next ten years.

In the long term, King County intends to enhance and continue its participation in Shared Strategy as a vehicle for addressing climate change impacts to salmon recovery. This should include continued technical participation with the Water Resource Inventory Area groups and the building of greater technical knowledge and capacity within the County.

Moving forward, King County will consider climate change information in the following arenas the King County instream flow workgroup, as proposed in this plan, and the 2008 King County Comprehensive Plan Update.

King County will also consider climate change impacts in other efforts to protect riparian zones for salmon recovery and wildlife habitat, such as evaluations of best-practice standards for sustainable forestry, given the critical role of forest health to salmon and wildlife in riparian zones.

Goal:

King County will protect the unique, productive, and diverse marine environment of the region from climate change impacts.

Action:

King County will help the region to understand and adapt to predicted climate change impacts to marine waters.

In the near term, King County will:

- Develop and conduct a sensitivity and vulnerability assessment of King County's marine ecosystems to projected climate change;
- Continue marine monitoring programs already in place and modify or combine with additional marine monitoring programs to provide data necessary for climate change analyses;
- Support the interdepartmental climate change adaptation team with technical expertise on marine issues; and
- Support managers of the Shoreline Management Program in incorporating climate change information into the program's near-term update.

In the long term, King County will:

- Support and participate in Puget Sound conservation efforts that aim to protect and increase the robustness of the marine system;
- Implement climate change and biota-focused monitoring in Puget Sound, through collaborative efforts;
- Collect data for use in Puget Sound climate change sensitivity models; and
- Collaborate with the University of Washington on the examination of scientifically focused climate change-related issues in Puget Sound.

C. Performance Measurement

Goal:

King County will track progress on climate change mitigation and adaptation by collaborating on measurement with other local, regional and national stakeholders and experts.

Information on the progress of King County's climate change mitigation and adaptation activities will be useful in county efforts to raise awareness about the problems and potential solutions related to greenhouse gas emissions and regional climate change impacts.

Action:

King County will complete regular updates to its operational greenhouse gas emissions inventory, work to achieve its Chicago Climate Exchange operational reduction target, and work collaboratively to achieve regional and state reduction targets outlined in this plan.

Greenhouse gas emissions reduction is the single measure of progress on climate change mitigation. The unit of this measurement is metric tons of carbon-dioxide equivalent (MTCO2e) emitted by a given entity or in a given geographic area. King County's past work on greenhouse gas emissions inventories position it well to continue measuring and managing its operational greenhouse gas pollution.

Whereas King County has control over emissions from its operations, it must be recognized in further discussion of regional progress on climate change mitigation that the county is only a single actor involved in the process of reducing regional greenhouse gas emissions. Therefore, any measurement of progress by the county on regional greenhouse gas emissions reduction must account not only for actual emissions reductions in (MTCO2e), but also the county's collaborative work on this count.

Action:

In 2007, King County will identify measures by which to track progress on adaptation and resilience to climate change impacts across the areas detailed in this plan.

The King County interdepartmental climate change adaptation team is in the process of developing measures by which to track progress in climate change impacts adaptation and preparedness. These measures will necessarily be different for each vulnerable area addressed in this plan, and their finalization will therefore take an additional period of time.

Appendix A:

Executive Orders on Global Warming Preparedness (PUT 7-5 through 7-8)

Executive Order: Transportation

Document Code No.: PUT 7-5 (AEO)
Department/Issuing Agency: Executive Office
Effective Date: March 27, 2006
Approved: /s/ Ron Sims
Type of Action: New

This Order requires and empowers King County Departments to employ increasingly aggressive strategies to mitigate regional contribution to global warming, including setting a goal of increasing the amount of biodiesel used in all County diesel vehicles to 20%.

WHEREAS, this Order requires and empowers King County Departments to employ increasingly aggressive strategies to mitigate regional contribution to global warming by: working to increase public transit ridership as a percentage of regional daily travel and stimulating regional markets of alternative fuels and transportation technologies; and,

WHEREAS, in its unique role as a regional government, King County has demonstrated necessary corporate citizenship and public leadership by employing critical policy levers of 1) land use, 2) public transit provision through King County Metro Transit, 3) environmental management, and 4) economic development intended to stimulate climate-friendly fuel and technology markets, in ways that support global warming adaptation and mitigation; and,

WHEREAS,of these critical regional policy levers in mitigating global warming, King County Metro Transit has already demonstrated and been nationally recognized in leadership in its coordinated land use and transit strategies to encourage walking and public transit ridership as modes of transportation, in its use of climate-friendly fuels and technology in its transit and corporate fleet, and in its stimulation of clean energy economic development; and,

WHEREAS, King County Metro Transit works to fund and provide public transit service to improve regional mobility and the quality of life in King County, and reduces public dependency on single-occupancy vehicles by offering fixed-route buses, demand-responsive transportation services, the largest public vanpool program in the US, access to transportation for people with disabilities, and taxi scrip for low-income residents and other services; and,

WHEREAS,in conjunction with state and local agencies, King County Metro Transit also provides park-and-ride lots, bicycle parking at transit facilities, and connections to transit in areas served by ferry, bus and rail; and,

WHEREAS, over the past several years King County Metro Transit has been making changes in the types of buses and their maintenance practices to minimize negative impacts on the environment, including: use of cleaner burning fuel such as ultra-low sulfur diesel, improvement of exhaust filtration and conversion systems, and purchase of hybrid buses and zero-emission electric trolleys; and,

WHEREAS, King County Metro Transit purchased 213 highly efficient hybrid diesel-electric buses; and,

WHEREAS, King County Metro Transit began fueling the fleet with a blend of five-percent biodiesel and 95 percent ultra-low sulfur fuel last year, a quantity of 2.6 million gallons of blended biodiesel, or over 138,000 gallons of pure biodiesel; and,

WHEREAS, DNRP Solid Waste Division uses 50,000 gallons of five-percent biodiesel a year in its fleet of vehicles and, in combination with King County Metro Transit use, this makes King County one of the largest single users in Washington State as of 2005; and,

WHEREAS, King County Metro Transit uses re-refined oil in their bus engines and a special formulation of transmission oil, such that the transmission oil can now be used for 72,000 miles rather than 12,000 miles, benefiting the environment by safely removing 140,000 gallons of oil from our waste oil load; and,

WHEREAS, the entire King County Metro Transit fleet has used ultra-low sulfur diesel since August 2002, directly reducing exhaust soot by 20%; and,

WHEREAS, King County Metro Transit is one of seven organizations recognized by the Environmental and Energy Study Institute (ESSI) as a National Clean Bus Leader for 2004; and,

WHEREAS, King County Metro Transit has for the last decade been working with local businesses on aggressive incentive-based programs aimed at getting commuters out of their cars and into alternative forms of transportation, with initiatives including: Commute Trip Reduction services, pass subsidy programs, tax benefits, FlexPass, Home Free Guarantee, Commuter Bonus, Rideshare Plus, and Flexcar support; and,

WHEREAS, in October 2000, King County Metro Transit's Commute Partnerships Program was honored as a winner of the prestigious Innovations in American Government Award from the Ford Foundation and the Kennedy School of Government at Harvard University; and,

WHEREAS, King County DOT, including Metro Transit, Roads and Fleet, is nationally recognized as a leader in the use of hybrid and alternative vehicles for use by government agencies; and,

WHEREAS, in 1993 King County Fleet Administration Division (King County Fleet) won the Clean Air Recognition Award from the American Lung Association for significant efforts to improve air quality; and,

WHEREAS, between 1993 and 1996 King County Fleet had approximately 275 vehicles operating on flexible-fueled CNG and Propane and the largest police vehicle fleet operating on CNG in the nation, and also built three CNG fueling facilities; and,

WHEREAS, in 1997 US Department of Energy selected King County Fleet as a model agency for successful implementation of an alternative fuel program; and,

WHEREAS, in 2001 King County Fleet began to purchase advanced hybrid technology vehicles, based on their reduction of carbon dioxide emissions by 30-50% as compared to a conventional vehicle, and the projection that King County would save an average of 20 tons of CO2 per Toyota Prius, and 27 tons of CO2 per Ford Escape; and,

WHEREAS, in 2002, King County Fleet began employing ultra-low sulfur diesel at all of the King County Roads fuel sites; and,

WHEREAS, in 2003 King County Fleet was selected as the lead agency to obtain a national contract for the procurement of hybrid electric vehicles on behalf of all public agencies in the US, with a goal of reducing procurement cost through volume purchase and the resulting purchase of 30,000 hybrid vehicles over the following three years; and,

WHEREAS, in 2004 King County Fleet successfully executed a region-wide contract for the hybrid vehicle purchase in both Oregon and Washington State, with 126 vehicles purchased as of 2005; and,

WHEREAS, as of 2005, King County Fleet operates 140 hybrid vehicles including the Toyota Prius, and Ford Escape, saving a total of 14,000 gallons of fuel annually and making a 19% return on investment for the Toyota Prius using a life-cycle costing methodology; and,

WHEREAS, in 2005 King County Fleet opened negotiations with CAL-START-WestStart to initiate a region-wide demonstration project for heavy-duty hybrid trucks in municipal services, as hybrid systems have a fuel use reduction of 40%-60% over a baseline conventional truck; and,

WHEREAS, in 2006 King County Fleet plans to phase in biodiesel for use in the heavy duty truck fleet, such that Fleet's annual consumption of biodiesel fuel would be 5,000-40,000 gallons annually (B5-B20 range), and would represent substantial reduction in greenhouse emissions from use of traditional fossil fuels; and,

WHEREAS, in 2006 Fleet plans to purchase 10 vehicles of the compressed natural gas-powered Honda Civic GX model, rated number-one green vehicle by the American Council for an Energy-Efficient Economy, using available incentives and grants to invest in three slow-fill fueling facilities, and such that this will significantly increase availability of fuel and utilization of compressed natural gas at a cost of $0.90 per gallon equivalent; and,

WHEREAS, in 2006 King County Fleet plans to research, support and invest in plug-in electric vehicles as they become available which, according to a recent study by Seattle City Light, will allow a vehicle to travel at a cost of $0.45 per gallon equivalent; and,

WHEREAS, King County Fleet is researching the creation of plug-in charging infrastructure at operational and regional sites; and,

WHEREAS, the work of King County Fleet represents a substantial past accomplishment and future vision toward the goal of reducing greenhouse gas emissions by King County vehicles; and,

WHEREAS, stimulation of regional markets for climate-friendly fuels and technologies is an important strategy that regional governments can take to mitigate global warming; and,

WHEREAS, significant reduction of regional single-occupancy vehicle miles traveled is an accepted measure of progress on important regional changes, including reduced regional energy consumption and reduction of greenhouse gas emissions, that help to mitigate global warming; and

WHEREAS, per person and per mile, travel by public transportation uses significantly less energy as compared to travel by single-occupancy vehicle; and,

WHEREAS, per person and per mile, travel by public transportation produces substantially less public health-harming and climate change-causing pollution as compared to travel by single-occupancy vehicle; and,

WHEREAS, the Puget Sound Regional Council 2000 Census showed that use of single-occupancy vehicles for daily travel needs has risen from 1980 to 2000; and,

WHEREAS, if Americans used public transportation for 10% of their daily travel needs, the nation could save more energy annually than all energy used by the petrochemical industry, reduce dependence on imported oil by more than 40%, and reduce carbon dioxide emissions by more than 25% of the Kyoto Agreement mandate, thereby mitigating global warming; and,

WHEREAS, this increased use of public transportation would also reduce carbon monoxide pollution and emissions of human health-harming volatile organic compounds; and,

WHEREAS, increased average regional percentage of individual use of public transportation for daily travel needs would therefore be consistent with and supportive of increased regional energy and economic security, improvement of air quality and protection of public health; and,

WHEREAS, King County is entrusted with protecting its citizens, the environment and economy through policies of land use, public transportation provision, environmental management and clean energy economic development; and,

NOW, THEREFORE, I Ron Sims, King County Executive do hereby order and direct:

(1) King County Departments to employ aggressive strategies to increase the percentage of public transportation as a mode that residents use for their total daily travel needs, thereby reducing single-occupancy vehicle miles traveled regionally.

(2)King County to seek and pursue aggressive strategies to advance regional development of a climate-friendly clean energy economy by implementing economic development policy and investing in alternative fuels and transit technology.

(3)To achieve compliance with this Order, the following Actions, among others that will be developed over time, will be taken:

a)The County shall set a goal of increasing the amount of biodiesel used in all County diesel vehicles to 20%.

b)The county will seek to use other alternative fuels and hybrid vehicles as technology and funding allow.

(4)The county will continue to seek and implement a series of aggressive transit, land use and demand-side strategies, such as commute trip reduction and transit-oriented development, to encourage King County residents' use of public transit. A detailed approach to carrying out these Actions and achieving compliance with this Order will be included the King County Global Warming Preparedness and Mitigation Plan which is to be completed by the King County Departments, by January 1, 2007. The county will prepare a Global Warming Preparedness and Mitigation Plan relating to goals of ridership and investment in county vehicle technology and fuel use. In addition, the county will continuously analyze new fuel and technology developments in order to prepare for the eventual transition to a fleet of county vehicles and buses powered solely by climate-friendly renewable energy sources.

(5)The public transportation section of the Global Warming Preparedness and Mitigation Plan will be consistent with the King County Energy Plan, which is concurrently underway.

(6)The public transportation section of the Global Warming Preparedness and Mitigation Plan will be updated at least every three years to ensure that the county is taking appropriate steps to achieve compliance with this Order and meet other objectives.

(7)A process will be created and presented to the Executive that directs and monitors the county's overall compliance with this Order by June 1, 2006. Relevant departments will issue an annual Global Warming Preparedness and Mitigation Report to the Executive detailing progress on mitigation, beginning January 1, 2007. The Executive will be presented with an annual report that addresses trends and developments in regional travel patterns, as related to mitigation goals of reducing single-occupancy vehicle miles traveled. The Executive will also be provided with an annual report that addresses trends and developments in regional clean energy and technology markets, as related to mitigation goals of stimulating a regional climate-friendly clean energy economy.

DATED this 17 th day of March, 2006.

Ron Sims, King County Executive (Original Signed)

ATTEST: (original signed)

Dean C. Logan, Director
Records, Elections and Licensing Services Division

Executive Order: Land Use Strategies for Global Warming Preparedness

Document Code No.: PUT 7-8 (AEO)
Department/Issuing Agency: Executive Office
Effective Date: April 1, 2006
Approved: /s/ Ron Sims
Type of Action: New

This Order requires that King County Departments employ coordinated strategies of land use to mitigate and adapt to global warming.

WHEREAS, this Order requires that King County Departments employ coordinated strategies of land use and transportation to mitigate regional contribution to global warming; and,

WHEREAS, in its role as a regional government, King County has demonstrated significant corporate citizenship and public leadership in ways that are supportive of global warming adaptation and mitigation by employing critical policy levers of 1) land use, 2) public transit provision, 3) environmental management, and 4) economic development directed towards stimulating climate-friendly fuel and technology markets; and,

WHEREAS, toward the goal of mitigating global warming, reduction of fossil fuel consumption resulting from vehicle miles traveled, especially vehicle miles traveled by single-occupancy automobiles, is important in that it is directly linked to reducing regional greenhouse gas emissions; and,

WHEREAS, while scientific evaluations of forests and open space for “carbon sequestration” value are still being analyzed worldwide, it is generally accepted that preservation of open space, forests and agricultural land are important regional ecological assets helping to mitigate global warming; and,

WHEREAS, work on land use policies in King County should be coordinated to achieve several primary goals related to global warming mitigation: reduction of fossil fuel consumption resulting from vehicle miles traveled; increase of public transit use, walking and biking as a percentage of average daily travel in King County; and “carbon sequestration,” which can be evaluated by measuring the acreage of protected important land resources that potentially sequester greenhouse gases; and,

WHEREAS, King County’s nationally recognized Land Use, Transportation, Air Quality and Health (LUTAQH) study found that higher-density residential neighborhoods with mixed land uses and a connected street network are associated with: less automobile use, less air pollution, fewer greenhouse gas emissions and less energy consumption; and,

WHEREAS, King County's LUTAQH study also found that toward this goal, the county must regionally coordinate and integrate its decisions in transportation, land use, environment and health to bring about approaches to community design that consider multiple environmental and health factors, including global warming mitigation; and,

WHEREAS, keeping with the county's responsibility to fund and provide transit service to improve regional mobility and quality of life in the region, King County has already implemented land use-based transit policies and investments that mitigate the region's contribution to global warming by: reducing fossil fuel consumption resulting from public dependency on single-occupancy vehicles; increasing public transit ridership; and reducing regional greenhouse gas emissions, as recommended in the LUTAQH study; and,

WHEREAS, the King County Metro Six-Year Transit Development Plan for 2002-2007 prioritizes areas for enhanced transit service when they encourage higher density development and pedestrian activity through adopted plans and policies, promote mixed-uses, establish minimum densities, and reduce parking requirements, all of which studies have shown are associated with fewer greenhouse gas emissions and less energy consumption; and,

WHEREAS, the King County Department of Development and Environmental Services (DDES) has joined the King County Department of Transportation in implementing land use policies of "transit-oriented development" with the same aims of reducing public dependency on single-occupancy vehicles, reducing regional greenhouse gas emissions and mitigating regional contribution to global warming; and,

WHEREAS, King County has been working with local businesses for more than a decade on aggressive incentive-based programs aimed at getting commuters out of their cars and into alternative forms of transportation, with initiatives including: Commute Trip Reduction services, vanpool and ridesharing services, pass subsidy and FlexPass programs, tax benefits, Home Free Guarantee, Commuter Bonus, Rideshare Plus, and Flexcar support; and,

WHEREAS, in October 2000, King County's Commute Partnerships Program was honored as a winner of the prestigious Innovations in American Government Award from the Ford Foundation and the Kennedy School of Government at Harvard University; and,

WHEREAS, though still being analyzed worldwide, certain land resources such as extensive forestland are particularly important to mitigation of global warming as potential carbon "sinks" that absorb greenhouse gas emissions of carbon dioxide, and other land resources are important as potential ecological buffers for non-human species threatened by the environmental impacts of global warming; and,

WHEREAS, the King County Department of Natural Resources and Parks (DNRP) has invested in preservation of important areas within the Cedar River Watershed, Lake Washington basin and other climate-vulnerable areas; and,

WHEREAS, forest acres and watershed areas protected represent potential "carbon sequestration" assets in a future carbon market and protection of important areas in the face of global warming threats; and,

WHEREAS, over the past ten years King County has protected over 125,000 acres of forestland, including the Snoqualmie Tree Farm, via acquisition, purchase of development rights, conservation easements and other means; and,

WHEREAS, King County has protected 340,000 acres of forestry lands in the Forest Production District through land use regulations and policies, and is promoting healthy forests in rural areas through the King County Forestry Program and the Rural Economic Strategies; and,

WHEREAS, policies that protect rural areas and conserve agricultural lands, forestry and open space are important to stopping urban sprawl and to fostering viable and climate-friendly networks of rural communities; and,

WHEREAS, King County has protected approximately 12,800 acres of farmland through the purchase of development rights in accordance with the Farmland Preservation Program, and these areas are valuable as an important ecological buffer against global warming; and,

WHEREAS, on farmlands, collecting and converting animal manure into energy will reduce emissions of methane, which is a potent greenhouse gas, and will potentially lead to additional energy production; and,

WHEREAS, protecting farmland and supporting farmers economically can also keep our agricultural lands in food production, thereby increasing the percentage of local food consumed in the region, and in turn reducing the amount of energy needed to transport food long distances; and ,

WHEREAS, the county is undertaking additional study and review of how to apply the principles of LUTAQH within King County through LUTAQH Phase II, which is funded through a $300,000 grant from the Federal Transit Administration, that will produce a ranking system and a list of projects within the county for implementation that will maximize long term transportation, global warming, air quality, and health benefits; and ,

WHEREAS, such land use strategies supportive of mitigating and adapting to global warming are consistent with the responsibilities of King County as a land use authority, and should be further funded based on their value as regional solutions to problems of global warming; and,

NOW, THEREFORE, I Ron Sims, King County Executive do hereby order and direct:

(1) King County to use land use and transportation plans, policies and regulations as primary means by which King County and the region can: increase efficiency of regional land use; reduce urban sprawl and vehicle miles of travel; keep rural areas rural; conserve natural resource lands; and protect environmentally sensitive areas, in ways that are coordinated, equitable and supportive of global warming mitigation and adaptation;

(2)To achieve compliance with this Order, the following Actions, among others that will be developed over time, will be taken:

a)The county shall set as its goal the acquisition of land or development rights for an additional 100,000 acres of forestlands by 2010, as both a possible means to reduce greenhouse gas emissions via “carbon sequestration” and as a important asset against global warming impacts.

b)The county shall use coordinated land use and transit policies to work toward a goal of reducing fossil fuel-consumption resulting from vehicle miles traveled and encouraging transportation alternatives such biking and walking, as intermediate measures of global warming mitigation.

c)Concurrent with the above action, the county will design and implement a measurement program quantifying the progress of such coordinated strategies on increasing public transit ridership, biking and walking as a percentage of average King County daily travel.

d)The county will seek to quantify the positive impact of these protections in context of global warming adaptation and mitigation.

e)The county will seek to engage local and regional partners via public education and action on stewarding natural resources and critical non-human habitats for the sake of global warming preparedness and mitigation.

f)The county shall work with other governments and businesses to advance awareness and actions to reduce greenhouse gas emissions.

g)The county shall engage the public through a series of workshops, meetings, and other outreach tools.

h)The county shall take actions necessary to keep rural areas rural and to promote the establishment of a sustainable rural economy, such that rural and agricultural areas will be protected in perpetuity.

(3) A detailed approach to carrying out these Actions and achieving compliance with this Order will be included in a land use element of a King County Global Warming Preparedness and Mitigation Plan, which is to be completed by January 1, 2007.

(4) The land use element in the Global Warming Preparedness and Mitigation Plan will be consistent with all related plans and policies. The land use element will be updated at least every three years to ensure that the county is taking appropriate steps to achieve compliance with this Order. The county shall in its 2008 update to the Comprehensive Plan identify and evaluate policies that must be updated or changed to prepare for global warming adaptation and mitigation.

(5) The county's overall compliance with this Order will be monitored, and an annual Global Warming Report will be issued to the Executive detailing progress on: reduction, capture and sequestration of greenhouse gas emissions in context of both county land use and transportation strategies and outside trends, understanding that the county is not solely responsible for achievement of that goal. The Report will also advise the Executive on planning and measures being undertaken to improve the county's strategies for mitigating regional contribution to global warming. A portion of this annual report will include: a survey of innovations and best practices in land use and transportation strategies worldwide; an evaluation of whether the county is demonstrating innovation and meeting those best practices; and an outline of opportunities for the County to apply further innovative approaches.

DATED this 22 nd day of March, 2006.

Ron Sims, King County Executive (Original Signed)

ATTEST: (original signed)

James J. Buck, Interim Director
Records, Elections and Licensing Services Division

Executive Order: Environmental Management Strategies for Global Warming Preparedness

Document Code No.: PUT 7-7 (AEO)
Department/Issuing Agency: Executive Office
Effective Date: April 1, 2006
Approved: /s/ Ron Sims
Type of Action: New

This Order requires that King County Departments employ innovative environmental management as a means for the region to mitigate and adapt to global warming.

WHEREAS, this Order requires that King County Departments employ innovative environmental management as a means to mitigate regional contribution to global warming; and,

WHEREAS, in its role as a regional government, King County has demonstrated significant corporate citizenship and public leadership by employing critical policy levers of 1) land use, 2) public transit provision, 3) environmental management, and 4) economic development intended to stimulate climate-friendly fuel and technology markets, in ways that are supportive of global warming adaptation and mitigation; and,

WHEREAS,global warming is expected to lead to water supply shortages, flooding, and shoreline erosion, matters over which King County maintains a responsibility to reduce the risk of harm to public health and safety; and,

WHEREAS, “environmental management” includes the infrastructure for and provision of solid and organic waste and wastewater treatment by King County, which can be used in innovative ways as detailed below to buffer global warming impacts; and,

WHEREAS,"land use" includes zoning and other regulations that can lead to reduced generation of greenhouse gases and that protect the public from public health and safety hazards, such as flooding, shoreline erosion, wildfires, and water supply shortages; and,

WHEREAS,"land use" includes zoning and other regulations that can lead to reduced generation of greenhouse gases and that protect the public from public health and safety hazards, such as flooding, shoreline erosion, wildfires, and water supply shortages; and,

WHEREAS, , in February 2005, King County and Cascade Water Alliance signed a Memorandum of Understanding (MOU) to develop a countywide water supply plan that

considers both people's needs and resource protection, and expands use of reclaimed water, which will be produced in large quantities at Brightwater in 2010; and,

WHEREAS, King County's innovative design of the Brightwater Wastewater Treatment Plant, to use reclaimed water for irrigation and industry purposes, demonstrates that critical infrastructure can be physically adapted in innovative ways for this region to adapt to declining water supplies and other potentially destabilizing global warming impacts; and,

WHEREAS, King County's land use plans, policies and regulations to protect shoreline areas, wetlands, rivers, lakes, streams and natural vegetation from development help the region prepare for and adapt to global warming impacts; and,

WHEREAS, King County's award-winning Flood Hazard Management Program continues to fund protection of watersheds, rivers and coastal areas that are vulnerable to climate variability, and provide an additional hedge against impacts from increasing floods expected from climate change; and,

WHEREAS, King County Department of Natural Resources and Parks' (DNRP) management of the Cedar Hills Landfill far exceeds the national landfill average of methane gas capture, preventing over 300,000 metric tons of methane-based greenhouse gas emissions from entering the atmosphere; and,

WHEREAS, this high capture rate of landfill methane gas will be converted to energy, therefore displacing fossil fuel energy use and creating additional greenhouse gas reductions of more than 100,000 metric tons; and,

WHEREAS, effective management of the Cedar Hills landfill will provide the additional benefit of storing carbon-based plant matter for more than 100 years thereby sequestering over 270,000 metric tons a year of greenhouse gases as a carbon "sink" for as long as the landfill is open; and,

WHEREAS, this excellence and innovation in landfill management represents an important mitigation of regional contribution to global warming, as well as a potential asset in a future carbon market; and,

WHEREAS, King County's innovative management of the South Treatment Plant has enabled recapture of methane for energy use within the plant that would otherwise have been released as 12,000 tons of greenhouse gas emissions; and,

WHEREAS, this recaptured methane is used for the operation of a hydrogen fuel cell within the plant, which was designed and operated as the first of its kind, on an $8,500,000 grant over eight years from the United States Environmental Protection Agency and in partnership with Fuel Cell Energy; and,

WHEREAS, this hydrogen fuel cell demonstration project represents advancement of public sector use of the hydrogen fuel cell stationary technology, an approach to waste gas recapture that will become increasingly important for other governments across the country in the name of global warming mitigation; and,

WHEREAS, these examples of innovative waste and wastewater management reflect the county's commitment to global warming adaptation and mitigation that should be replicated countywide and nationwide; and,

WHEREAS, such climate change adaptation and mitigation strategies carry out King County's responsibilities as an environmental management authority under the Regional Wastewater Services Plan, and its responsibilities as a land use manager under state and federal environmental law, including the Growth Management Act, strategies which should be further funded based on their value as regional solutions to problems of global warming;

NOW, THEREFORE, I Ron Sims, King County Executive do hereby order and direct:

(1) King County Departments to maximize the creation of resources from waste products such as waste gases and wastewater, in ways that both adapt to natural resource conditions impacted by global warming and mitigate contribution to global warming by reducing greenhouse gas emissions

(2)To achieve compliance with this Order, the following Actions, among others that will be developed over time, will be taken:

a)The county will continually review and update our land use and environmental policies and regulations to protect natural resources from global warming threat.

b)The county will seek to use its existing waste and wastewater infrastructure for multiple uses and in innovative ways that 1) provide an additional natural resources hedge against impacts expected from global warming and 2) potentially reduce greenhouse gas emissions in a manner consistent with the approved regional water supply plan and county Energy Plan now being formulated.

c)The county will draft a natural resources emergency management element for inclusion into the Global Warming Preparedness and Mitigation Plan that recommends further funding and strategies for protection of the region against natural resources emergencies related to global warming impacts, such as flooding, shoreline erosion, wildfires, and water supply shortages.

d)The county will fund expanded use of reclaimed water and take other measures to reduce vulnerability of the region's water supply and other critical natural resources to global warming impacts.

(3) A detailed approach to carrying out these Actions and achieving compliance with this Order will be included in the natural resources emergency management element of a King County Global Warming Preparedness and Mitigation Plan, which is to be completed by January 1, 2007.

(4) The natural resources emergency management element in the Global Warming Preparedness and Mitigation Plan will be consistent with the county's Energy Plan and related policies. The natural resources emergency management element will be updated at least every three years to ensure that the county is taking appropriate steps to achieve compliance with this Order.

(5) The county's overall compliance with this Order will be monitored, and an annual Global Warming Report on natural resources emergency management will be issued to the Executive detailing progress on how well the region's waste and wastewater treatment and land use planning have been managed in preparation for and mitigation of future global warming impacts. The Report will also advise the Executive on planning and measures being undertaken to improve the county's strategies for employing innovations in environmental management in context of global warming. A portion of this annual report will include: a survey of innovations and best practices in environmental management worldwide; an evaluation of whether the County is demonstrating innovation and meeting those best practices; and an outline of opportunities for the County to apply further innovative approaches.

DATED this 22nd day of March, 2006.

Ron Sims, King County Executive (Original Signed)

ATTEST: (original signed)

James Buck, Interim Director
Records, Elections and Licensing Services Division

Executive Order: Renewable Energy and Related Economic Development

Document Code No.: PUT 7-6 (AEO)
Department/Issuing Agency: Executive Office
Effective Date: April 1, 2006
Approved: /s/ Ron Sims
Type of Action: New

This Order requires that at least 50% of King County's total non-transit energy use come from renewable energy sources by the year 2012, that at least 35% of transit energy use come from efficiencies and renewable energy sources by the year 2015, and that at least 50% of transit energy use come from efficiencies and renewable energy sources by the year 2020.

WHEREAS, this Order sets a renewable energy standard that will put King County at the forefront of renewable energy use and will be a market catalyst to help move the region and the nation towards a clean energy economy; and,

WHEREAS, supply of traditional fossil fuels is rapidly diminishing and continued dependence on traditional fossil fuels will be economically devastating and is a threat to our national security; and,

WHEREAS,use of traditional fossil fuels results in air pollution and is a primary cause of global warming and climate change; and,

WHEREAS, global warming will have significant adverse impacts on our environment, health and economy; and,

WHEREAS,use of clean, renewable energy reduces the level of fossil fuel emissions that are a main cause of global warming; and,

WHEREAS, use of clean, renewable energy provides a primary resource for self-sustaining counties; and,

WHEREAS, improved transit technology and best practices by Metro Transit Operators and Vehicle Maintenance Section employees contribute to efficiencies that reduce non-renewable energy consumption and reduce greenhouse gas emissions; and,

WHEREAS, use of clean, renewable energy reduces our dependence on sources of foreign oil – strengthening our economy and promoting national security; and,

WHEREAS, , use of clean, renewable energy promotes new and environmentally-friendly economic development; and,

WHEREAS, use of renewable energy can be made in a cost-effective manner; and,

WHEREAS, King County has set a goal to use biodiesel across 20% of its buses and vehicles, making it the largest single user of biodiesel in Washington State and significantly helping to stimulate the region's biodiesel market; and,

WHEREAS, King County has demonstrated a first-of-its-kind stationary application of hydrogen fuel cell technology run on methane gas from its South Treatment Plant; and,

WHEREAS, King County has demonstrated the significant potential for waste-to-energy conversion at its Cedar Hills landfill; and,

WHEREAS, King County has joined with education, energy and business groups such as Friends of the Hidden River, the Northwest Energy Technology Collaborative, Snohomish County Public Utility District and Snohomish County Economic Development Council in designing an energy technology education center at its Brightwater Treatment Plant that aims to educate the public on innovative energy technologies that can be applied in wastewater treatment; and,

WHEREAS, King County is entrusted with protecting its citizens, the environment and economy and will be a leader in the use of renewable energy;

NOW, THEREFORE, I Ron Sims, King County Executive do hereby order and direct:

(1) This Order requires that at least 50% of King County's total non-transit energy use come from renewable energy sources by the year 2012, that at least 35% of transit energy use come from efficiencies and renewable energy sources by the year 2015, and that at least 50% of transit energy use come from efficiencies and renewable energy sources by the year 2020.

(2)To achieve compliance with this Order, the following Actions, among others that will be developed over time, will be taken:

a)The county will seek to maximize the conversion and use of waste for energy. The Department of Natural Resources and Parks (DNRP) will seek to convert and use all reasonably usable waste at wastewater treatment facilities and the Cedar Hills Landfill to energy. DNRP will also analyze other opportunities to use county or third party wastes to generate energy.

b)The county will transition to purchasing electricity produced from renewable sources either from the local utilities serving county facilities or other providers. County departments responsible for electricity purchasing are directed to make this transition as such resources become available and on a schedule that takes into consideration the cost, available funding and public benefit associated with such purchases.

c)The county will continue the use of biodiesel in county buses and other county vehicles and will seek to increase the amount of biodiesel used. In addition, the county will seek to use other alternative fuels and hybrid vehicles as technology and funding allows.

d)The county will implement a program to minimize existing energy use through increased efficiency, optimized operation and maintenance, and conservation efforts.

(3) A detailed approach to carrying out these Actions and achieving compliance with this Order will be include in a King County Energy Plan, which is to be completed by the Department of Natural Resources and Parks (DNRP) by January 1, 2007. The Energy Plan will also include other energy objectives and the necessary actions for achieving those objectives.

(4) The Energy Plan is to be consistent with the county's global warming policy and is to be completed in coordination with the Executive, the Department of Transportation (DOT) and the Facility Management Division of the Department of Executive Services (FMD). The Energy Plan will be updated at least every five years to ensure that the county is taking appropriate steps to achieve compliance with this Order and meet the other objectives of the Energy Plan.

(5) DOT will be responsible for developing the portion of the Energy Plan relating to county vehicle and bus fuel use. In addition, DOT will continuously analyze new fuel and technology developments in order to prepare for the eventual transition to a fleet of county vehicles and buses powered solely by renewable energy sources.

(6) DNRP is directed to monitor the county's overall compliance with this Order. DNRP will issue an annual Renewable Energy Use Report to the Executive detailing total county energy usage measured in British Thermal Units (BTUs) and the total percentage of such energy that is from renewable energy sources. The Report will also advise the Executive of the planning and measures being undertaken to increase the county's use of renewable energy. DOT will provide the portion of this annual report that addresses trends and developments in renewable energy sources and the potential use of such sources to power county buses and vehicles.

(7) For purposes of this Order, "energy" includes electricity, vehicle fuel, oil, natural gas, steam and other fuel purchased for the function of heating, cooling, lighting, and mechanical motion. "Renewable energy sources" includes solar, wind, water, geothermal, refuse-derived fuels, and other sources that can be replenished naturally or biologically. "Renewable energy" means energy derived from renewable energy sources.

DATED this 22 nd day of March, 2006.

Ron Sims, King County Executive (Original Signed)

ATTEST: (original signed)

James J. Buck, Interim Director
Records, Elections and Licensing Services Division

Appendix B:

King County Council Motion 12362

Sponsors: Constantine, Ferguson, Phillips and Patterson

A motion relating to county efforts to reduce greenhouse gas emissions, mitigate their impacts and prepare for climate change.

WHEREAS, there is a consensus among the world's leading scientists that global warming pollution by humans is among the most significant problems facing the world today, and

WHEREAS, climate scientists at the University of Washington predict that average temperatures in the northwest will increase approximately one degree fahrenheit per decade in the twenty-first century, and

WHEREAS, climate change in the northwest is expected to result in reduced snowpack and associated drinking water supplies, changes in winter flooding patterns, reduced summer stream flows for fish and altered habitat for other wildlife, and

WHEREAS, in September 1988, Proposed Ordinance 88-662 was introduced with the intent of creating an office of science and technology planning to address the issues of ozone depletion and global warming, and

WHEREAS, in 2002 the King County executive signed Executive Order PHL 10-1(AEO), by which the executive created a countywide initiative to inventory and reduce

global warming pollution caused by greenhouse gas emissions ("carbon" or "carbon equivalents"), and

WHEREAS, in January, 2002, the council adopted Motion 11364 that approved participation in the Cities for Climate Protection Campaign and supported the executive's development of an action plan to reduce emissions of greenhouse gases and targeted air pollutants from county operations, and

WHEREAS, the county has created one of the most comprehensive emissions inventories, also known as a carbon inventory, of any local government in the United States, and this work has built organizational expertise and resources in the departments of King County for future emissions reduction planning and sale of carbon credits, and

WHEREAS, actions to reduce greenhouse gas emissions can also benefit local economies and improve quality of life through increased energy efficiency, sustainable transportation, waste reduction, water conservation and open space protection, and

WHEREAS, management practices at the Cedar Hills landfill prevent more than three hundred thousand metric tons of methane-based greenhouse gas emissions annually from entering the atmosphere, and

WHEREAS, the county has initiated a gas-to-energy project at Cedar Hills that will convert methane gas to energy and further reduce gas emissions, and

WHEREAS, the county has also undertaken innovative energy cogeneration projects at its wastewater treatment plants, and

WHEREAS, King County Metro Transit provides more than one hundred million trips annually with a fuel efficient, environmentally friendly alternative to the private automobile, and

WHEREAS, King County Metro Transit received a 2004 National Clean Bus Leadership Award from the Environmental and Energy Study Institute for its role in developing a market for ultra-low sulfur diesel fuel, and

WHEREAS, King County Metro Transit spurred development of an important new technology and realized a fuel savings of approximately twenty percent in 2004 with one of the first major fleet purchases of over two hundred diesel/electric hybrid buses, and

WHEREAS, the county, in partnership with private landowners and nongovernmental organizations, has protected more than one hundred thousand acres of forest land, and provides incentives and technical assistance for restoration of rural and urban forest land, and

WHEREAS, long-term forest uses can help to sequester carbon emissions that would otherwise be released into the atmosphere, and

WHEREAS, King County is the first local government in the nation to develop a Land Use, Transportation, Air Quality and Health ("LUTAQH") Initiative, that considers the impacts of development on air quality and human health, and

WHEREAS, LUTAQH Initiative found that higher density residential neighborhoods with a mixed land uses and a connected street network are associated with less automobile use, less air pollution, fewer greenhouse gas emissions and less energy consumption, and

WHEREAS, the King County Comprehensive Plan focuses new development within urban areas which helps to reduce vehicle miles traveled and associated greenhouse gas emissions, and

WHEREAS, the region is currently updating Vision 2020 and King County is preparing for the next major update of its Comprehensive Plan, and

WHEREAS, on October 27, 2005, King County and its conference partners hosted a climate change conference with the goal to engage a broad cross-section of Washington State governments, businesses, tribes, farmers, nonprofits and the community at large in a dialogue about climate change impacts and potential adaptations, and

WHEREAS, the executive is developing a "Climate Change Toolkit" with guidelines, information and technical assistance on topics including emissions inventories, use of alternative fuels in transit and fleet management, energy co-generation at wastewater treatment plants and landfills, availability of and uses for reclaimed water, forest protection and restoration in urban and rural environments, land use planning to reduce greenhouse gas emissions and guidelines for adaptation of King County operations and policies to predicted climate changes, and

WHEREAS, the mitigation element of this toolkit will be based on the action plan created in response to emissions inventories conducted since 2002, and

WHEREAS, the adaptation element of this toolkit is being developed by the executive and is being refined in collaboration with the University of Washington Climate Impacts Group, the International Council on Local Environmental Initiatives, the Puget

Sound Clean Air Agency, local governments within King County and others initiating actions to address climate change, and

WHEREAS, in March 2006, the executive issued four executive orders to King County departments outlining actions to reduce greenhouse gas emissions and prepare for climate change in four policy categories: land use, environmental management, renewable energy, public transportation and use of alternative fuels, and

WHEREAS, the city of Seattle has initiated a national campaign to encourage cities to endorse the United States Conference of Mayors climate protection agreement, and

WHEREAS, the United States Conference of Mayors climate protection agreement includes commitments to strive to meet or beat the Kyoto Protocol targets in local communities through actions ranging from antisprawl land use policies to urban forest restoration projects to public information campaigns, to urge state governments and the federal government to enact policies and programs to meet or beat the greenhouse gas emission reduction target of the Kyoto Protocol, and to urge the United States Congress to pass greenhouse gas reduction legislation, which would establish a national emission trading system, and

WHEREAS, metropolitan counties, with larger land areas, a mix of urban and rural land uses, regional transportation systems and regional infrastructure have a unique and complementary role to play in reducing greenhouse gas emissions and preparing for the impacts of climate change;

NOW, THEREFORE, BE IT MOVED by the Council of King County:

A. King County shall work with other counties through cooperative intergovernmental frameworks like the International Council on Local Environmental Initiatives and the Washington State Association of Counties to develop a model climate change resolution tailored to climate change actions that can adopted by county governments;

B. King County shall work with other counties active in climate change initiatives and with national organizations such as the National Association of Counties to kick-off a national, Counties Climate Change Initiative as a companion effort to the United States Conference of Mayors climate protection agreement;

C. King County shall finalize a Climate Change Toolkit by October 31, 2006 and make it available to local governments throughout the nation as part of a Counties Climate Change Initiative;

D. The executive shall develop a King County Climate Change Mitigation and Preparedness Plan ("the plan") and file eleven copies with the clerk of the council by February 1, 2007, for distribution to all councilmembers;

E. The plan shall include actions related to carbon inventories, land use, environmental management, emergency preparedness, energy use and transportation, and shall include specific performance measures for recommended actions;

F. Implementation of the plan and identified performance measures shall be monitored, and results and recommended changes shall be reported to the council annually as part of a King County Climate Change Report ("the annual report"), eleven copies of which shall be filed with the clerk of council by February 1 of each subsequent year, for distribution to all councilmembers;

G. With respect to emissions targets and annual emissions inventories:

1. King County shall commit to reduce net carbon emissions from county operations by six percent below year 2000 emissions by the year 2010;

2. King County shall continue to monitor its own carbon emissions annually, and report its findings as part of the annual report;

I. With respect to the impacts of land use on greenhouse gas emissions and climate change:

1. King County shall use land use and transportation plans, policies and regulations to reduce greenhouse gas emissions by preventing sprawl and associated vehicle miles traveled, encouraging transit- and pedestrian-oriented development, conserving forest lands and maintaining vegetative cover;

2. King County shall continue to support forestry technical assistance, tax incentives, and property acquisitions as a way to reduce greenhouse gas emissions through carbon sequestration;

3. As part of updating King County's Shoreline Master program, King County shall consider the impacts of climate change on shoreline erosion;

4. As part of the scoping motion for the 2008 King County Comprehensive Plan update, the executive shall outline a work plan for reviewing and updating policies related to air quality, climate and land use to reduce greenhouse gas emissions and to address impacts of climate change; and

5. It is the council's intent, through participation in the Growth Management Planning Board's Vision 2020 Update, to raise awareness of the relationship between

land use and climate change and the role local governments can play in reducing greenhouse gas emissions;

J. With respect to environmental management and emergency preparedness:

1. King County shall maximize the creation of resources from waste products such as gases produced by wastewater treatment and solid waste disposal in a manner that reduces greenhouse gas emissions and produces renewable energy;

2. King County, consistent with the Regional Wastewater Services Plan, shall manage its wastewater treatment facilities and operations in a manner that minimizes greenhouse gas emissions, maximizes opportunities for cogeneration of renewable energy and produces reclaimed water that can be used for industrial and irrigation purposes to help offset the potential impacts of climate change on summer stream flows and water supplies;

3. King County shall analyze the potential impacts of climate change on winter floods, and update its flood plan, capital improvement projects and emergency plans as necessary to respond to projected changes in winter flooding;

4. As part of the scoping motion for the 2008 King County Comprehensive Plan update, the executive shall outline a work plan for reviewing and updating policies for water resources, erosion and landslide hazards and fish and wildlife to address impacts of climate change;

K. With respect to energy use:

1. The executive shall develop a King County energy plan and file eleven copies of the plan with the clerk of the council by February 1, 2007, for distribution to all councilmembers. The energy plan should include specific objectives and performance

measures for minimizing greenhouse gas emissions, conserving energy, increasing renewable energy purchases and continuing development of energy cogeneration projects;

2. King County shall set the following initial targets for renewable energy use:

a. At least fifty percent of the King County's total nontransit energy use shall come from renewable energy sources by the year 2012;

b. At least thirty-five percent of transit energy use shall come from efficiencies and renewable energy sources by the year 2015;

c. At least fifty percent of transit energy use shall come from efficiencies and renewable energy sources by the year 2020; and

d. The departments responsible for energy purchasing are directed to make this transition on a schedule that considers cost, available funding and public benefit associated with such purposes;

3. The county shall develop and monitor performance measures for use of renewable energy and report on these performance measures in the annual report. Reporting shall include total energy used, the percentage coming from renewable sources and updated information on cost and feasibility of meeting initial targets for conversion to renewable energy sources; and

L. With respect to transportation and use of alternative fuels:

1. In the short-term, the county shall set a target of increasing the amount of biodiesel used in all county diesel vehicles to twenty percent;

2. The county shall seek to use alternative fuels and hybrid and electric vehicles as technology and funding allow, with the intent of transitioning to a county fleet

of vehicles and buses powered entirely by more climate-friendly renewable energy sources as technically feasible;

3. The county will implement aggressive transit, land use and transportation-demand strategies, such as commute trip reduction and transit-oriented development, to encourage King County residents to use public transit as an alternative to single-occupancy vehicles;

4. The county shall design and implement a measurement program quantifying the progress of the coordinated strategies on increasing public transit ridership, biking and walking as a percentage of average King County daily travel and report on them as part of the annual report; and

5. The executive shall include a detailed approach and performance measures for implementing transportation and alternative fuels actions in the plan, and report on them as part of the annual report.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

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ATTEST:

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Appendix C:

King County Global Warming Action Team and Adaptation Team Participating Departments and Divisions

Global Warming Action Team

- Executive Office
- Department of Development and Environmental Services
- Department of Executive Services
- Department of Natural Resources and Parks
- Department of Public Health
- Department of Transportation

Adaptation Team

- Executive Office
- Department of Development and Environmental Services
- Department of Executive Services, Facilities Management Division
- Department of Natural Resources and Parks
- Department of Public Health, Environmental Health Division
- Department of Transportation
- Washington State University, King County Extension
- Office of Emergency Management (contributor)

Appendix D:

King County Sources of Information on Climate Change -- Conferences, Briefings, Workshops and Significant Reports

Unlike most regions of the world today, King County is fortunate to have several sources of cutting-edge information about climate change impacts to this region. These include in-house hydrologists, meteorologists and oceanographers, and experts at the Climate Impacts Group at the University of Washington. The Climate Impacts Group is one of eight groups funded by the National Oceanographic and Atmospheric Administration across the United States. The Climate Impacts Group is an interdisciplinary research group studying the impacts of natural climate variability and global climate change on the Pacific Northwest.

Conference and Related Materials

In preparation for the King County Climate Conference, "The Future Ain't What It Used to Be: Planning for Climate Disruption" on October 27, 2005, the Climate Impacts Group prepared a series of materials for policymakers about impacts of climate change for the Pacific Northwest. These materials are available at http://www.cses.washington.edu/cig/outreach/workshops/kc2005.shtml.

Abbreviated List of Briefings and Presentations

On January 27, 2003, Dr. Amy Snover of the Climate Impacts Group presented a briefing entitled "Planning for Climate Change in the Pacific Northwest" to the King County Council.

On July 15, 2004, Dr. P.W. Mote of the Climate Impacts Group briefed members of the King County Council.

On March 9, 2005, Dr. Rick Palmer and Dr. P.W. Mote of the Climate Impacts Group spoke at a press briefing on drought conditions as related to climate change trends.

On November 29, 2005, Dr. Amy Snover of the Climate Impacts Group presented "Choices & Change: What does global climate change mean for the Pacific Northwest & How can we best prepare?" at the semi-annual Science Seminar of King County Department of Natural Resources.

On March 8, 2006, Dr. Amy Snover of the Climate Impacts Group gave a presentation entitled "Climate Change in Washington: Past and Future" to the Climate Change Technical Subcommittee of Regional Water Supply Planning Process. This

presentation was co-sponsored by King County Department of Natural Resources and Parks.

On July 24, 2006, Dr. Marcia Baker of the Climate Impacts Group gave a presentation on climate change in the Pacific Northwest to the King County Council at their Town Hall Meeting.

On September 7, 2006, Patty Glick, Climate Change Specialist of the National Wildlife Federation, presented "Global Warming and the Pacific Northwest" to King County Department of Transportation Road Services Division Environmental Services Section.

On November 17, 2006, Dr. Amy Snover of the Climate Impacts Group briefed members of the King County global warming action team on the most updated projections of climate change in the Pacific Northwest.

Significant Reports

In October 2006, the Climate Change Technical Subcommittee of the Regional Water Supply Planning Process published "Climate Change Building Blocks," a document which presented some of the more important conclusions from the three past Intergovernmental Panel on Climate Change reports, as well extensively peer-reviewed results from other studies. The document provides a series of "building blocks" as a foundation for understanding climate change and its likely impacts in the region. The information in that document was associated with both global trends and forecasts, and specific climate changes in the Pacific Northwest. The primary purpose of that document is to identify the changes that are occurring and to take a first step toward agreement among regional agencies on potential impacts.

In January 2007, the Washington State departments of Ecology and Community, Trade and Economic Development released a report on the economic impacts of climate change on Washington State, "Impacts of Climate Change on Washington State." The analysis examined seven key sectors, industries, and regions of Washington State and used existing research from the Climate Impacts Group and others for the first-ever assessment of potential economic impacts to Washington.

Appendix E:

General Information Resources on Climate Change

- The Intergovernmental Panel on Climate Change
  http://www.ipcc.ch/

- World Health Organization
  http://www.who.int/globalchange/en/

- National Oceanic and Atmospheric Administration, Climate Program Office
  http://www.climate.noaa.gov/cpo_pa/risa/

- United States Environmental Protection Agency
  http://www.epa.gov/climatechange/

- Union of Concerned Scientists
  http://www.ucsusa.org/

- The Climate Impacts Group at the University of Washington
  http://www.cses.washington.edu/cig

- Washington State Department of Ecology
  http://www.ecy.wa.gov/climatechange/

Appendix G:

Background and Additional Actions on Greenhouse Gas Emissions from Landfills and Wastewater Treatment

Landfills

Landfill gases can be considered in terms of four elements: a liability, the methane gas that is not captured and is emitted as a greenhouse gas; a credit, an amount of methane gas that is captured and used to create renewable energy; methane flared, which is considered to be neither a liability nor a credit; and another credit, landfill plant matter that sequesters carbon.

Landfill Methane Emitted

Methane that is not captured by the landfill gas collection system is emitted as a greenhouse gas. Since methane is 23 times more powerful than carbon dioxide as a greenhouse gas, these non-recoverable methane gases can be considered a "liability" for the County in context of a carbon market. Cedar Hills alone generates approximately 107,000 MTCO2e annually of non-recoverable methane. The remaining County landfills contribute another approximate 55,000 MTCO2e of non-recoverable methane annually.

Landfill Methane Captured and Converted

Methane gas that is captured and used to create renewable energy has the benefit of displacing fossil fuel. If Cedar Hills Landfill gas were converted to electricity, or if it were used to displace natural gas in the commercial pipeline, it would generate significant greenhouse gas credits in a carbon market, possibly up to 125,000 MTCO2e annually.

Landfill Methane Captured and Flared

The Cedar Hills Landfill methane (or any landfill gas) that is currently captured and flared and gets converted to carbon dioxide is not considered a liability or a credit. Similarly, landfill methane gas for electricity generators is neither a liability nor a credit. National and international protocols assume that any biomass (plant matter) that is burned has no net increase or decrease in greenhouse gas emissions. The reasoning is that landfill methane comes from plant matter, whether it is food waste, paper, packaging, cotton textiles or wood waste, and plants need carbon dioxide to grow. The accounting protocols assume that any carbon dioxide emissions (flared or combusted) are approximately equal to the amount of carbon dioxide that was first absorbed (or sequestered) by plants.

Landfill Carbon Sequestration

Finally, landfills can also provide a carbon sequestration credit. Landfill plant matter (food waste, paper, packaging, textiles or wood waste) that does not decompose provides a greenhouse gas emissions credit. This plant matter must remain un-decomposed for 100 years to receive greenhouse gas sequestration credit. Calculating these sequestration benefits is controversial and uncertain. Cedar Hills may provide

between 250,000 to 400,000 MTCO2e of sequestration credit for each year it remains operational. Since this accounting is controversial, CCX does not currently recognize it within its trading scheme.

It is important to provide a caveat with this discussion of landfill gas sequestration. Despite the climate change benefit of sequestration, studies indicate that the "Three R" (Reduce, Reuse and Recycle) programs reduce overall greenhouse gas emissions because they reduce more manufacturing-related emissions than are saved with landfill sequestration. Therefore, this discussion should not imply that increasing waste is a climate-friendly solution.

Additional Landfill Actions

Action:

King County will continue to manage to a high standard of methane recovery at Cedar Hills landfill.

Additional reductions of non-recoverable methane emissions from the Cedar Hills landfill will be difficult. The Solid Waste Division already does an exceptional job at maximizing the capture of methane gas from the Cedar Hills landfill. The United States Environmental Protection Agency (EPA) estimates that the average "capture rate" for landfill gas is approximately 75 percent recovery; the Cedar Hills managers already are capturing approximately 90 to 95 percent of the landfill gas that is generated by the landfill. Little additional effort is possible beyond the far-above-standard capture rate that is already being achieved.

Action:

King County recommends no action for historic landfills.

The remaining landfills under the County's control produce comparatively little methane and would require significant capital investments to make marginal improvements in the capture rate for the non-recovered methane. Additionally, most of these "historic" landfill have passed their peak rate of methane generation and will continue to have declining methane emissions.

Action:

King County will potentially seek to secure credits for excellent landfill management as part of its Chicago Climate Exchange obligations.

King County believes that landfill managers should be given an incentive to maximize methane capture beyond the EPA standard of 75 percent recovery. Clearly demonstrating capture rates beyond the 75 percent should be rewarded.

Wastewater Treatment

Wastewater greenhouse gas emissions can be considered in two parts, identical to landfills' methane liability and renewable energy credit.

The first greenhouse gas liability of wastewater treatment is from methane that is released in the primary and secondary treatment systems and in the extensive piping system. The second part is the same renewable energy credit from landfill gas. Both Westpoint and South Plant currently capture digester gas and generate electricity for renewable energy credits.

Action:

King County advocates no action for attempting to capture methane emissions at the wastewater treatment plants.

King County's Westpoint and South Treatment Plant emit approximately 18,593 MTCO2e annually. Placing covers over the primary and second treatment facilities to capture the methane would be a very expensive project for achieving greenhouse gas emissions reductions.

Action:

King County will continue to maximize renewable energy generation at Westpoint and South Plant.

Westpoint and Southpoint can generate 7 (average) MW of annual renewable energy power, providing approximately 30,000 MTCO2e of greenhouse gas reductions.

Appendix H:

Background on Cement Substitutes

"Fly ash" from coal plants and "slag" from steel plant furnaces are the most common substitutes in this region. Both are waste products that would otherwise be landfilled, which means that using them provides the additional benefit of reducing space needed in landfills.

Fly ash comes from Centralia, and slag is barged from China and Japan. These sources are important to understand in upstream accounting of greenhouse gas emissions.

Small amounts of fly ash are commonly used in most building applications but less on roads. Slag is used extensively in the Midwest "steel belt" but is only beginning to make in-roads here though Washington Department of Transportation has approved a 35 percent blend of slag for most projects.

Fly ash is already used as industry practice but higher blends that are achievable have not been sufficiently supported. King County Department of Natural Resources and Parks has been promoting slag with seminars, trainings, materials testing and limited demonstration projects.

Appendix I:

Questionnaire for King County Departments and Divisions on Climate Change Impacts

This questionnaire has been used for:

- Assessing the potential impacts of climate change on King County's natural and built resources
- Understanding the depth and limitations of our knowledge about the impacts
- Assessing our capacity to adapt to climate change
- Understanding how other activities will affect adaptation strategies in a given area

We ask that you take some time to provide some preliminary answers to this questionnaire, and then there will be a follow up interview about your responses. If there is additional information that you believe is important to include, please take the time to provide any relevant information in the last section, "Additional Information."

General Information

1. Name(s) of person(s), title(s) and division/department completing this survey:

2. What is the natural or built resource that is the focus of this questionnaire response? Please use above sector name:

Assessing Sensitivity

3. How is your natural or built resource sensitive to present day climate variability?

4. How is climate change likely to affect your natural or built resource? Of these impacts, which present the greatest concern and why?

5. What additional information about climate impacts would help further your ability to manage climate change impacts?

6. Do you know of, or can you identify, potential economic impacts from climate change? Please state what the potential or expected impacts are and why they may occur.

Assessing the Capacity to Adapt to Climate Change

7. To what extent do current plans, policies, and regulations explicitly account for the impacts of climate variability or change, or inherently provide a buffer against climate impacts? Please provide examples.

8. How adequate are these existing plans, policies, or regulations for managing climate impacts? (very good, good, fair, poor) If answering for more than one plan, policy, or regulation, please answer for each.

9. What additional actions, authorities, policies, or regulations are needed for managing climate change impacts?

    a. If specific recommendations are not identifiable, what process is necessary to identify adaptation strategies?
    b. Do you have existing forums or committees to do this?

10. What recommendations can you make for near-term (less than 5 years) and longer-term actions or next steps?

Cross-agency and Cross-sector Interactions

11. To what extent do climate change impacts and adaptation activities in other sectors (listed above) affect your resource? Please specify.

12. To what extent do climate change impacts and adaptation activities in your resource affect other sectors (listed above)? Please specify.

13. What other county departments or governmental jurisdictions need to be involved in developing and implementing adaptation responses to climate change for your natural or built resource?

    a. Is there currently a process or forum in place that facilitates this type of interaction? If so, please specify.

14. Additional information:

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