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Adapting to Climate Change: Strategies from King County, Washington

By Karen Wolf, AICP

Darwin's Theory of Evolution tells us species can change over time as certain genetic variations which increase an organism's chance of survival in an ever-changing environment are passed on to future generations. He called this *adaptation*. Adaptation is the transformation in living organisms that allows them to live successfully in a changing environment. Adaptations enable living organisms to cope with environmental stresses and pressures. Organisms that are not suitably adapted to their environment will either have to move out of the habitat or die out.

We usually think about natural selection and adaptation in the context of life forms evolving throughout our planet's history, or plant and animal populations changing in response to recent environmental pressures. However, we now face environmental pressures of our own making. Climate change presents human societies with a changing environment to which they must adapt or face potential property loss, displacement, or collapse. Increasing concentrations of greenhouse gases, including carbon dioxide and methane resulting from human activities, have already begun altering the earth's atmosphere.

While rising temperatures are a global phenomenon, the impacts will be felt on a very local level. Increasing temperatures may cause shifts in weather patterns, exacerbating drought in some areas while causing storms of higher intensity in others. Retreating glaciers and disappearing snowpack will cut into supplies of irrigation and drinking water in some communities. A rise in sea level will cause more frequent flooding and permanent inundation of low-lying coastal areas. Vegetation range shifts could result in greater human-wildlife conflict as animals move into new areas, and could lead to losses of iconic regional characteristics and economic drivers such as fall foliage and the maple sugar industry in New England.

Rather than simply respond to these changes after they occur, planners are in a unique position to help their communities assess potential climate change impacts and develop adaptation strategies to counter the threat of devastating changes that may come in years ahead. This PAS *Memo* describes strategies developed in King County, Washington, to direct local government efforts to address climate change. These tools can be useful to all local communities that are faced with the challenges of inevitable alterations in the environment resulting from climate change. The steps planners take now to anticipate and prepare for climate change will have profound impacts on the future of our cities.

Climate Change is Irreversible

According to a newly-published report in the *Proceedings of the National Academy of Sciences* (Solomon 2009), some climate change is irreversible. According to the report, as carbon dioxide emissions continue to rise, the world will experience increasing levels of long-term environmental disruption. The damage will persist even when — or if — emissions are brought under control. According to study author Susan Solomon in a National Public Radio interview on January 26, 2009, "People have imagined that if we stopped emitting carbon dioxide that the climate would go back to normal in 100 or 200 years. What we're showing here is that that's not right. It's essentially an irreversible change that will last for more than a thousand years."

Societies need to prepare for increased flooding, sea-level rise, limited water supplies, and a world with fewer natural resources. Scientific reports suggest that we can avoid the most dangerous impacts of climate change by aggressively mitigating greenhouse gas emissions, so it is important to keep in mind that mitigation strategies will play a critical role in responding to climate change. Mitigation and adaptation go hand in hand.

Adaptation Versus Mitigation: What's the Difference?

Mitigation refers to the actions and strategies to reduce greenhouse gas emissions. Using less and

cleaner energy, driving less, and planting trees to sequester carbon are all mitigation strategies. Actions that reduce the release of carbon into the atmosphere or that sequester the carbon that is already there will reduce the severity of changes in the future. But mitigation alone is not enough. Even if greenhouse gas emissions ceased today, atmospheric carbon concentrations have already reached such levels that global and regional temperatures will still increase to some degree.

Because some change is inevitable, adaptation strategies must be an equally important component of communities' response to climate change. *Adaptation* is about employing strategies to protect communities from the alterations that climate change is bringing to the environment. Adaptation could involve moving entire neighborhoods away from harmful flooding, retrofitting housing units to be cooler in the increased summer heat, and developing reclaimed water systems to sustain our communities as summer water supplies become less plentiful.

As planners, our reaction to climate change thus far has largely focused on mitigation of greenhouse gas emissions through strategies like planning for compact and walkable neighborhoods, promoting public transportation, and protecting natural resource lands. Little time or resources have been spent on adaptation. But because government has the responsibility to protect the health, safety, and welfare of citizens, it is imperative that we plan and prepare for the consequences of climate change. These changes will affect a broad range of community assets and government services, operations and policy areas. Preparing for this is a matter of risk management.

Planners are especially well-suited to lead communities in adaptation because of our experience in working with a variety of stakeholders — citizens, the business community, environmentalists, health professionals — to improve the quality of life for all residents. Through the smart growth movement, planners have already begun breaking down silos between agencies to integrate land use, transportation, public health, environmental management, and economic development to guide strategies for the future. Tackling the effects of climate change will require the same approach — and planners have the skills and experience to lead the effort.

Some tools and techniques can contribute to both mitigation and adaptation strategies. Smart growth, a premier mitigation strategy, can also be seen as a very important adaptation strategy. Smart growth policies that promote compact urban communities, public transit, walking and biking, and protection of our farmland will help us better adapt to the changing future by preparing us for living with less resources to consume. For years, planners have been touting the virtues of smart growth planning as a way to create a more sustainable future. Now, with the effects of climate change looming in our future, smart growth takes on renewed importance.

Adaptation Strategies: A King County Case Study

King County in Washington State is one community that has embarked on a comprehensive program to equip itself to deal with climate change. Many of the tools and strategies that King County has employed can be applied in other communities.

Located in the Pacific Northwest, King County is the home of the City of Seattle (not to mention Costco, Starbucks, and Microsoft), as well as 39 cities and numerous county public purpose districts. King County stretches from the shores of Puget Sound to the snow-capped peaks of the Cascade Mountains. In between are 2,000 square miles containing vibrant urban centers, four major river systems, 760 lakes, 3,000 miles of streams, and 1,000 square miles of forest.

The county is known for its efforts to reduce greenhouse gas emissions. In the last several years, county departments have purchased more than 200 hybrid buses, invested in plug-in hybrid electric vehicles, tested a stationary hydrogen fuel cell that used methane from wastewater to produce enough electricity to power 800 homes, promoted innovative smart growth strategies, and required many new developments to report expected greenhouse gas emissions (King County, 2007).

King County is uniquely positioned among local governments to be a leader in reducing greenhouse gas emissions and preparing for the impacts of climate change. As both a local and regional government, the county looked at the facilities and services it directly controls to select four areas where county action could have the greatest impact on climate change. The county recognized that these key functions of government had to be organized differently. This became a way to mobilize government programs and interest groups around common goals. Using four levers of change — land use planning, transportation, environmental management, and renewable energy policy — King County government has become a successful living laboratory and national model of strategies to reduce and prepare for global warming impacts.

In March 2006, then-King County Executive Ron Sims issued Executive Orders on Global Warming Preparedness that directed King County to reduce greenhouse gas emissions and prepare for anticipated climate change impacts (King County, 2008). All King County departments work to look at their operations through a climate change lens.

Executive Order on Land Use Strategies for Global Warming Preparedness (Excerpted)

This order requires that King County Departments employ coordinated strategies of land use to mitigate and adapt to global warming.

...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 an 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 as 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.

One example of this new way of doing business is the Transportation Department's leadership in the Evergreen Fleet Initiative and a corresponding switch to hybrid-articulated buses. Another demonstration is the Department of Natural Resources and Parks's emphasis on securing permanent protection of more than 100,000 acres of forestland and open space. Perhaps the most visible change in how the county is doing business differently is the use of the State Environmental Policy Act (SEPA) to account for greenhouse gas emissions of projects throughout unincorporated King County. This directive was initiated through an executive order in the fall of 2007. The second phase of this project, which involves using SEPA to regulate and mitigate greenhouse gas emissions, is now under consideration by the King County Council.

The King County Comprehensive Plan sets the policy basis for King County to work with local governments in the region to reduce countywide greenhouse gas emissions to 80 percent below 2007 levels by 2050. The four levers of change listed above will be the organizing principles in this effort. This goal applies to all of King County — residents, businesses, and governments. Further, the county recognizes its impact on greenhouse gas emissions from its own operations and has set an additional short-term goal of reducing net carbon emissions from county operations by six percent below year 2000 emissions by 2010 (King County, 2008).

King County Comprehensive Plan: Sample Climate Change-Related Amendments by Chapter

The Metropolitan-King County Council adopted a major update to the King County Comprehensive Plan on October 6, 2008. The 2008 update included text and policy amendments throughout the document to integrate climate change assessment, mitigation, and adaptation strategies. The following outline provides excerpts of the climate change-related background and policy direction in the Comprehensive Plan. See Resources list for a link to the actual text and policy language.

Introduction

- Add new text and framework policy directing King County to be a leader in prevention and mitigation of, and adaptation to, climate change effects (background text, FW-102).

Chapter 1: Regional Planning

- Recommend that the county incorporate the most promising actions to reduce emissions of greenhouse gasses or otherwise respond to climate change into future planning, economic development efforts, and natural resource management (RP-106).
- Require review of future Comprehensive Plan policy amendments to include a statement of anticipated impacts on climate change (RP-307).

Chapter 2: Urban Communities

- Add background text describing the role of mixed-use developments in mitigating climate change impacts by providing opportunities for people to walk or bicycle to retail and public services.
- Strengthen policy direction on sustainable and low impact development, making a tie to climate change mitigation (U-406).

Chapter 3: Rural Communities and Natural Resource Lands

- Recognize role of resource lands in supporting carbon sequestration (background text).
- Describe potential impacts of climate change on forest lands and recognize the climate change adaptation benefits of long-term forest management. (background text).
- Recommend that the county consider climate change impacts on forestry and take steps to improve forest health and resiliency through technical assistance, management of county owned lands, and support of neighborhood-based efforts to reduce risk of wildfire (R-640).
- Recommend that the county collaborate with UW, WSU, KCD to assess likely impacts of climate change on agriculture, and to develop mitigation and adaptation strategies suited to King County soils and farm economy. Recommend that this information be made available through technical assistance and farm planning programs (R-666).

Chapter 4: Environment

- Describe projected climate change impacts to the Pacific Northwest and King County, and the actions King County can take to mitigate and adapt to climate change (background text).
- Direct the county to conduct a regular greenhouse gas emissions inventory on a regular basis using established greenhouse gas emissions accounting protocols, and to work with local and state governments to account for greenhouse gas emissions in the evaluation of regional investments (E-201).

- Establish a goal of reducing the county's net carbon emissions from county operations by six percent below year 2000 emissions by 2010 (E-204).
- Direct the county to evaluate proposed actions subject to the State Environmental Policy Act (SEPA) for their greenhouse gas emissions (E-206).
- Recommend that the county consider projected climate change impacts when updating disaster preparedness, levee investment, land use plans, and development regulations (E-212).

Chapter 7: Transportation

- Describe role of transportation sector in greenhouse gas emissions and how management of transportation systems can help to reduce emissions (background text).
- Direct the county to promote strategies to reduce emissions from the transportation sector through promotion of new vehicle technologies and fuels and actions aimed at reducing vehicle travel (T-334).
- Direct the King County Department of Transportation to incorporate climate change impacts information into construction, operations, and maintenance of infrastructure projects (T-336).
- Direct the King County Department of Transportation to develop methods to evaluate the climate change impacts of its actions and train staff to implement climate sensitive practices in its work (T-337).

Chapter 8: Services, Facilities, and Utilities

- Recommend that regional water supply plan consider impacts of climate change impacts on future water demand and supply (F-235).
- Recommend that the county encourage land uses and development that will improve energy efficiency and support expansion of renewable energy sources (F-303).
- Recommend that the county foster the development and use of clean, renewable, and alternative fuel and energy technologies (F-304).
- Direct that the county develop and adopt strategic energy management, efficiency and conservation programs in its own operations (F-308).

Some aspects of future climate change in the Pacific Northwest are well known, while others are less certain. A new report by the Climate Impacts Group at the University of Washington (Littell, ed. 2009), using a middle-of-the-possibilities estimate of future global greenhouse gas emissions, points to severe potential impacts on the Pacific Northwest. One of the most daunting predictions for a state dependent on abundant snowfall to fill its reservoirs is the projected decrease in the snowpack by nearly 30 percent across the state by the 2020s, 40 percent by the 2040s, and 65 percent by the 2080s. Further, rising temperatures could result in more forest fires, harm agricultural productivity, and affect the quality and extent of freshwater salmon habitat. Increased average temperatures in urban areas could hurt the most vulnerable populations.

It is important to note that King County's progress has depended heavily on scientific analysis of climate change and its impacts in the region, as well as the scientific literacy of leading public officials. Additionally, King County has long had a robust internal scientific and technical capacity. County decision makers have relied on staff members who understand the technical aspects of climate change modeling in order to translate climate scenarios into understandable information that leads to action.

In spite of these resources, there are gaps in King County's understanding of how climate change will affect the Puget Sound region. Information is still limited regarding urban heat and its health impacts on vulnerable and disadvantaged populations. Even in better understood impact areas, uncertainty still exists. It is broadly expected, for example, that fall and winter flooding will become more frequent and intense, but future precipitation changes are still not completely predictable (Palmer et al., 2006). However, based on the potential consequences for public health and safety, the environment, and economic prosperity in the region, the county is taking precautionary action now to increase the resiliency of both natural and built systems to climate change using the best information available.

The King County Comprehensive Plan sets the overarching policy basis for dealing with climate change by outlining the approach to assessment, mitigation, adaptation, and collaboration. The King County Climate Plan lists the actions and strategies specific to each department and line of business in the county to follow the established policy. Planners throughout the county have formed strong partnerships with scientists at the University of Washington and ecologists and engineers in county agencies. It is these partnerships that have shaped the foundation for the county's work on climate change. Following are highlights of actions King County is undertaking now to adapt to the future.

Flooding

Flooding is expected to become more frequent and intense throughout the Pacific Northwest, according to climate change scientists at the University of Washington. Warmer, wetter winters are projected to result in higher river flows, which could damage levees and structures on which King County relies to protect citizens, property, transportation corridors, and the prosperity of the entire region. Information about these likely climate change impacts helped the county build support and approve plans for a regional flood district funding source that will make much needed repairs over the next decade to the county's aging system of 500 levees and revetments.

To address the increased impacts from flooding, the King County Flood Control District was established in April 2007. The district is funded with a property tax assessment of 10 cents per \$1,000 of assessed valuation, raising approximately \$32 million per year. This newly created district will be instrumental in addressing the backlog of maintenance and repairs to levees and revetments, acquiring repetitive loss properties and other at-risk floodplain properties, and improving countywide flood warning and flood prediction capacity.

One of the district's first projects involved acquiring chronically flooded property along the Cedar River in south King County, relocating the residents of the Cedar Grove Mobile Home Park, and setting back the levee. Past floods had cut off the sole access road to the mobile home park, potentially trapping residents and making it unsafe for rescue workers to reach potential victims. Flooding had also backed up the mobile home park's septic systems and infiltrated the drinking water supply, creating unhealthy conditions. Some residents had moved to the mobile home park since the last major flood event and others did not fully understand the serious threat and the risks of living there (Cedar Grove Mobile Home Park Acquisition).

Floodplain buyouts in and around the mobile home park were supported by seven of 16 different grants and partnerships managed by King County Flood Control Zone (KCFCZD) staff in 2008. Funding sources included FEMA, the Washington State Department of Ecology, Army Corps of Engineers, the Conservation Futures Trust, and the Washington State Recreation and Conservation Office. KCFCZD was able to leverage over two dollars for each dollar it contributed to flood hazard reduction in this area of the Cedar River (KCFCZD, April 2008). The total estimated cost of the project was \$6.77 million (Cedar Grove Mobile Home Park Acquisition).

Along with property acquisition, KCFCZD retained a consulting firm to facilitate the relocation of mobile home park residents to equal or superior housing in a safer location. Relocation assistance available to residents included federally determined rent supplements or home down payments sufficient to move them into fair and decent housing appropriate to their family size, relocation counseling and assistance, and moving expenses (KCFCZD, July 2008). Ultimately, the floodplain buyout will reduce flood pressure on a nearby highway, help to move floodwater downstream, and restore natural floodplain functions.

King County Department of Transportation



The Cedar Grove Mobile Home Park during the January 2009 flood. Photo courtesy Ned Ahrens,

Reclaimed Water

King County treats a significant amount of wastewater to such a high level that it can be safely recycled for irrigation and industry, and the county places a priority on making this "reclaimed water" widely available for these uses. This approach provides important flexibility for the county to plan ahead for the pressures of climate change and population growth on water supply, while also reducing effluent discharges and supporting statewide efforts to clean up Puget Sound.

The county's new wastewater treatment plant, Brightwater, will use state-of-the-art membrane bioreactor (MBR) technology to treat wastewater. This secondary treatment process will be used as an alternative to the more conventional activated sludge method. This approach comprises fine screens to exclude any remaining debris and inorganic material, bioreactor aeration basins and, finally, membrane tanks where the last stage of ultra-filtration takes place (Brightwater Project, 2008). The advanced MBR technology at Brightwater will get wastewater seven to 10 times cleaner than conventional treatment processes, treating nearly all of the plant's wastewater to the state's

highest reclaimed water standards (Two Mile, 2008).

King County is constructing a reclaimed water distribution "backbone" from Brightwater to bring reclaimed water closer to future customers. This distribution system will ultimately have the capacity to carry 21 million gallons per day of Class A reclaimed water for use by irrigators and industries in north King County, south Snohomish County, and the Sammamish Valley. Using reclaimed water from Brightwater for irrigation in the Sammamish Valley will replace some water now being drawn from the Sammamish River, benefitting wildlife including salmon, which are projected to be especially stressed by climate change-related impacts including decreased summertime water flows and increased water temperatures.

Sea Level Rise Impacts on Wastewater Facilities

King County's Wastewater Treatment Division (WTD) maintains 40 major facilities that are situated adjacent to tidally influenced water bodies. WTD protects water quality and public health in the Central Puget Sound region by collecting and treating wastewater from 17 cities, 16 local sewer utilities, and one Indian tribe. In 2008, WTD conducted a study to identify which facilities are at risk of flooding as the result of climate-induced sea level rise combined with the probability of an extreme storm event.

The study relied on projections of sea level rise for Puget Sound made by the University of Washington's Climate Impacts Group (CIG) (Mote et al., 2008). Projected increases in sea level for three CIG scenarios and for a 20-foot rise in sea level were coupled with increases based on historical data on storm events (Zervas, 2005 and 2007). The scenarios were also considered alone to assess the influence of climate change in the absence of a storm event. The resulting 35 permutations resulted in estimated high tide levels ranging from about 9 to 35 feet above current sea level.

The study found that no WTD facilities are at risk of flooding with a sea-level rise of less than about 0.8 feet. However, storm events could cause facilities at the lowest elevations to flood by as early as 2050 under a low probability — high impact sea-level rise scenario, and by 2100 under the medium sea-level rise scenario. Under a "rapid ice sheet melt" scenario, 30 or more facilities would flood under non-storm conditions and under all storm events analyzed.

Given the current flux of climate change research, it is likely that these scenarios will change. Scientists may alter their estimates of the rate of sea level rise as well as the frequency of the most intense storm events. In the meantime, WTD plans to implement recommendations made as a result of the study. These recommendations include conducting more detailed analysis of the site terrain at the five most vulnerable facilities, reviewing the design of vulnerable facilities that are currently under construction, analyzing the impacts of sea level rise to WTD system hydraulics to determine if design or operational changes are needed, including sea level rise in planning for major asset rehabilitation or conveyance planning, and reviewing sea level rise literature every five years to determine if changes are needed to WTD's conveyance system planning approach.

A major product resulting from this study is the Vulnerable Facilities Assessment Tool (2009). WTD determined that to disseminate the methodology used for its assessment to internal King County agencies, specifically the Roads Services Division, the best way to package the approach was through a GIS tool.

The design was kept simple to facilitate ease and speed of use. It was developed as a Python script based tool that could be easily imported into ESRI's ArcGIS suite of GIS software. The data inputs required were GIS depictions of the facilities, some source of elevation data, and some sea level rise scenarios including storm surge events. The design was left flexible enough to accommodate various elevation sources and includes global predictions if regional modeling results are not available. The tool is well documented with links to methodology documentation as well as educational websites pertaining to sea level rise, the IPCC, and tide gauges. The output is a GIS point file for each scenario indicating whether a facility is above or below water for that given set of inputs.

Once WTD decided on this solution, it realized that the methodology was suitable for not only internal and local users but for anyone around the world looking to answer these questions about the vulnerability of their assets. WTD has made the Vulnerable Facilities Assessment Tool available online for free; see the Resources list below for more information.

Transportation Infrastructure

King County is taking action now to make its transportation system more resilient to the effects of climate change. The new \$24 million Tolt Bridge spanning the Snoqualmie River has been built with longer spans than the previous bridge, increasing its capacity to withstand high flows and major flooding events. More than 57 smaller "short span" bridges are planned to be replaced with wider span structures, allowing debris and floodwater to pass underneath without backing up river levels. In addition, the county is tackling culverts that will increasingly be at risk for chronic flooding, road

failure, and destruction of fish habitat during storm events. The county's Department of Transportation Road Services Division (RSD) is replacing these culverts with larger systems not only to prevent roads from failing, but also to improve fish passage.

The RSD is also incorporating low impact development techniques into its road projects to more effectively manage stormwater runoff during heavy rain events. Low impact development (LID) is not yet King County policy, but projects are examined on a case by case basis. For example, a porous concrete sidewalk and rain garden system are being used to manage stormwater at a recently completed intersection project, Military Road South at South 272nd Street near Kent.

The King County Road Services Division is beginning to use the Vulnerable Facilities Assessment Tool developed by WTD to identify infrastructure most susceptible to damage or closure from the effects of climate change. While the road services division is not currently undertaking an extensive study of all infrastructure, it is assessing its drainage system and considering climate change information in infrastructure design and maintenance; pending projects that show susceptibility may be designed differently to be more resilient.



Low Impact Development at the Military Road S. at S. 272nd Street site, King County. Visible are the porous sidewalk and the bioretention facility. Photograph taken on a tour given by King County to Transportation Improvement Board, on September 10, 2007. Photo by Bob Hamilton

Implementing Strategies for Adaptation in Your Community

King County has not only taken steps to mitigate climate change but is also preparing to address anticipated local impacts of climate change. Their example can provide a starting point for planners in other communities to begin tackling the question of how their communities should begin thinking about adaptation.

The major steps in this process can be summarized as follows:

- Assess the climate change impacts to your region and government.
- Build and maintain support to prepare for climate change impacts.
- Assemble a climate change preparedness team.
- Identify planning areas relevant to climate change.
- Conduct a climate change vulnerability assessment.
- Set goals, develop, and implement your preparedness plan.

The first step is to ask the climate question. Do you have a good understanding of how climate change could impact programs, services, and the quality of life in your community? While scientific information is critical for understanding the impacts of climate change, information specific to your community may be nonexistent or sketchy. Planners can partner with scientists and other experts to begin to extrapolate information about local impacts from broader-scale studies or studies from other regions to develop a picture of how climate change might affect their region.

The second step is to build support within your community and executive-level leaders. Public outreach — a specialty of planners — will be critical to moving this forward. At this stage, public meetings, targeted seminars, and media training events are just some of the strategies that can be employed to garner public support for climate change activities.

The third step in developing your climate change preparedness strategy is to form a multi-disciplinary team to assist in guiding the planning efforts. This is another specialty of planners, who often work with transportation experts, ecologists, public health officials, and housing planners to develop smart growth strategies. You might want to include scientific advisors from outside your government, as

well as public relations experts. These external advisors can direct team members to appropriate information sources and translate the technical climate change research for a broader audience.

Next, it is time to identify your planning areas relevant to climate change. These planning areas are defined as the areas in which a government or community manages, plans, or makes policy affecting the services and activities associated with built, natural, and human systems. Planning areas may include water supply, wastewater treatment, public health, and the transportation infrastructure.

With this background information in hand and community support at your side, it is time to develop your plan for climate change preparedness. One place to start is to systematically incorporate climate change into major planning and decision making. King County's 2008 Comprehensive Plan reflects this approach, as do a range of functional plans such as the county's Flood Hazard Management Plan.

It is important to note that climate change adaptation is an ongoing process — just like land use planning. New and evolving scientific information will impact actions and reprioritize strategies. Any preparedness plan needs to have a built-in schedule for reassessment to take advantage of the ever-evolving science of climate change.

Resources for Planners

Building on these early experiences with climate change adaptation, King County staff have begun to develop tools for other governments to use in beginning their own planning. The action plan for implementing adaptation strategies above is a brief summary of the step-by-step instructions on how to begin your jurisdiction's climate resiliency effort that can be found in *Preparing for Climate Change: A Guidebook for Local, Regional and State Governments* (see Resources box below). This resource was co-authored by King County and the Climate Impacts Group (CIG) at the University of Washington and published by ICLEI — Local Governments for Sustainability. The guidebook is intended to help planners and decision makers in local, regional, or state governments prepare for climate change by outlining a detailed, easy-to-understand process for climate change preparedness based on familiar resources and tools.

King County has also teamed up with Padilla Bay National Estuarine Research Reserve, Washington Sea Grant, and the CIG to create a training curriculum, based on the above guidebook, for coastal managers and planners across the State of Washington.

In addition, King County staff have participated in hundreds of conferences on climate change impacts to health, biodiversity, and infrastructure to share their expertise. King County has also helped to develop a nationwide learning group on this topic to build greater political power among local and regional governments to push a national adaptation agenda. The Urban Leaders Adaptation Initiative was launched by the Center for Clean Air Policy with the understanding that local governments are the first responders when natural disasters strike. It is a consortium of the following local governments: Chicago, King County, Los Angeles, Miami-Dade County, Milwaukee, Nassau County in New York, Phoenix, San Francisco, and Toronto.

These cities and counties are "early adopters" of climate change adaptation practices. Urban Leaders serves as a resource for all local governments and communities in developing and implementing climate adaptation strategies. Participants pool knowledge to learn lessons from one another's experiences in adaptation.

Finally, senior King County staff also participated in the National Academy of Sciences Climate Change Study, to help the federal government shape future approaches to providing actionable climate-related information to local and regional government officials.

Conclusion

"We have disrupted our global climate patterns — with the cars that we drive, the lands that we develop, and the lifestyle choices we make. We have disrupted the global climate to such a degree that we have already begun to live and breathe the consequences — of hotter temperatures, drier soils, warmer rivers and less predictable oceans, destructive weather patterns, and declining snow pack and glaciers. We will not give up the fight to stop global warming. But we must begin to adapt to it — and prepare ourselves for what is to come. We must find new ways to engage leaders on the issues of global warming." (King County Executive Ron Sims on August 2, 2006.)

One could be dismayed by the future in light of the challenges that climate change poses to our communities. However, planners can look at these challenges as opportunities to improve the way we live and to create a more sustainable future. As a society, we will need to adapt to the changing environment of the future or face the consequences.

We have the tools to start this process: smart growth principles and strategies, a multi-disciplinary approach, and an understanding of how the built environment must respect the natural environment

to be sustainable. We will need to work with scientists to develop new tools of assessment such as King County's Vulnerable Facilities Assessment Tool, and we will need to work to engage our leaders. Planners need to take the lead in helping to ensure that their communities are prepared to face whatever challenges the impacts of climate change may have in store. We must help our communities adapt to — and even flourish in — a world of climate change.

About the Author

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Resources

Preparing for Climate Change: A Guidebook for Local, Regional and State

Governments. <ftp://dnr.metrokc.gov/dnr/VCGIS/xfer/070910climateGUIDE.pdf>

Brightwater Project, Membrane Bioreactor (MBR), King County, Washington. <http://www.water-technology.net/projects/brightwater/>

Cedar Grove Mobile Home Park Acquisition.

<http://www.kingcounty.gov/environment/waterandland/flooding/flood-control-zone-district/programs/cedar-grove-acquisition.aspx>

Climate Change at the National Academies. <http://dels.nas.edu/climatechange/>

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