Local Warming
It's too late to stop climate change. What we can do is plan for it.

By CHRISTOPHER SWOPE

It's a blue-sky morning in Seattle, which means that Ron Sims can see the Cascades all the way from his downtown office. The mountain range cuts a long, jagged shadow on the eastern horizon, before heaving upward to the surreal snow-capped heights of Mount Ranier. It's a nice view, but there's nothing pretty about what Sims, the King County executive, knows is going on up in the mountains: Temperatures there have nudged higher in recent decades and, as a result, the snowpack has declined by as much as 60 percent in some places.

Historically, the pattern has been that each winter, snow piles up high in the Cascades, and each spring and summer, that snow gradually melts. Cities depend on the runoff for drinking water, farmers depend on it for irrigation and hydroelectric dams depend on it to generate almost all of the region's power. In other words, modern human life here is calibrated to one grand assumption: that complex cycles of water, ice and slush will keep working pretty much as they always have.

The problem is, they aren't. And that's what has Ron Sims concerned. Temperatures are up one-and-a-half degrees from a century ago. And as global warming heats up, that trend is expected to accelerate. Scientists at the University of Washington predict that local temperatures will rise another 1.9 degrees by the 2020s and 2.9 degrees by the 2040s. What that means for weather this winter, or for any specific year in the future, is hard to say. But scientific modeling points to a couple of inescapable conclusions that have huge implications for how King County plans its future.

One is that a lot of the water that used to fall as snow in the Cascades instead is going to fall as rain. So rather than trickling from the mountains for months, that water will rush down the valleys, surge into floodplains and strain levees that were designed for cooler times. Flooding events such as the one last November, which caused $34 million worth of damage, are likely to become more frequent. The other conclusion is directly related to the first. Less snow in the mountains means less snowmelt in the spring and summer. And that means water for drinking, farming and generating power will be a lot harder to come by.

The science has pointed Sims to a conclusion that many of his peers will find hard to swallow. No matter how many hybrid cars they buy for government fleets or energy-efficient light bulbs they install in government buildings, some
degree of climate change is inevitable. The amount of greenhouse gas already in the atmosphere is simply too great to avoid any consequences. "With all the discussion we've had on global warming, I am stunned that people haven't realized that it's actually going to occur," Sims says. "The ice caps are melting now. They're not going to refreeze next year because we reduce our emissions. We're going to live in that world. So plan for it."

Sims is not saying that governments should give up on reducing their carbon footprints. In fact, both King County and the city of Seattle are national leaders in reducing emissions through the use of biofuels and other measures. However, if most of the talk about global warming — and all of the controversy — have been about mitigation, Sims believes that governments must also start thinking about adaptation.

So King County has begun looking out to the year 2050 and planning backwards. County staffers are working with scientists to understand what the local impacts of climate change are likely to be. They expect coastal-erosion problems associated with rising sea levels, health crises associated with new infectious diseases and heat stroke, public-safety difficulties associated with more frequent forest fires and ecological issues associated with endangered habitat for salmon.

Climate change won't affect every region in the U.S. in quite the same way, but every region will be affected somehow. That's why King County also published a guidebook for local, regional and state governments. It's called "Preparing for Climate Change," and it's essential reading for government managers everywhere.

King County is building climate-change risks into all of its long-term planning and policy-development processes. Last month, the county council agreed to a tax inspired by the looming dangers of climate change — a down payment on Sims' $335 million plan to bolster levees and reduce flood risks during warmer, wetter winters. "We're learning to define ourselves not in 2007 terms or 2009 terms but in 2050 terms," Sims says. "It's a gamble. We're making decisions based on something that has not occurred yet, but we believe from the science that it's what will be.

"I don't think we're being unreasonable," Sims goes on. "But I don't know how you divorce your immediate issues from 2050. If you get there by accident, fine. But if you know you need to plan and don't, to me that's negligent."

ADAPTATION PLANNING

There's a paradox about climate change that you can easily miss, even if you accepted all the arguments in Al Gore's documentary, "An Inconvenient Truth." For a problem that is global in scope and whose politics reverberate internationally, the on-the-ground consequences of climate change are entirely local. And local governments, by and large, will be the ones stuck dealing with floods and drought, fires and storms, infectious diseases and invasive species.

Ron Sims’ call for municipal officials to adapt for global warming may sound daunting. It shouldn’t. Most cities and counties are accustomed to doing land-use planning, natural-hazards planning and, since 9/11 and Hurricane Katrina, disaster planning. Most of global warming’s local perils are familiar problems, only magnified. And although environmentalists don’t like to talk about this, some regions stand to gain. Longer warm seasons for agriculture and recreation could be a boon for some northern climes.

What’s difficult about adaptation planning is that it casts doubt on many long-held assumptions.

Take the concept of the "100-year flood." That benchmark is deeply ingrained in local planning documents, building codes and the federal flood insurance program. Yet a 100-year flood today may not mean the same thing just 20 or 30 years from now. Scott Shuford, a city planner who has worked in St. Petersburg, Florida, and Asheville, North Carolina, says climate change essentially voids the historical record. "Basically, we're looking at changes to our climate that have not been witnessed for centuries or millennia," Shuford says.

The other cognitive leap with adaptation is a matter of acceptance. This isn't the old debate about whether or not global warming is for real — that is settled. Rather, the debate is among environmentalists and others who never doubted the problem. Until recently, adaptation was something of a dirty word. Some greens believed that time, money or resources dedicated to planning for a warmer world only distracted from the hard work of preventing warming in the first place. Some still see adaptation as waving the white flag. "It’s kind of depressing," says Anne Marie Holen, who coordinates a global warming task force in Homer, Alaska. "It's hard not to see the need for adaptation as a sign of failure. If we'd begun serious mitigation measures when scientists first began warning government leaders about global warming and climate change, we wouldn’t be in such a pickle."

COMPANION EFFORTS

Despite Holen’s misgivings, Homer is one of a handful of communities around the country that have begun thinking about adaptation. Homer, a coastal town of 5,000, is feeling vulnerable to nature’s whims. A recent run of warm, dry summers brought an invasion of spruce bark beetles that ravaged millions of acres of forest. Then this summer, about 75 square miles of the weakened timberland caught fire. Homer also is susceptible to sea-level rise: The city’s port and its major tourist draws are located on a low-lying spit. Many locals noticed when the Anchorage Daily News ran a front-page story in October about three Alaskan villages that must relocate, at a cost of $330,000 per person, because of coastal erosion. "That's just the beginning," Holen says.
On the national level, Shuford is working with scientists at the National Climatic Data Center to recognize the importance of keeping policy makers up to date with the latest understanding of climate impacts across the state. By revisiting the issue every two years, California is building research capacity that states might be well suited to help with.

Building research capacity is a crucial matter and one that states might be well suited to help with. Washington State, for example, has contracted with the Climate Impacts Group to model climate change in the Cascades' retreating snowpack. "In the last two years, the demands on our time have really shot through the roof," says outreach specialist Lara Whitely Binder. "Local governments are saying, 'Okay we get it.' They're asking us to share the science with them because they're ready to take action on it, and they're trying to bring themselves up to speed."

As Sims sees it, the fact that scientists are still debating details is no reason for government not to act now. After all, governments are accustomed to building highways based on traffic projections or schools based on projections of school-age children. "Here's what I say: I don't need perfect, I need approximate," Sims explains. "I'll never be a scientist. I'm a policy maker. Our job is to ask, 'Do you think this might happen?' and when the answer is yes, that's sufficient for me."

Perhaps the biggest problem with the science is that there's not enough of it to go around. "Local warming" is something of an emerging field. And government at all levels has failed to fund enough downscaling work, given the stakes. The Climate Impacts Group is one of only eight such teams around the country — and not every region has one of its own. "We've been working for years to show there's a problem" with global warming, says Josh Foster, a program specialist with the University Corporation for Atmospheric Research. "Now we've convinced everyone there's a problem and overnight they want much greater certainty. We haven't invested enough resources into the questions for which answers are now being demanded."

On the national level, Shuford is working with scientists at the National Climatic Data Center to...
develop another climate change handbook for local planners. He’s hoping to pull together a detailed national picture of what urban and rural communities across the country can expect from global warming. “One of the challenges is to identify these resources and translate them into something useful,” Shuford says. “As we get further into it, it may be that we find it’s not possible to break it out at a county or community level. But I’m fairly convinced that for most of the areas we can get information out there summarized in a way that will be effective for them.”

NO REGRETS
If climate adaptation is still a nebulous field, Sims has come up with a way to navigate the fog. King County is focusing first on “no regrets” policies. In other words, policies that would make good sense to implement whether or not the year 2050 turns out as wet and wild as Sims fears it will be.

A good example of what “no regrets” means can be found in an industrial zone southeast of Seattle. Hundreds of warehouses and light manufacturing plants, including a Starbucks coffee-roasting facility, are situated in a flat river plain that goes on for miles. In late October, the Green River looks tamely confined within its earthen levees. But it was a different scene in November 2006, when unusually heavy rains soaked the whole region, including the Cascades. Muddy runoff came to within a foot of overtopping the Briscoe levee, which began cracking and sloughing under the strain of holding back the waters. Mark Isaacson, director of the county’s water and land resources division, walks atop the levee as it undergoes repairs, recalling the economic disaster that almost was. “The engineers asked me if I thought the levees would hold,” he says. “And I said I can’t promise you that.”

As Isaacson explains, there are 119 miles of levees in King County. And many of them date back to the 1930s and ‘40s, when farmers protected their crops by heaping piles of sand, rocks and tree stumps along the river banks. The Army Corps of Engineers shored up many of the levees back in the ‘60s. But development that followed in the flood plains raised the stakes. Boeing, for example, makes 737s at a plant adjacent to the Cedar River in Renton. When the river floods, new airplanes can’t get to the runway to take off.

Now, climate change is layered into the calculations. The Climate Impacts Group tells King County to expect more flooding events in the future, especially during November. So Sims ordered a countywide flood-control plan, and persuaded the county council to replace numerous small flood-control districts with one that serves the whole county. The real test came last month, when the council funded the first phase of the plan with a property-tax hike.

“No regrets” thinking is simple enough to grasp when it comes to levees, especially after Hurricane Katrina. But King County is now applying the same logic across all areas of government. County officials are promoting the use of reclaimed water as a drought-proof source of summer irrigation water. Health officials are plotting responses for non-native diseases such as the West Nile and hanta viruses. And planners are looking at ways to reduce the urban heat-island effect, as a hedge against heat waves. That last measure may sound particularly odd in a cool region where most homes don’t even have air conditioning. But that’s exactly the point. “You don’t want to believe anything’s going to change,” Sims says. “You want to say we’re going to reduce our emissions, and everything’s going to be okay.

“I won’t be here in 2050,” Sims goes on. “But I believe that whether it’s my children or their grandchildren, future generations will look back and say these were prudent investments.”
Climate-Change Adaptation Resources

"Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments," Published by King County, the climate impacts group at the University of Washington and ICLEI-Local Governments for Sustainability. The most comprehensive guide to the choices communities face in adapting for climate change. September 2007.

"Cities Preparing for Climate Change." Published by the Clean Air Partnership in Toronto. Includes case studies of London, New York, Boston, Halifax, Vancouver and Seattle/King County. May 2007.


"Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change." The last comprehensive national look at climate change impacts in the U.S. Published in 2000 by the National Assessment Synthesis Team of the US Global Change Research Program.

South Florida Regional Planning Council’s Climate Change Community Toolbox.Includes case studies and maps showing Miami-Dade County’s vulnerabilities to sea-level rise.

The Center for Clean Air Policy’s Urban Leaders Adaptation Initiative on Infrastructure, Land Use and Climate Change

ICLEI’s Climate Resilient Communities campaign. Pilot governments include Keene, New Hampshire, Ft. Collins, Colo., Miami-Dade, Fla. and Homer, Alaska.

"Our Changing Climate: Assessing the Risks to California." The California Energy Commission’s biennial look at climate change research and impacts on health, water resources, agriculture, forests and coasts.

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A Rising Tide

A Q&A with Olympia, Washington, city manager Steven Hall and public works director Michael Mucha

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—Governing Associate Editor Christopher Swope

Christopher Swope: Is Olympia’s sea-level rise problem any more pressing than in other coastal communities?

Steven Hall: I don’t know if it’s more pressing. It’s just that we’re getting out there quickly to understand what the impacts are and what we might do. Our community is pretty engaged around the whole climate change issue. We’ve been working on reducing our greenhouse gas emissions since the early 1990s, and we’ve actually reached the standards set in the Kyoto protocol.

We’ve done a lot of things related to greenhouse gases but we’ve also focused on one of the inevitable consequences of climate change, and that’s sea-level rise. We have slides to show the likely impact on our downtown with a two-foot and then a three-foot sea-level rise. So we’re beginning to assess the situation and we’ll eventually take action to deal with it, although we’re still debating at the policy level what that means.

Michael Mucha: It’s important to know that with sea-level rise, it’s not like it just rises and that’s it. We have fairly major tidal influences in South Puget Sound—our water level can fluctuate by 20 feet twice a day just from the tides. Since we’re at the end of Puget Sound, the tides are magnified. So when we talk about sea-level rise, we’re talking about what happens during the highest tides, and when we have high winds. So the seas would just be up for a period of time-on occasion we’d have this kind of flooding.

Swope: It’s interesting how you’re describing the problem, because when one thinks of sea levels rising, it might call to mind water gently lapping higher up on the shore. But you’re saying the problem is not so much higher water, but that you’ll get more flooding during specific events.

Mucha: It magnifies major climate events and natural events.
The issue of sea-level rise is not just the melting of ice. As water temperature rises, there's thermal expansion globe wide, so the water actually has a higher volume. That's a lot of what contributes to sea-level rise—it's not just the melting ice packs. And then with the changing wind patterns, more water is pushing into the west coast. We're seeing prevailing winds push more water here—I call it the sloshing effect. And with subsidence, the south sound is sinking about a tenth of a foot in the next 50 to 100 years. So we have land going down, we have the water getting bigger, we have snow melt, and we have winds pushing the water around the globe in different ways. So it's a very complicated thing. And so when people ask how much are seas going to rise and I say three feet, it's based on a lot of assumptions and a lot of dynamics. Does anyone know? No. These are best guesses at this point. But we're looking at the climate scientists to help us.
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Swope: The first question any community looking at adapting to climate change is going to confront has to do with data. Climate change is a problem that has mostly been researched at a global level, not a local level where the impacts are felt the most. Here in the Pacific Northwest, you’re fortunate to have the Climate Impacts Group at the University of Washington working to dial down that global data in a way that makes sense for local policy makers. But even you’re not sure what to expect.

Mucha: I’m not concerned about getting the sea-level rise numbers precisely right. I think we all know the trends are moving toward rising seas. The number is not as important as moving our community towards understanding that this trend is happening and it’s very long term. If we can all agree that there will be some amount of sea-level rise instead of arguing over how much, we’ll get a lot further.

Hall: It’s interesting, because when talk about sea-level rise, we get two reactions from the policy level. One is that we can’t understand it— we can’t know exactly how much it’s going to rise, so we can’t react to it. It’s just too overwhelming, there’s just too many factors of wind and subsidence of land and global warming, and maybe Greenland will melt and what do we do? So we do
And then I think there's another choice for policy makers, to make reasonable assumptions about what's going to happen. There's this trend toward global warming, there's this trend toward sea-level rise, and we're a coastal community. What's reasonable to do? And that's the approach we've taken. So we picked some numbers. We said, let's talk about two to three feet of sea-level rise over the next 50 to 100 years. What does that mean for our community? What does it mean for our utility infrastructure downtown? What does it mean for our roadway systems? And what does it mean for investment in our public and private facilities? Because downtown Olympia is more than a few buildings. It's the financial center of Thurston County. It's the cultural, social and historical center of the wider region. And so for us it's not a choice to run to higher ground. So given that we have reasonable projections that we can adapt to, we're starting to ask the questions about what should we do as a community?

In 2008 the council will spend a quarter of a million dollars to begin a technical assessment. Is the answer berming? Is it seawalls? Where are we vulnerable? What are the elevations downtown? Where are we vulnerable to a one- or two- or three-foot sea-level rise, and how do we deal with those? And what are the technologies used in Europe and other places that have already dealt with rising sea levels? Because we're not the first to deal with this.

Swope: What sorts of problems would a few more feet of water in the sound cause here?

Mucha: We have a natural spring as a drinking water source and it's very close to salt water. And as sea level rises, we've projected that we'll have saltwater intrusion in our drinking water within the next 20 yrs. It's just a given if we don't get off that spring system. So we're drilling other wells to find a more reliable water supply.

Also, as the seas rise, the storm pipes that drain into Budd Inlet no longer can discharge because the water is higher than the pipes. So what happens is rain water can't drain out of our community and we see flooding upstream in areas that aren't even close to the sound. And then as sea rise even more they start traveling up these pipes and start bubbling out of catch basins. We can berm all we want but if we don't deal with the entry points, which is the pipes, what happens is we might hold the water in by berming.

There are engineering solutions from the big hairy engineering solutions like putting a tide gate across Puget Sound, which would probably be a multi-billion dollar solution, to more affordable solutions like looking at how we build downtown, or using check valves. A check valve is something that allows water to go only one way. We'd pump fresh water into the Puget Sound to keep flooding from backing up. Installing a series of pumps and check valves would be relatively low-cost—probably in the millions of dollars versus the billions of dollars.

Swope: Of course, with every engineered step, aren't you looking more and more like New Orleans, relying on the engineers to get it right?

Mucha: I'm an engineer, so I understand that. We're human. We're fallible. Every time we try to battle nature, nature eventually wins. So we have to be humble and realize that any engineered solution has risks associated with it. There's no question about that. So that's the picture we're looking at. With our water resources team we're going to be figuring out over the next couple of years how to deal with this.

One thing we have going for us is we've been doing 100 year capital planning. We received an Innovations award from Harvard for this. We're trying to project out what our capital needs are going to be over 100 years and then back cast that to the current day, and then incrementally bring those facilities forward. Because we realize that everything has a lifespan and needs to be replaced on a continuous basis.
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Swope: I’d guess that for some people in government, thinking out 50 or 75 or 100 years would make their heads spin. On the other hand, you’ll often see cities issue "vision 2040" plans saying what they want to be like many decades from now.

Mucha: If you step back and look at how long Earth has been here, and the thousands of years of human existence, two generations is such a blip. If I were to drive my car today, the emissions that go into the atmosphere today will still be in the atmosphere 50 years from now. That can be very discouraging. However, I can also say if I stop driving my car today, in 50 years there will be a big difference. We’ll start to see the climate recover.

Hall: By the way, Michael rides his bike every day.

Mucha: We keep slamming our heads against the wall about trying to convert the generation that’s set in its ways, when the younger generation--they get this. And they’re already changing their lives to live differently. So we’re going to see a natural change, and I think it’s a major lifestyle change. It’s not just driving a hybrid vehicle--it’s not driving a vehicle. It’s living close to work. Living more simply. We’re going to see that actually happen as the younger generations move into power and move into their life. So part of
this is waiting and letting younger people change the world with their awareness and motivation.

**Swope:** Some communities may actually see upsides to climate change. Northern areas may see longer growing cycles or new agricultural opportunities. I saw a map they were using in Chicago, showing that the climate of Illinois may resemble the climate of East Texas a century from now. They illustrated that by superimposing the state of Illinois over Texas. When I saw that, I wondered whether places with cold winters, who have been losing people and businesses to the Sun Belt, might turn that around. Is there any upside to global warming here?

**Mucha:** No. There's higher highs, and lower lows. I can't think of any benefits we'd have, even economic or social, as a result of nature being out of balance.

**Hall:** And there's a lot of negatives for Washington State, beyond just what happens in Olympia. One of the issues is snow pack. Not just for water supply for cities, but also for irrigation. Eastern Washington is an agricultural region and they rely heavily on snow pack and rivers and streams. And so as the snow pack declines, then agricultural production declines on the east side of the state and the battle for water becomes more intense.

The other issue is we have great skiing in the Cascades—it's part of the quality of life here. You can take off and in an hour and a half you can be on the ski slopes. That won't happen as much in the future as global warming occurs.

Our third issue is wildfires. Whereas now our forest and grasslands in Eastern Washington start drying out in July or August and we have fires in August or September, we will start drying in April or May and have fires in June, July and August. People go to Eastern Washington for camping, fishing, hiking and biking. Now it's going to be on fire more often. So there aren't a lot of positives.

**Swope:** Tell me about your city hall project, and how sea-level rise played into the discussions of where to build. On the one hand, your downtown is increasingly vulnerable to flooding, but on the other hand if you put your city hall anywhere else it looks like you're abandoning downtown.

**Hall:** That's exactly right. Olympia has been talking for a long time about a new city hall building. Two or three years ago we got political support from our council and a financial package together to either buy or build a new city hall, which also will house the police. The first site we landed on was one owned by the Port of Olympia. And one of the issues that was raised was the sea-level rise. That site sits around 11 or 12 feet above sea level. At extreme high tides that puts it only one or two feet above those high tides.

So people started doing the math and said in 50 or 75 years you'll have water a couple of times a year at high tides up against the side of city hall. So we started asking how to address that. Early on, we asked, do we pull out of downtown? And the council said no, but if we construct at this site we have to address it. So we'll elevate the building, we'll reinforce the electrical, water and sewer systems, so that in those occasional high-tide situations, the building isn't compromised. And we also asked ourselves a question, because buildings aren't forever: can we use and protect this building for 80 years? And the answer is yes. Given the numbers we're seeing, we're sure we can.

After we did that, another site became available downtown, a former Safeway property which, unlike the port site, already has roads and utilities. So we actually have an option on that. And one advantage is that it's two-to-three feet higher above sea level, so we wouldn't have to do any of this work. So now we're evaluating the two sites. But the council is still committed to downtown investments. That's the first thing they said. One council member is just refusing to support building anything downtown. But the rest of the council has said downtown is the heart and soul of the community, and we'll continue to invest and to lead private investment there, while doing what we need to in order to adapt to the changing climate and sea-level rise.

**Swope:** And those two goals aren't inconsistent with each other?

**Hall:** I don't think so. At the same time we're leading the charge saying there will be issues with sea-level rise, we're out there saying these issues will be manageable. The melting of Greenland is a wild card nobody can deal with. If that happens it's a whole new ballgame. But given what we know and our commitment to the community, I think it's a good decision.
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**Swope:** Are there any lessons here for other coastal communities?

**Hall:** Don't ignore the issue. It's real. Start taking some action and figuring out what you're going to do as a community. The same type of map Michael uses to show sea level in downtown Olympia, Al Gore uses in his movie. It shows two-thirds of Florida underwater. So is the state of Florida really going to be underwater, or are people in Florida going to adapt to sea-level rise? I've got to believe they're going to adapt.

**Mucha:** I can't say we're experts yet, because I don't think anybody really is on this. I know in Holland what they do is build their homes on floats, and they just rise with the tides. That might be one solution. For us we have to start seeing this as a community-wide effort, and the best way for us to move forward is for us to all be talking about it, thinking about it and really agreeing on what we want our future to look like way out there.

And once communities agree on what they want their future to be there's less disagreement about the day-to-day strategic stuff. We know the seas are going to rise, so what are the baby steps we can take to move the community along with that understanding. And then once that happens, I think our community starts to authorize us with resources to begin taking steps.

**Swope:** Is there a role for the state or federal governments in adaptation? Or at the end of the day is this going to be a local issue because even though global warming is a global problem its consequences are intensely local?

**Hall:** I think there's definitely a role at the state level, and maybe in Olympia even more so because we are the state capital. We often become the guinea pig for trying things. And so there are dozens of coastal communities in Washington State where things we try can be replicated.

I have to say I'm more pessimistic about the federal government and its ability to act. But the impacts are so enormous economically, culturally and socially that I've got to believe the feds are going to provide some assistance or guidance or direction.

**Mucha:** I guess resources would always be nice. But I really think these problems are solved where we live, and local governments have shown, when they put their minds to it, they can do good things.