

WARMING UP TO CLIMATE

Lawmakers are looking at ways to adapt to rising temperatures and other changes.

BY GLEN ANDERSEN

Change is hard. Especially when it involves rising sea levels, flooding in some regions, drought in others and hotter temperatures everywhere.

Humans have adapted to climate changes for millennia, but now many of the world's 7.8 billion people face food, water and natural resource challenges. While nearly all climatologists and all major scientific bodies in the United States concur that human activity is a major driver behind climate change, debate continues.

Regardless of the cause, state policymakers are preparing for changes they see coming that could disrupt the economy and cause other problems.

"Climate change poses substantial risks to North Carolina's air quality, coastal ecosystems, agriculture and economy," says North Carolina Senator Josh Stein. "With significant tourism and agriculture industries and miles of tidal and estuarine shoreline, adaptation efforts are important."

As the massive winter storms and floods this year have shown, weather is not climate. Although variations in week-to-week and season-to-season temperatures and precipitation fluctuate dramatically, data collected at weather stations across the country show a warming trend and increased precipitation.

The U.S. Global Change Research Program, a consortium of 13 federal agencies,



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Lawmakers in coastal states, such as North Carolina, are increasingly concerned about the effect of climate change on sea levels.

stated in a 2009 report that climate-related changes are being seen throughout the world. "We are seeing trends in both direct measurements of the climate such as temperature, rainfall, freeze dates, etc.," says Thomas Karl, director of the National Climatic Data Center, which helped with the report. "Changes in spring blooming dates, forest die backs from insect infestation, wildfire and drought provide us with indirect measures of a changing climate."

The recorded changes vary significantly, although the United States has seen some of the more dramatic effects. Average temperatures across the nation have risen 2 degrees Fahrenheit since 1950, double the global average of 1 degree. The Midwest and northern Great Plains now experience average winter temperatures 7 degrees warmer than just 30 years ago, according to the report.

Parts of the country have also experienced more heavy downpours, earlier snow melts,

CHANGE



rising sea levels, longer growing seasons and greater precipitation. Partly as a result of warming oceans and melting ice sheets, sea levels along the mid-Atlantic and Gulf coasts have risen up to 12 inches in the last century, with the rate of rise accelerating since 1993. This rate is higher than the global average of 7 inches.

In some states, such as North Carolina, higher sea levels have caused accelerated land loss because of erosion. Researchers

expect these changes to continue in coming decades, with regions of the United States seeing a variety of effects that include:

- ◆ Sea level increases of 3 to 4 feet.
- ◆ More frequent droughts.
- ◆ Increases in extreme heat.
- ◆ Decreases in agriculture production—livestock grow more slowly since they eat less in warmer temperatures; chickens and dairy cows produce less in higher temperatures.
- ◆ More severe weather and flooding.

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North Carolina Senator Josh Stein

◆ **Increases in forest fires.**

These changes are expected to occur regardless of efforts to reduce carbon emissions, since heat-trapping greenhouse gases continue to be released into the atmosphere even if emissions are significantly curtailed. Nonetheless, many of the models scientists use to estimate climate change scenarios indicate that temperature change and sea-level rise may reach catastrophic levels if emissions are not decreased.

ESSENTIAL WATER

As states adapt to climate changes, protecting water resources is at the top of the list. Precipitation in the United States has increased by 5 percent over the last 50 years. Although more moisture might seem welcome in many regions, severe rain and snow storms have grown by approximately 20 percent in the last century.

The intensity and frequency of drought also has increased in some areas. Heavy downpours and long, dry periods diminish any added benefit of the extra rain since water runs right off the land during intense storms and increases the chance of flooding.

Climate changes have not been evenly distributed. The Midwest and Northeast are seeing increases in precipitation, while much of the Southeast and West are experiencing increases in the length and severity of drought. This is attributed to temperature-induced changes in the movement of air, which causes storms to track northward.

The largest water worries are in the dry Southwest, which has a rapidly growing population but scarce water resources. Arizona, California, Colorado, Nevada and Utah rely on snow pack to provide millions with water for power, irrigation and drinking.

These states are seeing earlier spring

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snow melts that not only shorten the ski season, which could have considerable costs for the industry, but also affect water supplies, which is even more troubling. Snow pack acts as a vital source of water storage for these states, usually providing a steady stream of water as melting occurs. Early melting can mean less water is available during the summer months, when it is most needed.

Warmer temperatures have also caused more precipitation to fall as rain, reducing snow pack levels. This key source of water storage could be affected if temperatures continue their upward trend. These states may be forced to limit population growth because of water constraints.

Representative Roger Barrus of Utah

CHALLENGES VARY BY REGION

Climate change affects different regions of the United States in different ways. These are some of the effects that can be expected, based on the U.S. Global Change Research Program.

Alaska. Longer summers and higher temperatures already are causing drier conditions. Insect outbreaks and wildfires are increasing. Thawing permafrost is damaging roads, runways, water and sewer systems, and other infrastructure.

Coastal areas. Significant sea-level rise and storm surges will harm coastal cities and ecosystems.

Great Plains. Increases in temperature and the frequency of drought are raising concerns about declining water resources.

agrees that “warmer winter seasons and lower snow pack could affect both water runoff and the length of the ski season.” But he believes “how natural variation in climate will affect Utah is yet to be seen and most probably cannot be predicted.”

TAKING ACTION

Some states are developing plans to protect coastal infrastructure, agricultural productivity, tourism, forestry and other areas of their economies.

A bill introduced in North Carolina, called the Climate Change Adaptation Strategy Act, is aimed at “helping policymakers translate what we know about climate change into what we can do about climate change,” says Stein, the bill’s sponsor. “Threats to our economy and way of life,” he says, “demand that we explore adaptation strategies.”

The bill directs the North Carolina Department of Environment and Natural Resources to gather data about the impacts of climate change on the state, prioritize them based on their severity and certainty, and conduct a cost-benefit analysis of making changes.

“Improving data collection and monitoring at the local level to provide accurate, accessible information are key,” says Stein.

New York lawmakers are concerned about the threat rising sea levels may pose to their state’s large coastal population. They formed a task force in 2009 to study the best ways to alleviate and plan for these threats, such as setting standards to limit coastal development in high-risk areas, building sea walls and break-

Agriculture, ranching and natural lands are likely to be stressed as temperatures increase.

Midwest. Climate changes are bringing more heat waves, poorer air quality, and increases in insect and waterborne diseases. There likely will be both more floods and water shortages. Longer growing seasons provide the potential for larger crop yields, though increases in heat waves, drought and insects may counteract potential gains.

Northeast. Extreme heat and declining air quality are likely to pose problems for human health, especially in urban areas. Dairy, fruit and other agricultural production are likely to be reduced as climates shift. Severe flooding from a rise in sea level and heavy downpours are likely to increase.



REPRESENTATIVE
ROGER BARRUS
UTAH

waters to protect wetlands and shorelines, and developing plans for a post-storm recovery.

Washington lawmakers passed a bill in 2009 that “requires the Ecology Department to compile the scientific information about climate change impacts likely to be felt in Washington,” says Senator Kevin Ranker, one of the bill’s authors. “This information will be made accessible to all the many interests with long-range planning responsibilities so that potential climate change impacts can be factored into their plans.”

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Utah Representative Roger Barrus

Northwest. Shrinking snowpack is likely to lessen stream flows, straining water supplies. Wildfires from higher temperatures and insect outbreaks, along with a changing composition of trees in forests, may challenge the lumber industry.

Southeast. Climate changes are increasing heat stress, water scarcity and severe weather. Higher temperatures are likely to stress humans and coastal ecosystems. The most serious threats are posed by sea-level rises and increases in storm surge and severe weather, causing serious infrastructure damage and expenses.

Southwest. Water scarcity is likely to require trade-offs and conflict among competing uses. Higher temperatures along with drought, wildfire and invasive species also are expected.



SENATOR
KEVIN RANKER
WASHINGTON

The bill also requires the Department of Ecology to assess Washington's vulnerability to climate change, create a priority list of solutions, and identify where to get the money and other resources necessary to implement the effort.

"As we ask our citizens adapt, I felt it was very important that the state lead by example," says Ranker.

Hawaii lawmakers last year created a climate change task force to focus on potential climate risks and responses around tourism, agriculture, recreation, fishing, public health, infrastructure and Hawaii's unique ecosystems. The task force—made up of high level members of various agencies, mayors, legislative appointees and scientists—must make final recommendations by the beginning of the 2011 session.

But not everyone agrees that state adaptation plans are the best approach.

"I do not believe that this should be a spending priority for state or federal governments when compared to other government priorities such as education, transportation, economic development and health care," says Barrus. "I feel it's a waste of resources to play out scenarios that science cannot accurately predict at this time."

FEDERAL RESPONSE

The first major federal effort was announced in January 2010, creating a national Climate Service run by the National Oceanic and Atmospheric Administration. The new government agency, which will be in business by Oct. 1, will be dedicated to providing state and local governments, as well as businesses, with information to help them adapt to climate change.

The information includes sea level rise maps, precipitation changes, projections of snow melt, stream flow charts and water availability. This information could prove critical for a number of sectors, including agriculture, water resources, skiing and tourism, and forestry. The agency will incorpo-



Portage Glacier, Alaska

The temperature has changed in polar regions more quickly than elsewhere, which is one of the reasons Alaska has seen so many climate-related changes in the last 30 years. The state is now more than 3 degrees warmer in summer and 6 degrees in winter. This has melted snow and ice cover, allowing the darker earth to absorb more sunlight, and increasing the warming trend.

Sea ice has declined by as much as 20 percent, threatening wildlife and villages that are protected from the ravages of the stormy seas by the ice. Summers are now longer, with the growing season in Fairbanks expanding from 80 to 120 days since the early 1900s. This has helped melt centuries-old permafrost, making building much more challenging in soft muddy ground, and decreasing the number of days (from 200 in 1980 to 100 today) that heavy equipment can be driven out for oil pipeline repairs and energy-related work.

Longer summers have led to drier forests and a growth of pests such as the bark beetle. More beetle larvae survive the milder winters while higher summer temperatures allow the insects to mature and reproduce faster. Beetles have devastated 17 million acres in the western United States as well. The estimated 100,000 dead trees that fall each day because of the epidemic have closed numerous campgrounds this summer, according to the U.S. Forest Service.

The milder winters also are affecting towns and villages along the north Alaskan coast. In the towns of Shishmaref and Newtok, melting coastal ice and permafrost have caused erosion and flooding. Houses have sunk or fallen into the sea. Newtok is now being relocated to higher ground, which could cost \$130 million, according to the U.S. Army Corps of Engineers.

rate the National Climatic Data Center, the Geophysical Fluid Dynamics Laboratory and the National Weather Service's Historical Climate Network.

Although the federal government is begin-

ning to investigate ways to deal with climate change, states are ultimately responsible for ensuring that their economies can adapt to the potential changes in temperature, water availability, sea levels and severe weather. ■