

## **Climate Adaptation Strategies Gaining Traction Among States, Businesses**

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July 17 (BNA) -- While the debate in Washington over climate change has largely focused on the issue of reducing greenhouse gas emissions, the issue of climate adaptation is gaining traction among states and businesses, which see the economic impact of severe weather as too great to ignore. Climate adaptation involves a wide range of steps that can be taken to prepare for severe weather and other impacts resulting from climate change. Among the many steps that states are taking are: hardening their infrastructure and power systems to make them more resilient to severe weather; rebuilding homes and businesses stronger and in different locations; and restoring wetlands to create natural protections against the impacts of severe weather.

Almost half the states have either completed a climate adaptation plan, are in the process of completing one, or have overall climate plans that recommend creation of a climate adaptation plan, according to the Center for Climate and Energy Solutions (C2ES), which tracks state plans on its website.

A number of cities and other local governments also have adaptation plans in place, including New York, Chicago and Los Angeles. A 2012 study by the Department of Urban Studies and Planning at the Massachusetts Institute of Technology found that 59 percent of 298 local governments surveyed in the U.S. have undertaken some form of climate adaptation planning.

According to the National Climate Assessment released by the Obama Administration in May, climate change is having a significant impact on severe weather in all regions, including extreme precipitation events and coastal flooding, drought, and increased ocean acidification (88 DEN A-7, 5/7/14).

### **A Premium on Building Codes**

The increase in severe weather events is also putting a greater premium on state building codes, which can help improve the resilience of residential and commercial structures.

There are 38 states with building codes, although some are stronger than others and some are enforced more rigorously, Julie Rochman, president and chief executive officer of the Insurance Institute for Business and Home Safety, told Bloomberg BNA.

Businesses also are recognizing the impact of severe weather. Some are adapting and some have not bridged the gap between recognizing the impact of climate change and taking steps to adapt, according to recent studies.

The National Climate Assessment released by the Obama Administration in May said there is substantial adaptation planning under way in both the public and private sectors, but “few measures have been implemented and those that have appear to be incremental changes” (88 DEN A-7, 5/7/14).

“Adaptation to climate change is in a nascent stage,” the report said. “Barriers to implementation of adaptation include limited funding, policy and legal impediments and difficulty in anticipating climate related changes at local scales.”

### **Cost of Failing to Act**

The report said the cost of failing to take action on climate adaptation is four to five times greater than the costs for preventive hazard mitigation. According to the Insurance Institute, every dollar spent on disaster mitigation saves \$4 in disaster recovery expenses.

Another report, “Risky Business,” released June 24 by a bipartisan group of political and financial leaders, said the U.S. could face hundreds of billions of dollars in economic losses by the end of the century from the effects of climate change (122 DEN A-11, 6/25/14).

“States and municipalities are recognizing the importance of pre-emptive action to address their vulnerabilities to climate change impacts and many have begun to address adaptation concerns either within broader climate action plans, or through separate efforts,” C2ES said in a statement on its website.

Florida, Virginia and Maryland in 2008 were the first to address the impact of severe weather with climate adaptation plans, according to C2ES, which is the successor to the Pew Center on Global Climate Change.

States that now have completed a climate adaptation plan include Alaska, California, Connecticut, Florida, Maine, Maryland, Massachusetts, New Hampshire, New York, Oregon, Pennsylvania, Vermont, Virginia, Washington and Wisconsin, according to C2ES.

Climate adaptation plans are in the process of being completed in Delaware, Minnesota, Rhode Island and New Jersey, while climate plans in Arizona, Colorado, North Carolina, South Carolina and Utah recommend the development of an adaptation plan.

Most states follow a four-step process in their plans, according C2ES. They outline their vulnerabilities to the impacts of climate change, develop a plan to become more resilient, implement the plan and then monitor and evaluate its progress.

### **State Building Codes**

Rochman said a critical step in building resilience is for states to adopt statewide building codes. She said a statewide code, as opposed to local codes, “levels the playing field” for all builders and construction.

She said state climate adaptation plans, the Obama Administration's climate plan, Hurricane Sandy and other factors are generating momentum for stronger building codes and improved resiliency to severe weather.

“A lot of these threads are starting to come together,” Rochman said. “I think we're going to look back on 2014 as a very pivotal year, in terms of our nation's ability to adapt and to become more resilient.”

The Insurance Institute for Business and Home Safety issued the first state-by-state analysis of building codes in 2012, looking at 18 states along the Atlantic Ocean and Gulf of Mexico. It found a large degree of variation, with Florida, New Jersey and Virginia having the strongest codes and enforcement. Alabama, Delaware, Mississippi and Texas were at the bottom of the list.

Mississippi has enacted a state code law since the report was released, while Maryland and Connecticut have improved their ratings, Rochman said. A revised report will be issued in 2015. Rochman said drought and wildfires are also posing increasing threats. She said California and Colorado have established community standards to prevent wildfires and that other states should follow. Standards include having a “defensible space” around structures through smart landscaping and using noncombustible building materials.

Rochman said a key obstacle in creating more resilient communities is a lack of political will. “We basically know what to do,” she said. “Its having the will to do it.”

### **STATE ACTIONS**

New York, California, Washington and Massachusetts are among several states that have been active in the area of climate adaptation.

Their plans include hardening infrastructure, electrical power systems and wastewater systems, restoring wetlands and other natural barriers, and improving emergency response systems.

All four states are on the coasts and are particularly susceptible to the effects of rising sea levels.

#### **California's 2005 Executive Order**

California's effort to identify climate risks is rooted in a 2005 executive order signed by former Gov. Arnold Schwarzenegger (R) that set statewide greenhouse gas reduction targets and directed key state agencies to assess risks and evaluate adaptation measures.

Initial and subsequent risk assessments found that sea level rise threatens crucial low-lying public infrastructure such as airports, roads and highways, wastewater treatment systems and marine cargo ports. Rising sea levels also threaten the 20 power plants located along the California coast as well as thousands of homes and hotels and other businesses.

California's transportation system, energy transmission and distribution systems, homes and businesses also are vulnerable to increased wildfires and inland flooding from the extreme weather events that the state's studies indicate are likely to come with climate change.

- Modernize the state's water delivery system.
- Build more resilient smart power grids that are connected, but localized.
- Promote strategies to protect residents from longer, more frequent heat waves.
- Restore wetlands to guard against floods.
- Support climate research.
- Assess the adequacy of emergency responders.
- Reduce risks for the most vulnerable populations.

- Provide a sustained source of funding for climate science and adaptation measures. Cities and other local governments throughout the state are also assessing climate risks, in part due to state laws and policies.

Recent changes to California Environmental Quality Act guidelines now require local governments to consider climate impacts when making land-use decisions and considering development projects. The state's Sustainable Communities Act (S.B. 375) requires the state's major transportation planning agencies to address climate impacts.

Los Angeles, San Francisco, San Diego and other cities have developed their own climate adaptation strategies and are regularly assessing climate risks.

### Update Expected Soon

California is on track to complete the first update of its 2009 climate adaptation plan by the end of this summer, according to Richard Stapler, a spokesman for the state's Natural Resources Agency. A draft of the update, released in December 2013, builds on the initial plan's multi-sector approach for reducing the risks of climate impacts such as rising sea levels, increased wildfires, severe storms, decreasing snowpack, drought and extreme heat (238 DEN A-6, 12/11/13).

The 289-page draft “Safeguarding California Plan” reflects the latest scientific data from the state's third major assessment of climate risks and evaluates the state's progress in addressing those risks. The proposed update also includes what the document said are “real-world, realistic recommendations for actions” that can be implemented now to prepare and protect California's people, economy, infrastructure and natural resources against climate impacts.

Among the recommendations in the proposed update are:

- modernizing the state's water delivery system;
- building more resilient smart power grids that are connected but localized;
- promoting strategies to protect residents from longer, more frequent heat waves;
- restoring wetlands to guard against floods;
- supporting climate research;
- assessing the adequacy of emergency responders; and
- reducing risks for the most vulnerable populations.

The draft update also calls on lawmakers to provide a sustained source of funding to finance climate science and adaptation measures.

### No Mandate for Businesses

Like the “2009 Climate Adaptation Strategy,” the proposed update doesn't impose any mandates on businesses to address climate impacts.

“It's policy guidance for state and local decision makers,” Ann Chan, the deputy secretary for climate change and energy at the resources agency, told Bloomberg BNA.

The draft plan identifies climate risks in nine sectors: agriculture, nature (biodiversity and habitat), emergency management, energy, forestry, ocean and coastal ecosystems and resources, public health, transportation and water.

All levels of government, businesses, insurers, investors, nonprofit groups, foundations, communities, organizations and individuals must work together to reduce climate risks, the plan said.

“All core functions of government must make the risks Californians face from a changing climate an integral part of their activities,” the draft update said.

“Without meaningful action, California faces tens of billions of dollars per year in direct costs and exposes trillions of dollars of assets to collateral risks, with additional social and human costs,” the plan said.

Some businesses are expected to benefit indirectly from the state's effort to lessen climate impacts. For example, publicly funded studies and state incentives may encourage farming operations to participate in projects that can make them more resilient to extreme weather events and deploy water-saving technologies.

Adaptation policies may create new markets for clean technology companies, like those producing power storage devices and water efficiency systems.

With California now grappling with an historic drought, farms are being forced to adapt to uncertain water supplies. Rice growers in the Sacramento Valley, for example, have voluntarily cut production to save water to help provide river flows needed to protect fish and wildlife.

Uncertain and scarce water supplies—resulting from the state's aging water infrastructure and the potential for more frequent and longer dry, hot weather—are among the most immediate and long-term challenges for California.

The state's \$44.7 billion a year agricultural industry depends on a reliable source of water. Climate impacts, like extreme heat or cold weather, also pose threats to nut and fruit tree growers, specialty crops, wine grape growers, livestock operations and agricultural operations. Food processing plants, manufacturing operations and other businesses also rely on dependable sources of water.

California's tourist and recreation industry also stands to suffer economically from climate impacts. Climate related coastal erosion and polluted runoff from extreme storms could force the state's beaches to close as well as harm local businesses, according to various climate risk assessments and studies.

### **Sandy Spurs Action in New York**

While New York had been taking some steps to adapt to climate change, Superstorm Sandy changed everything. The 2012 storm devastated the New York City area, leaving 2 million people without power, causing catastrophic flooding, shutting down the region's transportation and power systems and spilling more than 200 million gallons of untreated sewage into waterways.

In response to Sandy, along with Hurricanes Irene and Lee and other storms, Gov. Andrew M. Cuomo (D) announced a major rebuilding plan in January 2014. Funded with \$17 billion from the federal government through a supplemental appropriation, the plan will improve the resiliency of the state's transportation system, infrastructure, power systems and coastlines. New York is also investing in improvements in its severe weather warning systems and emergency management.

- \$5 billion to reconstruct and harden the Metropolitan Transportation Authority's mass transit system, including new technologies to seal subway and automobile tunnels and increase the pump capacity in stations and tunnels.
- \$1.4 billion to improve the resiliency of the electric grid by moving primary wires underground, elevating low-lying substations, expanding tree trimming, and raising power lines for newly elevated homes.
- \$1.8 billion to protect 83 miles of coastlines, including the installation of natural barriers.
- \$1.6 billion to protect and improve wastewater systems, some 30 percent of which are at least 60 years old. Cuomo has repeatedly said the “new reality” is that 100-year storms are now occurring every two or three years. In his first three years in office, there were nine federally declared disasters due to severe weather.

Jared Snyder, the state's assistant environmental conservation commissioner for air resources, climate change and energy, told Bloomberg BNA that Sandy put the state's existing efforts “on steroids.”

He said Sandy and other recent storms shifted the state's emphasis “from the study phase and the analytical phase to implementing on a bigger scale.” One of the key challenges for the state is making old systems more resilient, since those systems have been built up over many years, he said.

“We can't just take them down and build something new immediately,” Snyder said. We have to evolve those systems over time, making the existing systems more resilient.”

### Key Projects

The key projects in New York's multiyear climate adaptation plan are:

- \$5 billion to reconstruct and harden the Metropolitan Transportation Authority's mass transit system, including new technologies to seal subway and automobile tunnels and to increase the pumping capacity in stations and tunnels;
- \$1.4 billion to improve the resiliency of the electric grid by moving primary wires underground, elevating low-lying substations, expanding tree trimming and other steps;
- \$1.8 billion to protect 83 miles of coastlines, including the installation of natural barriers; and
- \$1.6 billion to protect and improve wastewater systems, some 30 percent of which are at least 60-years-old.

The state also has created a recovery program for small businesses, providing grants and low-interest loans for small businesses affected by Sandy, Irene or Lee. The funds can be used to repair or replace equipment or lost inventory, to renovate facilities that were damaged or destroyed or for working capital needed as a direct result of the storms.

Both houses of the New York State Legislature approved a bill June 19 that would require state agencies to consider the effects of climate change and severe weather in permit applications and grants of state funding (S. 6617).

The bill also would require that the state Department of Environmental Conservation promulgate regulations by 2016 that project rises in sea levels. In addition, the environment department and the New York Department of State would be required to establish model local laws “that include consideration of future physical climate risk due to sea level rise, and/or storm surges and/or flooding, based on available data predicting the likelihood of future extreme weather events including hazard risk analysis.”

Under S. 6617, the Community Risk and Resiliency Act, the state would consider the impact of climate change in permitting and funding provided under four key statutes and programs: the State Smart Growth Infrastructure Policy Act; the water pollution and drinking water revolving program; the Environmental Protection Fund; and major permits issued pursuant to the Uniform Procedures Act (120 DEN A-4, 6/23/14).

A spokesman for the governor could not be reached for comment on whether he plans to sign the measure.

#### Commission Issues Adaptation Decision

New York is also addressing climate adaptation through a ground-breaking decision issued by the state Public Service Commission (PSC) in February 2014. The decision requires all New York utilities to integrate the potential impacts of climate change into their system planning and construction forecasts and budgets (38 DEN A-2, 2/26/14).

The requirement, which was contained in an order approving Consolidated Edison's climate plan, covers electric, gas, telecommunication and water utilities regulated by the PSC.

“The state's utilities should familiarize themselves with scientists' projections for local climate change impacts on each service territory,” the order said. “We expect the utilities to consult the most current data to evaluate the climate impacts anticipated in their regions over the next years and decades, and to integrate these considerations into their system planning and construction forecasts and budgets in preparation for severe weather.”

The PSC said the impact of severe weather will vary from utility to utility, but “all the state's utilities face challenges such as Hurricane Irene and Tropical Storm Lee, nor'easters, floods, severe winds, increasing ambient heat and extreme heat events.”

The Con Edison order contained a number of provisions that environmental groups hope make it a national model for storm hardening and resiliency efforts. The order approved the continuation the Con Edison Resiliency Collaborative, a panel that includes the company, the state, environmental groups and other stakeholders.

Legislation (A. 9991, S. 7755) introduced at the request of New York Attorney General Eric T. Schneiderman (D) would build on the PSC decision by requiring that electric and gas utilities assess their vulnerability to the impacts of climate change and prepare a plan for adapting to severe weather (98 DEN A-10, 5/21/14).

The bill, the “Public Utility Extreme Weather and Storm Hardening Assessment Act of 2014,” failed to pass either house before the legislature adjourned its 2014 session.

### **Washington State**

Washington state released an Integrated Climate Change Response Strategy in April 2012 that is intended to provide a broad framework for decision-makers to use in their day-to-day work to ensure that consideration of climate change impacts is given a high priority.

The strategy lays out a variety of threats ranging from the risks posed by a projected spike in diseases found in warmer climates, such as Rocky Mountain Spotted Fever and tularemia, to increased flooding brought on by more frequent extreme weather events.

The plan was forged under the leadership of then-Gov. Chris Gregoire (D) in recognition of a projected \$10 billion in costs related to climate change by the end of the decade.

The response plan suggests adaptive strategies such as public education to address disease threats and flood plain restoration to increase water storage capacity to fend off floods. Other response strategies identified in the report include:

- compensating for declining snowpack and stream flows through better water management that takes into account both human and animal requirements, such as cold water for endangered salmon species;
- reducing wildfire risks by disseminating more robust data on forest pests and diseases and by encouraging local governments to pass ordinances that reduce such risks; and
- increasing aquatic species' resilience to climate change by reducing stress from existing threats such as stormwater pollution.

### **Massachusetts**

The Massachusetts Legislature in 2008 passed the Global Warming Solutions Act, requiring the Executive Office of Energy and Environmental Affairs (EEA) to issue a Climate Change Adaptation Report. The report, released in September 2011, presented an overview of risks and identified potential strategies to address those risks.

The EEA report stressed the need for additional information-gathering to help assess risks and vulnerabilities and to determine what actions must be taken to minimize impacts through effective planning and management.

For example, the report said future risks and costs can be reduced for new development and redevelopment through careful siting and the inclusion of design, engineering, construction and maintenance standards that account for higher sea levels, increased temperatures, more intense coastal storms and inland flooding.

The report also identified a need for sound land-use decisions, effective emergency response systems and measures that preserve, protect and restore natural habitats and watersheds.

Efforts are under way at the state level to act on these findings. The Massachusetts Department of Environmental Protection (MassDEP) has developed a regulatory workgroup to focus on possible



regulatory changes under the state Public Waterfront Act to establish how projects should be designed to prepare for sea level rise.

Discussions are also under way at MassDEP on how to create incentives for improvement to existing structures to accommodate sea level rise, MassDEP spokesman Ed Coletta told Bloomberg BNA.

MassDEP is also working with EEA to explore mechanisms to address the potential impacts of climate change through the Massachusetts Environmental Policy Act (MEPA) review process. In addition, MassDEP is working with municipal water and wastewater system operators by providing technical assistance on adaptation issues.

Massachusetts Gov. Deval Patrick (D) unveiled plans in early 2014 to devote more than \$50 million to secure the state's energy resources, coastal regions and transportation infrastructure against the impact of climate change. As part of the plan, the state established a \$40 million municipal resilience grant program that will provide cities and towns with funds to "harden" critical sites using clean energy technology.

The program is being administered by the Massachusetts Department of Energy Resources and will be funded via alternative compliance payments, which are paid by electricity retail suppliers if they lack enough renewable or alternative energy certificates to meet their obligations under the state renewable portfolio standard.

The state's utilities regulators are also working with utility companies to determine ways to accelerate storm hardening and deploy micro-grids and resiliency projects for energy transmission and distribution systems. The EEA will assess the vulnerability of generating facilities and develop preparedness plans.

The climate adaptation plan also requires the Massachusetts Department of Transportation to conduct a statewide vulnerability assessment for all facilities, including rails, ports, roads and bridges, and to adopt climate adaptation plans by 2015.

### **New England Effort**

Massachusetts is part of a regional effort involving all six New England states to identify ways in which government agencies, businesses and regional and nonprofit organizations can work together to address adaptation issues.

More than 140 representatives from various sectors met at a summit in Rhode Island in November 2013 at the invitation of the Environmental Protection Agency to identify issues and consider ways to achieve a more climate-resistant New England.

Information presented during the session showed that only about 10 percent of New England communities have begun to address the impacts of climate change with adaptation plans, but that many more want to address the threats they face.

A number of regional actions are planned, including the launching of a pilot project on vulnerability assessments and resiliency planning in one or two communities in each New England state to establish a regional foundation for action.

In addition, the states plan to:

- convene meetings with a cross-section of state and federal agencies to coordinate assessment resources;
- integrate adaptation planning into local public health and public safety programs;
- develop a common data platform for New England;
- develop a multilevel communication initiative; and
- convene a public-private workgroup on smarter spending on resilient infrastructure.

## **INDUSTRY ACTIONS**

Companies in the electric power and insurance industries, as well as those dependent on water resources, have been among the most active in responding to the impacts of climate change. These companies have directly experienced the economic and business impact of severe weather. Among the most active in responding to the impacts of climate change and severe weather are Entergy Corp., Consolidated Edison, National Grid, and Starbucks.

### Response From Insurance Industry

One of the industries that has been most deeply affected by climate adaptation is insurance. According to the Zurich-based reinsurance company Swiss Re, natural disasters cost the global insurance industry \$45 billion last year.

In the aftermath of Hurricane Katrina, which caused insurance losses of \$41 billion alone, the agencies that rate insurance companies raised their capital adequacy standards significantly, according to the Insurance Information Institute.

The rating agencies now look at the capital adequacy of insurers based on their exposure to a 250-year event, rather than a 100-year event. They also look at potential losses from two major disasters within a short time frame, rather than one.

“Even before anyone ever used the word climate change, insurers were prepared to deal with extreme [weather] variability,” Robert P. Hartwig, president of the institute, told Bloomberg BNA. “This industry has probably been thinking about—and is more prepared for—this challenge than any other industry.”

To keep up with climate change, the insurance industry must change its traditional approach of looking at historical data and shift to a model based on “predictive risk assessment,” according to June 2013 report from the Geneva Association, an international insurance think tank based in Geneva.

The report, “Warming of the Oceans and Implications for the (Re)insurance Industry,” said “traditional approaches, which are solely based on analyzing historical data, increasingly fail to estimate today's hazard probabilities.”

The report also recommended that the industry support and encourage climate adaptation by designing new insurance products.

“This can and should be done in collaboration with local authorities through engagement in public-private cooperation,” the report said. “This will, as well as enhancing reputation, lead to a more resilient building stock and an overall reduction of risk.”

### New Insurance Product

One of the relatively new products that insurers are offering is insurance to protect officers and directors from liability related to the impact of their company's actions on climate change.

“The potential increase in property losses may be relatively small in comparison to what could happen on the liability side,” the institute said in a February 2014 analysis posted on its website.

“Liability suits could be filed based on legal concepts yet untested as well as existing ones tailored to ‘sustainability’ cases. Awards could be substantial because, by their very nature, activities that result in harm to the environment and future generations can impact large numbers of people.”

Among the activities that insurers review in writing such policies are “the company's efforts to adapt to global warming to help ensure that they did not cause harm, along with their emissions reduction program and their energy conservation projects.”

Large insurance companies in five states are also providing detailed information on climate risk, under a project headed by the National Association of Insurance Commissioners (NAIC).

California requires that all insurers writing more than \$100 million in direct premiums complete an NAIC climate risk disclosure survey, while Connecticut, Minnesota, New York and Washington require that the survey be completed by insurers writing more than \$300 million in premiums.

### Insurers Surveyed by States

Under the eight-part survey, companies must disclose their climate change policy, if they have one; what they're doing to manage climate risks; any steps taken to help policyholders reduce climate-related losses and the impact of climate risk on their investment.

The information is collected by the California Department of Insurance in a database that is searchable online by the name of the insurance company, survey question or response.

A 2012 report from the Boston-based sustainable investment group Ceres found that 23 of 184 insurance companies responding to the survey had comprehensive climate strategies. It said “almost all companies responding to the survey show significant weakness in their preparedness to address the effects climate change may have on their business.

“However, a small subset of industry leaders are evolving their business strategies to remain competitive as the impacts of climate change unfold,” the report said (121 DEN B-1, 6/24/13). Washington State Insurance Commissioner Mike Kreidler (D) told Bloomberg BNA May 28 that it's been an uphill battle to get states to participate in the project. Although the survey instrument was developed through the NAIC, “we had enough political pushback that we were not able to do the survey the way it was intended, which was to make the results public and to make it mandatory for all insurance companies.”

Kreidler said the results show incremental progress at best. But, as chairman of the NAIC's Climate Change and Global Warming Task Force, Kreidler said he's seeing some signs that the survey is beginning to nudge insurers to take actions such as requiring policyholders to take steps to mitigate risk and lobbying legislatures to do the same.

“I don't want to get in the way of an insurance company making the right decisions, but the right decision here would be to get involved early with land-use practices, building codes and mitigation efforts,” Kreidler said.

#### Class Action Suit

Kreidler said he was encouraged when Illinois Farmers Insurance Co. filed six novel class action lawsuits in April alleging that 200 municipalities in Northern Illinois caused liabilities for the company by not implementing reasonable stormwater control practices prior to floods in 2013 (108 DEN A-15, 6/5/14).

The lawsuit, said Kreidler, sent the message to zoning officials: “It's one thing to kowtow to homebuilders in the area; but you're putting communities at risk.”

“They withdrew the suit—possibly they always intended to withdraw the suit—but they certainly got peoples' attention.”

Kreidler criticized the industry, saying, “I wish I could say we are seeing more bold moves, but it has been somewhat incremental.”

“We are trying to bring the property casualty industry into the 21<sup>st</sup> century. But there has always been this somewhat laissez faire attitude in the U.S. insurance market that we'll offer products when it's in our financial interests, then we'll just simply withdraw.”

“What is in their long-term, best interest is to recognize the risk and vulnerability they have and to become much more actively engaged. I think we are starting to see some of that,” he said.

Hartwig of the Insurance Information Institute said “insurers are supporters of strengthened building codes and sound land use policies, but the policies themselves are not under our control.” “We simply measure risk and we price the risk,” he said.

Hartwig said insurers would like states to allow insurance companies to be able to charge “a rate that fully reflects the risk that vulnerable properties represent.” He said businesses and homeowners are more likely to take steps to improve the resilience of their property or move to a less vulnerable area if their insurance costs are priced appropriately.

“A very high price for a structure that's located in a vulnerable area on the coast, for example, provides an incentive to either mitigate or to think about different locations or to build to an even stronger building code,” he said.

“The price of insurance is a message that every single policy holder gets every single year about their risk.”

### Carbon Disclosure Project Report

A report released June 10 by the Carbon Disclosure Project (CDP) found that Standard & Poors 500 companies are integrating climate change into their business strategies by seizing on new business opportunities, shifting to renewable energy and investing in resilience.

“Managing global warming impacts delivers competitive advantage to US companies,” Tom Carnac, president of the CDP in North America, said in a statement on the release of the report.

“We are moving from a world that's projecting future climate risks to one that's experiencing those risks now,” Carnac said.

The report looked at the responses to climate change by 172 S&P 500 companies in nine states: California, Colorado, Michigan, Minnesota, North Carolina, Ohio, Pennsylvania, Texas and Virginia. The report found that companies are building greater resilience to extreme weather, in response to higher costs related to lost business, unstable supplies of raw materials and potential damages to their physical plants and assets.

Companies are also generating revenues from new energy-efficient products. In the consumer goods sector, for instance, they are remaking products such as laundry detergent, tires and building insulation to reduce the carbon footprint throughout the product lifecycle, according to the report. One of the many examples cited in the report is Hewlett-Packard Co., which is trying to reduce the environmental footprint of large-scale computing. The HP “EcoPOD” is a “self-contained, modular, ultra-efficient data center that uses a fraction of the energy of traditional brick-and-mortar data centers while achieving 10 times the information technology capacity,” the report said.

### S&P 500 Companies

A separate CDP report released in May found that S&P 500 companies see climate change-related risks becoming more urgent. Forty-five percent of the climate-related risks described by the companies were considered current or likely to occur within the next five years (96 DEN A-9, 5/19/14).

The report cited several examples of the risks reported by leading companies, including:

- Gap Inc. reported experiencing higher material costs for cotton due to changes in precipitation and drought in China.
- Dr. Pepper Snapple Group Inc. reported that \$2.5 billion of its cost of sales could be at risk through increased costs to its supply chain for water, raw materials and commodities as a result of severe weather and climate.
- Union Pacific Railroad reported an 11 percent decline in corn shipments affecting its freight revenue as a result of droughts in 2012.

A July 2013 report from the Center for Climate and Energy Solutions found that 90 percent of companies in the S&P Global 100 Index have identified extreme weather or climate change as a current or future risk to their businesses. Only 28 percent, however, have undertaken climate-related vulnerability assessments and 18 percent have used climate-specific tools or models, the study found (138 DEN A-19, 7/18/13).

“The huge majority of companies acknowledge these risks exist,” Janet Peace, vice president of markets and business strategy at C2ES and a co-author of the study, told Bloomberg BNA. “They have some difficulty taking action on these risks.”

### S&P 100 Concerns

The primary climate-related concerns expressed by the S&P 100 companies are “direct impact on production capacity such as property damage or supply interruptions” and “impacts on operational costs such as higher commodity prices or maintenance costs,” according to the report.

The study cited a number of obstacles that have prevented companies from taking action:

- existing risk management approaches underestimate climate risks;
- few companies have undertaken comprehensive climate vulnerability assessments and
- limited availability of risk data.

Many companies recognize the risks posed by climate change, but far fewer have actually taken steps to adapt, Heather Coleman, climate change policy manager for Oxfam International, told Bloomberg BNA.

Coleman said some sectors are more active than others, largely because their businesses are either dependent on water resources, like the agriculture and beverage industries, or directly impacted by severe weather, like the electric power industry.

“There's a strong business case for taking action,” Coleman said. “If you're just looking at the pure economics, you've got to be taking this seriously.”

Coleman said there are several reasons why companies are not taking action, including pressure from shareholders and others to look at short-term horizons instead of long-term benefits. She said there is also a lack of communication among divisions of individual companies, with those involved in supply chains, risk assessment and modeling often in their own silos.

The companies that have been most active are those in which the top leadership has taken the issue seriously, she said.

A 2011 Oxfam report, “Adapting for a Green Economy: Companies, Communities and Climate Change,” said companies also lack information needed to understand the impact of climate change. Moreover, it's difficult for them to integrate scientific information into site-specific decision making, the report said.

Oxfam has identified a number of companies in seven sectors that have capitalized on climate change by developing products and services that help build preparedness and resilience. According to a 2009 report, “The New Adaptation Marketplace,” there are business opportunities in water management, disaster preparedness, climate information services, energy, agriculture, resource management, and insurance.

“What we've found over and over again,” Coleman said, “is that there are risks, depending on the sector, of course, and there are opportunities.”

### Power Sector Impacted

The power sector has been dramatically impacted by severe weather and has been one of the most active in responding by system hardening and improved resiliency.

Consolidated Edison in New York City, for example, will spend \$1 billion over four years for storm hardening and resiliency projects to prepare for severe weather. The effort is a response to Superstorm Sandy, which devastated the region and Con Edison's 3.3 million customers in New York City and nearby Westchester County (35 DEN A-3, 2/21/14).

Under a plan approved by the state Public Service Commission, Con Edison also will:

- replace a greater number of leak-prone pipes and study how to reduce methane leaks from its gas distribution system;
- study the use of “micro-grid” systems to achieve goals such as carbon emission reductions and diversification of energy sources and
- promote voluntary time-of-use rates, particularly for owners of electric vehicles.

A demand management program will provide \$219 million for energy efficiency and demand reduction projects to reduce peak electric demand by 100 megawatts and \$66 million for combined heat and power systems at customer sites to replace another 25 megawatts of electricity from the grid.

The program is limited to large energy users, including commercial, industrial and institutional buildings. Funding is available for projects that have a peak demand reduction of at least 50 kilowatts.

The program is funded through a charge on Con Edison customer bills.

### Entergy Takes Steps

Entergy Corp., a New Orleans-based energy company, has taken many steps to adapt to severe weather and has been a leader on the issue in the Gulf Coast. The company, which sustained significant damage and losses after Hurricanes Katrina and Rita, began a storm hardening program in 2007 and has spent more than \$1 billion to improve resiliency and harden its system, according to Jeff Williams, senior manager of climate consulting.

Among the key investments that the company has made in storm hardening and resiliency are replacing wooden transmission structures with concrete and steel to withstand winds of 150 miles per hour, elevating substations in flood-prone areas and hardening transmission lines that cross major interstate highways.

The company has undertaken a number of studies and economic modeling to build a strong business case for climate adaptation, in an effort to avoid the politically charged debate over climate change. The company joined with America's Wetland Foundation, America's Energy Coast, and Swiss Re in 2010 to undertake the first major analysis of climate risks and “adaptation economics” for the region.

The study found that severe weather costs the Gulf Coast region an estimated \$14 billion per year. It projected that, without climate change, the annual average cost of losses will rise to \$19 billion by

2030. A scenario that accounts for rising sea levels and other impacts related to climate change projected annual average losses of \$24 billion.

The study also ranked a series of measures according to a cost-benefit analysis and came up with several cost effective measures that would reduce losses by \$7 billion over the next 16 years. These include improved building codes, improving the resilience of electric utility systems and building levees for refineries and petrochemical plants. The study found that restoring wetlands and levee systems had a higher cost, but were still beneficial because of strong co-benefits and risk aversion. “We've been successful in having a rational conversation about this,” Williams told Bloomberg BNA. “This isn't something that you should ignore just because you don't believe in climate change.”

### Working With Communities

Entergy also has worked closely with the leaders of the communities that it serves, in an effort to build resiliency across the economy. In a speech before the 2014 Electric Power Conference in New Orleans, Rod West, Entergy's executive vice president and chief administrative officer, said the company had an “Aha!” moment when it realized that businesses and other customers could not receive power after Hurricane Ike, even though Entergy's hardened transmission system had withstood the storm.

“It's not enough for Entergy to build resilient systems and facilities,” West said. “If we want to ensure our own business continuity, our customers must do so, too.”

West said “the costs of inaction are far, far more expensive than the investments we choose to make today.” He said about 66 percent of the cost-effective investments identified by the 2010 study don't require any public funding, including more resilient residential building codes.

“Other investments, however, like beach re-nourishment, wetlands restoration and improved levee systems, would require public funding, but would likely be highly cost-effective when you consider avoided losses and how those losses ripple through the economy.”

Williams said anecdotal evidence indicates that Entergy's efforts have had a positive impact. For example, it took an average of five days for the company to restore power to at least 90 percent of its customers after Hurricane Isaac in 2012. By contrast, it took 15 to 17 days to restore power after Hurricanes Katrina and Rita, he said.

### PG&E Examines Risks

The San Francisco-based Pacific Gas and Electric Co. is also taking a close look at climate risks. “Many of the expected impacts of climate change are identical to or closely related to the risks that PG&E faces every year—flooding, fires, extreme storms and extreme heat events,” Denny Boyles, a spokesman for the utility, told Bloomberg BNA in an e-mail.

PG&E said it is working with the U.S. Geological Survey and the California Department of Water Resources to model and better understand the potential impacts of snowpack on watersheds that support its hydropower facilities. It also has developed guidance that will be updated periodically to address the risks to its assets of increased temperatures, rising seas, storm events and wildfire patterns.



In addition, the company is supporting local and regional climate adaptation efforts and diversifying its mix of technologies, including boosting its use of renewable energy.

NRG Energy, which operates several power facilities along the coast of California and other states, must address potential sea rise and climate change impacts in all its applications for new generation, Jeff Holland, a company spokesman, told Bloomberg BNA. He said the company must also consider potential impacts to current assets as they are configured.

In California, NRG's coastal plants "are located at elevations above the predicted effects of sea level rise due to climate change," Holland said.

NRG also is upgrading its wildfire emergency response plan, Holland said. "As this year's San Diego fire taught us, keeping the units available during wildfires is critical to grid stability."

NRG also is addressing the issue of water management planning, including designing facilities to minimize the use of water, he said.

"Water usage at our facilities will also be a primary concern, especially in California, as drought conditions are still affecting the region," Holland said.

NRG brought the world's largest solar thermal project on line earlier this year near the California-Nevada border. It uses 95 percent less water than competing wet-cooled solar thermal plants, Holland said. In addition, nearly 100 percent of the water used for the steam turbines is recycled back through the system.

#### National Grid's Investments

National Grid, an international company based in the United Kingdom and the northeastern United States, has been investing heavily in storm hardening and resiliency over the past several years, according to Patrick Stella, a spokesman in Albany, N.Y.

He told Bloomberg BNA that the company will have spent more than \$5 billion in New York state by 2016 on network infrastructure for electric and gas.

"National Grid is keenly aware of the impact severe storms have on the communities we serve, as our customers were directly impacted by Sandy in our downstate markets, and Irene/Lee primarily in our upstate areas."

National Grid spent \$1.6 billion, for example, over a five-year period on projects in the upstate regions of New York, including replacing poles with stronger ones, installing more resilient wire, and installing cutouts or fuse devices to prevent outages from spreading to more customers.

Stella said National Grid estimates that it will cost almost \$1 billion for additional storm hardening in the downstate region, which includes New York City and Long Island. It has developed a long-term storm hardening plan that will include upgrading the natural gas system in flood zones and possible new technologies to shut off individual services as they sense flooding.

### Steps Taken by Starbucks

A virulent tropical fungus stoked by climate change is prompting executives half a world away in the Seattle headquarters of Starbucks Corp. to take steps to make their coffee supply chain more resilient. Coffee leaf rust fungus is just one of the climate-related impacts motivating Starbucks to help its suppliers in developing countries adapt to the realities of climate change.

“Unless we spend the necessary time and resources in scientific research and farmer's extension services, we will see production considerably dipping in several countries as temperatures rise and extreme climatic events become more frequent,” Mauricio Galindo, head of operations for the International Coffee Organization, told Bloomberg BNA in an e-mail.

Galindo cited examples of intense rains in Columbia for the 2007-2009 period, Brazil's drought this year and the spread of coffee leaf rust in Central America to areas where it had never reached before.

Starbucks is confronting the challenge to its business exactly as Galindo prescribes: through the expenditure of time and resources in research and extension services.

“One of the greatest opportunities we have as a company is to leverage our scale to create sustainability for producers within the coffee supply chain,” Craig Russell, executive vice president of Starbucks Global Coffee, told Bloomberg BNA.

“We're heavily invested in helping farmers manage through changes in weather or conditions like coffee rust,” Russell said in an e-mail. “Supporting the farmer's ability to access information, technology and resources allows them to adapt to these uncertainties and ensures the longevity of our industry's supply chain.”

To address the coffee rust threat, which the Intergovernmental Panel on Climate Change says could result in a 34 percent decline in global coffee production by 2020, Starbucks is taking a variety of steps, including the acquisition in 2013 of a working farm in Costa Rica that Russell calls the global agronomy center. The center is testing best growing practices, with the results openly available to farmers everywhere.

The company has committed to increasing the resilience of coffee farmers by setting a goal of spending \$20 million on farming loans by 2015. The money will go to a variety of efforts to support growers, such as financing for farmers to fight rust infestation.

Starbucks is also collaborating with World Coffee Research at Texas A&M's Norman Borlaug Institute for International Agriculture to evaluate 30 new coffee varieties at the Costa Rican farm that have the potential to be rust-resistant.

### Taylor Shellfish Adaptations

Taylor Shellfish Farms of Shelton, Wash., has taken a number of steps to adapt to ocean acidification resulting from climate change.

Taylor, which is the largest producer of farmed shellfish in the United States, has expanded larvae production at its Kona, Hawaii, hatchery, which was not as impacted by seawater heavily saturated with carbon dioxide as its facility at Dabob Bay, Wash.

“The first thing we had to do is monitor the water,” Bill Dewey, director of public policy for the company, told Bloomberg BNA.

“We could accurately see the water chemistry that was coming into the hatchery and, once we did, we soon realized that when we got a north wind starting to blow, the pH would drop.”

Dewey cited help from Sen. Maria Cantwell (D-Wash.) in getting federal funding to install sophisticated monitoring equipment at hatcheries up and down the coast. Monitoring allowed the hatchery to determine when the water chemistry was safe for the shellfish and could be pumped into the hatchery.

“Putting that monitoring equipment in the hatchery was like putting a headlight on a car,” Dewey said.

“All of a sudden, you could see what was coming at you and dodge. Now we've learned that we can't always dodge that corrosive water so we've been working over the last couple of years to see how to treat that corrosive water.”

Dewey said the threat of ocean acidification has transformed his industry into “the canary in the coal mine.”

The annual economic impact of shellfish aquaculture on the U.S. Pacific Coast, which directly or indirectly employs 3,200 people from California to Alaska, was about \$270 million in 2011, according to the coast growers association.

So when baby oysters in the wild and in hatcheries began mysteriously dying in catastrophic numbers, the industry panicked, according to Dewey.

“It's not unusual to have a year of catastrophic failure,” he said. “But starting in 2005, it became more of a pattern of failure than success.”

At first, people thought a bacteria might be the culprit, he said. One big Oregon hatchery owned by another company spent a quarter of a million dollars hoping to strain out pathogens with a high-tech filter, but it didn't work.

Then Richard Feely, a chemical oceanographer with NOAA's Pacific Marine Environmental Lab in Seattle, gave a keynote address in 2008 to the shellfish growers association that left the growers stunned.

“The source of the problem was beyond our ability to control—CO<sub>2</sub> emissions being absorbed by the ocean and causing it to acidify,” Feely said.

Feely was at the vanguard of a group of scientists who described complex chemical processes marked by increasingly acidic water and a reduction in the availability of carbonate ions that shellfish, especially in larval stage, use to create and maintain their calcium carbonate based shells.