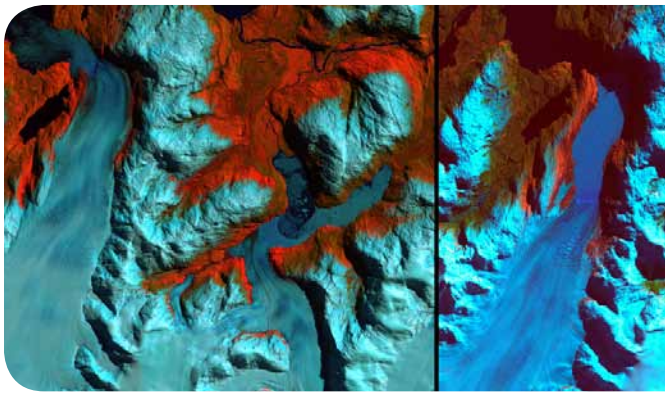
Exceptional service in the national interest

Sandia National Laboratories

Sandia's Climate Security Research

Enhancing the nation's understanding of global climate change, its risk and options to lessen the consequences

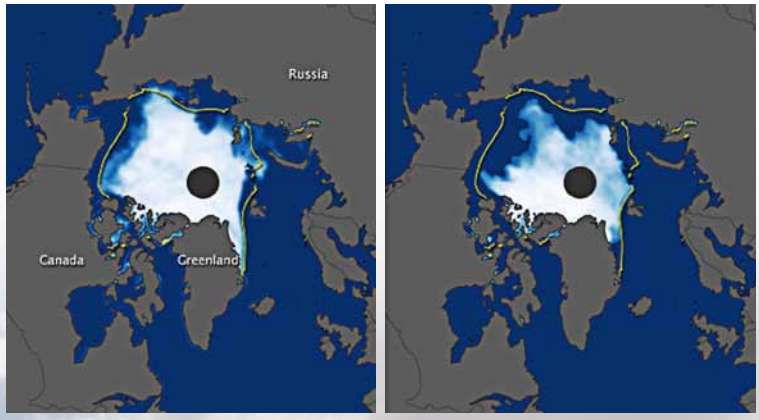


Growing scientific evidence shows Earth's climate is changing, causing concerns about possible consequences for humanity. Sandia is working to help policy makers better understand climate change, so they can make informed decisions to mitigate the effects. Sandia scientists are examining the changes and imbalances in major planetary climate regulators, such as the atmosphere. By collecting data that refines sophisticated computer models, Sandia can predict evaluate likely socioeconomic and national security impacts of climate change under various scenarios. This research will allow testing of possible strategies for adapting to climate change and its effects.

A major source of climate instability is the changing composition of the atmosphere. This is often over-simplified as a net increase in carbon dioxide and other "greenhouse gases" that trap heat within the atmosphere, hence the term "global warming." But other factors are involved. For example, certain cloud types contribute to atmospheric warming, while others help cool the atmosphere by reflecting sunlight into space. And, melting sea ice in the Arctic will affect the global environment.

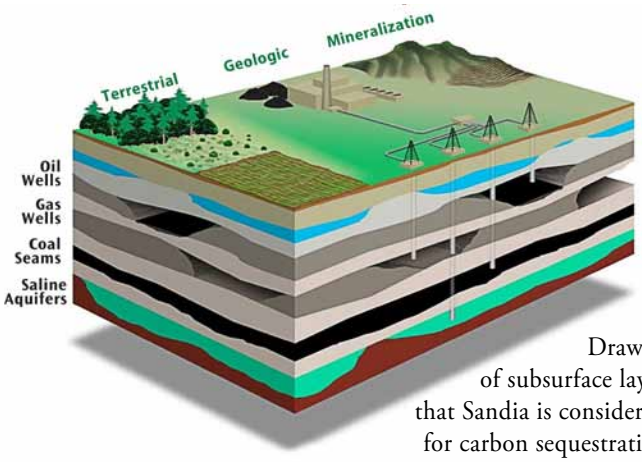
Climate Change Modeling and Uncertainty Assessments

Given the complexity, Sandia scientists use high-performance computing to help create predictive models. Such models not only help us understand how the many factors interact, but also help measure the mathematical uncertainty of diverse potential outcomes. This information contributes to the climate model at the National Center for Atmospheric Research.



Satellite composite images of sea ice in the Arctic region acquired for 1999 (left) and 2010 (right), showing a decrease in the amount of coverage. (Photo courtesy of NASA.)

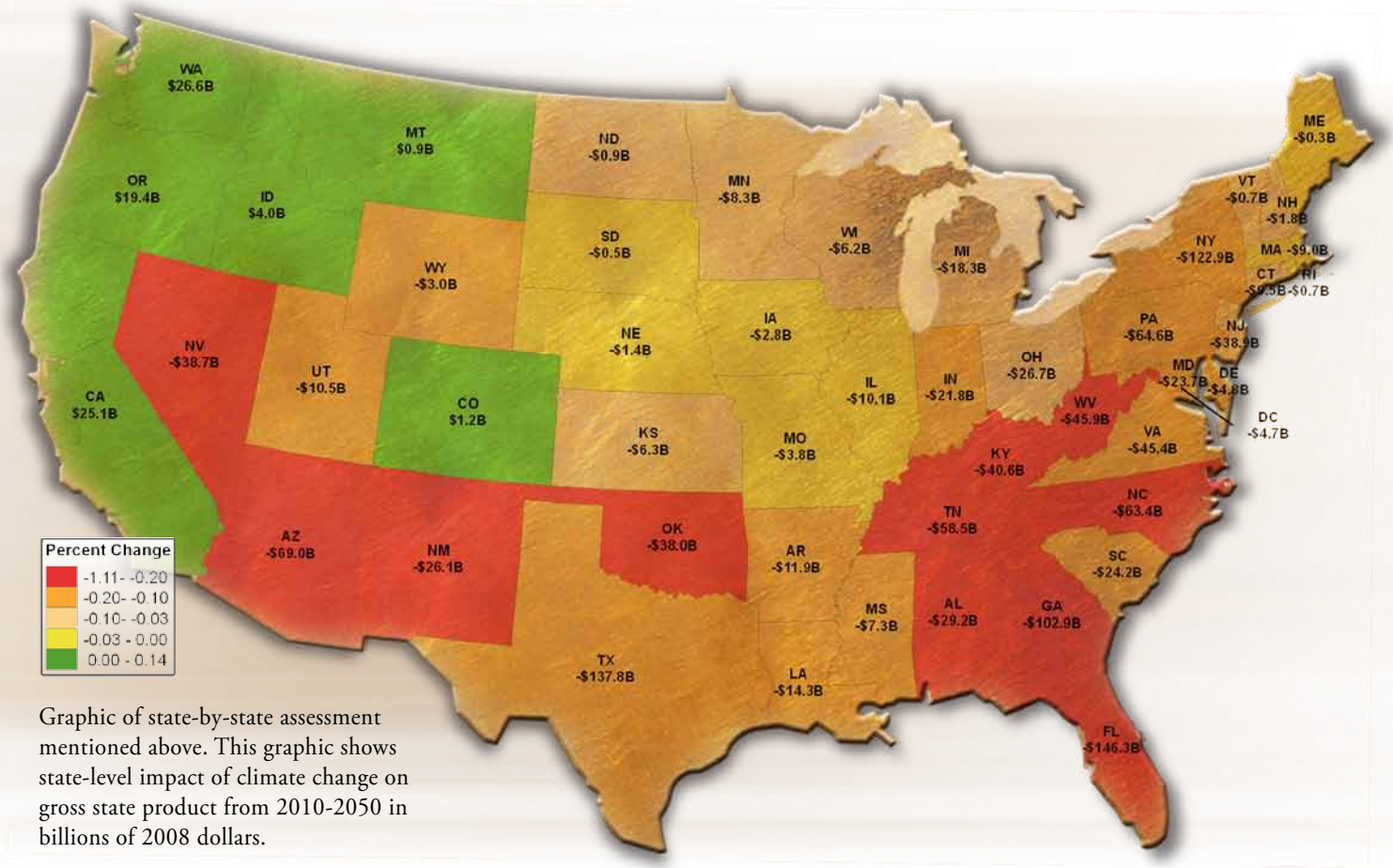
Sandia researchers also generated the first integrated assessment of climate risk for the 48 contiguous states. This risk assessment uses probability techniques familiar to insurance companies to look at the most uncertain impact of climate change, precipitation, from 2010-2050 and estimates the economic impact upon each state due to water availability. The dynamic interaction among the states was a critical element missing from previous studies.



Drawing of subsurface layers that Sandia is considering for carbon sequestration.

Reducing Expected Effects of Climate Change

Sandia researchers are exploring ways to reduce the causes of climate change and to mitigate its anticipated effects. Sandia is investigating options for collecting carbon from industrial waste streams and burying it underground, while determining how much carbon various geological layers can hold and for how long. Sandia models show climate change threatens to stress potable water supplies, so scientists are devising more efficient nano-filtration methods to produce drinking water from salty and contaminated water and studying how to cultivate crops that use less water. As the climate changes, the probability of new infectious diseases from organisms not normally found in temperate areas or new strains of existing pathogens, like influenza, increases. Sandia is identifying methods for containing the early stages of potential pandemics, mitigating death tolls and economic hardship.



Graphic of state-by-state assessment mentioned above. This graphic shows state-level impact of climate change on gross state product from 2010-2050 in billions of 2008 dollars.

U.S. DEPARTMENT OF ENERGY
NNSA National Nuclear Security Administration

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