

Climate in the FY 2014 Budget

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HIGHLIGHTS

- The U.S. Global Change Research Program (USGCRP), which coordinates and integrates research over 13 Executive Branch departments and agencies, would receive \$2.7 billion (up 6.0 percent).
- The National Oceanic and Atmospheric Administration (NOAA) requests \$2.2 billion for the National Environmental Satellite, Data, and Information Service (up 15.7 percent) and \$1.1 billion for the National Weather Service (up 4.2 percent).
- The National Aeronautics and Space Administration (NASA) requests \$1.8 billion for Earth Sciences (up 4.6 percent), including \$443 million for Earth Science Research (up 0.5 percent), \$354 million for Earth System Science Pathfinder (up 88.6 percent), and \$788 million for Earth Systematic Missions (down 10.6 percent).
- The National Science Foundation (NSF) requests \$1.4 billion for the Geosciences (up 5.5 percent) and \$223 million for Science, Engineering, and Education for Sustainability (up 41.4 percent).
- The Department of Energy (DOE) requests \$3.1 billion for energy R&D (up 48.6 percent) and \$4.7 billion for Office of Science R&D (up 6.3 percent). The Office of Science's Biological and Environmental Research program would receive \$625 million (up 5.6 percent).
- The Department of the Interior (DOI) requests \$72 million for climate variability science (up 23.3 percent), \$33 million for Science Support (up 99.0 percent), \$18 million for Cooperative Landscape Conservation (up 13.8 percent), and \$100 million for New Energy Frontier renewable energy programs (up 35.9 percent).

INTRODUCTION AND POLITICAL BACKGROUND

Past scientific research demonstrates that the Earth's climate is changing, that humans are very likely responsible for most of the recent increase in global average surface temperature, and that further greenhouse gas emissions will almost certainly contribute to additional widespread disturbance of the climate system. This poses considerable risk to society because physical systems, biological resources, and social institutions that people depend on are highly adapted to climate conditions.

In the broadest sense, society has three proactive options for reducing the risks associated with climate change (global warming). We could reduce our greenhouse gas emissions and thereby reduce the amount that climate changes (often called mitigation). We could build our capacity to cope with the climate changes that lie ahead (adaptation). We could deliberately manipulate the earth system in the hope of counteracting some climate effects of our emissions—critically, without triggering unintended and harmful side effects (often called geoengineering or climate engineering). Each of these broad categories (mitigation, adaptation, and geoengineering) encompasses a wide range of more specific risk management options and none is mutually exclusive—we could use them together and in a wide range of different combinations.

Research, observations, scientific assessments, and technology development support and enhance the risk management options by providing knowledge and understanding to decision makers. Expansion of the knowledge base allows policy makers to select and refine risk management strategies to increase their effectiveness. Increasing the knowledge base can also reveal entirely new approaches for protecting the climate system or reducing the risks of climate disturbance. Research on the climate system spans multiple disciplines including atmospheric science, oceanography, hydrology, biology, and cryology. Understanding the societal impacts of climate variability and change also requires input from social sciences, including (but not limited to) economics, sociology, history, and political science. Furthermore, policy choices must also consider ethical concerns, value judgments, philosophical views, and uneven distributional consequences. Given this level of inter-disciplinary complexity, accurately and comprehensively describing the climate-related R&D in the President's budget request is challenging and requires at least some subjective judgments.

Basic economic principles demonstrate that placing a price on greenhouse gas emissions is cost-effective (i.e. the lowest cost way of achieving a given level of emissions reduction) and that adding a price on emissions that accounts for climate damage would lead to net economic benefits for society. However, legislation that would put a price on emissions is politically challenging in Congress, in part because that legislation would very likely cause uneven distributional consequences.

In recent years, the Republican leadership in Congress and the Administration have frequently been at odds over climate-related R&D spending. For example, Congress did not support the Administration's reorganization proposal for a NOAA Climate Service in the FY 2012 budget and the House of Representatives attempted to eliminate U.S. funding for the Intergovernmental Panel on Climate Change (IPCC), which periodically assesses the science of climate change. The past year has seen the Republican leadership in Congress and the Administration spar over the FY 2013 Continuing Resolution and the sequester that was established in the Budget Control Act of 2011.

Meanwhile, the Environmental Protection Agency (EPA) is in the process of regulating greenhouse gas emissions under the Clean Air Act, as required, in part, by the Supreme Court's 2007 decision in *Massachusetts v. EPA* coupled with EPA's 2009 Endangerment Finding that greenhouse gases threaten public health and welfare. For example, in March of 2012, the EPA proposed a rule to limit carbon pollution from new fossil-fuel-fired power plants. In recent years, a number of bills have been proposed in Congress to block or delay EPA's authority to reduce greenhouse gas emissions.

PROGRAMS, DEPARTMENTS, AND AGENCIES

United States Global Change Research Program (USGCRP). The USGCRP coordinates climate research and its applications over 13 Executive Branch departments and agencies. The total requested budget for FY 2014 that falls within the scope of the USGCRP is \$2.7 billion, which would be a \$151 million (6.0 percent) increase over FY 2012. Note, however, that all budget figures in Table 1 are not adjusted for inflation, which is expected to be in the range of 4 percent between 2012 and 2014. Therefore, the actual increase in USGCRP funding would be a more modest 2 percent. It is also important to note that funds counted within

the USGCRP framework are allocated directly to the agencies and each agency has discretion in what it counts as being within the framework. Therefore, the number reported for USGCRP does not account for all climate-related research and year-to-year changes in USGCRP funding can reflect accounting changes rather than actual changes to agency requests.

National Oceanic and Atmospheric Administration (NOAA). NOAA's total FY 2014 budget request is \$5.4 billion (an 11.1 percent increase). The request includes \$472 million (a 21.1 percent increase) for the Office of Oceanic and Atmospheric Research (OAR). The National Environmental Satellite, Data, and Information Service (NESDIS) would receive \$2.2 billion (a 15.7 percent increase) with \$824 million (a 7.7 percent decrease) for the Joint Polar Satellite System (JPSS), which reflects in part the transfer of the Free Flyer-1 satellite mission to a Polar Free Flyer budget line. The National Weather Service would receive \$1.1 billion (a 4.2 percent increase).

As in the President's FY 2013 request, the FY 2014 budget does not include the previously proposed Climate Service. NOAA's FY 2012 budget request included a major budget-neutral reorganization proposal to create the Climate Service, a line office intended to increase NOAA's efficiency and effectiveness in providing climate science information and decision-support services. Congress subsequently blocked the proposed reorganization in the FY 2011 continuing appropriations bill and did not establish the Climate Service in the FY 2012 "minibus" spending bill, nor in subsequent appropriations.

National Aeronautics and Space Administration (NASA). NASA's total FY 2014 request is \$17.7 billion (a decrease of 0.3 percent). Earth Science would be funded at \$1.8 billion (a 4.6 percent increase). NASA Earth Science funds climate-related research (Earth Science Research) and satellite observations: Earth Systematic Missions (ESM) and Earth System Science Pathfinder (ESSP). Earth Science Research would receive \$443 million (a 0.5 percent increase). ESM would receive \$788 million (a 10.6 percent decrease) and ESSP would receive \$354 million (an 88.6 percent increase).

NASA Earth Science Research funds competitive grants to the research community in six areas: (1) climate variability and change; (2) atmospheric composition; (3) carbon cycle, ecosystems, and biogeochemistry; (4) water

and energy cycles; (5) weather; and (6) the Earth surface and interior. Grants in these areas are primarily for research and analysis of NASA satellite data.

NASA satellites provide information relating to climate variability and change as well as existing weather patterns, including measurements of the atmosphere (e.g., composition, temperature, pollution, clouds, precipitation, and radiation); ocean (e.g., surface temperature, salinity, circulation, sea-surface height, and sea ice); and land surface (e.g., land cover and forest density). NASA has five satellite missions in development or under study within ESM (compared to 12 in operation) and four within ESSP (four in operation). Some of these missions have been delayed due to cost overruns, technical problems, and shifting budget priorities.

National Science Foundation (NSF). NSF's total request for FY 2014 is \$7.6 billion (a 7.3 percent increase). The request includes \$326 million under the USGCRP framework (a 2.1 percent decrease). The Geosciences Directorate would receive \$1.4 billion (a 5.5 percent increase), with \$267 million (a 3.1 percent increase) going to Atmospheric and Geospace Sciences. NSF's Science, Engineering, and Education for Sustainability (SEES) crosscutting program would receive \$223 million (a 41.4 percent increase) to promote capabilities and discoveries needed to inform societal actions related to environmental and economic sustainability (note that this includes some funding under Geosciences).

Department of Energy (DOE). DOE's total FY 2014 request is \$28.4 billion (an 8.0 percent increase). DOE requests \$3.1 billion for energy R&D (a 48.6 percent increase) and \$4.7 billion for Office of Science R&D (a 6.3 percent increase). Energy Efficiency and Renewable Energy programs would receive a total budget of \$2.8 billion (a 55.9 percent increase), including \$357 million for solar energy, \$144 million for wind energy, \$575 million for vehicle technologies, and \$300 million for building technologies.

The Office of Science's Office of Biological and Environmental Research (BER), which supports basic research in atmospheric sciences, terrestrial ecosystems and climate modeling, would receive \$625 million (a 5.6 percent increase). BER's request includes \$45 million for the Terrestrial Ecosystem Science (TES) program, which examines the impacts of climate change on biological systems and land-surface carbon cycle feedbacks to climate change.

DOE's FY 2014 budget request provides considerable resources for technology development relating to climate change. The Batteries and Energy Storage hubs would receive \$24 million (a 24.9 percent increase), the Fuels from Sunlight hubs would also receive \$24 million (a 0.1 percent decrease), and Advanced Research Projects Agency-Energy (ARPA-E) would receive \$379 million (a 37.8 percent increase) to support high risk, high reward energy research projects.

Department of the Interior (DOI). DOI's total FY 2014 request is 18.3 billion (a 3.1 percent increase). DOI requests \$18 million (a 13.8 percent increase) for Cooperative Landscape Conservation, including support for Landscape Conservation Cooperatives (LCCs) that develop natural resource management strategies to respond to climate change and other stressors. Science Support is a new sub-activity (formerly embedded in Cooperative Landscape Conservation and Adaptive Science) and would receive \$33 million (a 99.0 percent increase).

The United States Geological Survey (USGS) would receive \$72 million (a 23.3 percent increase) for DOI climate variability science. Of this, \$35 million (a 40.1 percent increase) is intended for the National Climate Change and Wildlife Science Center and DOI's eight regional Climate Science Centers (CSCs), which aggregate and synthesize data on climate impacts, assist local decision makers in implementing adaptation strategies, and educate the public. USGS climate science funding also includes \$11.3 million (a 27.8 percent increase) for biologic and geologic carbon sequestration research and storage capacity assessment.

DOI's New Energy Frontier initiative would receive \$100 million (a 35.9 percent increase) for renewable energy programs. The initiative's renewable energy goal is to increase approved generation capacity for solar, wind, and geothermal energy on DOI-managed lands.

Department of the Treasury. Treasury's total FY 2014 request is \$16.1 billion (an 8.4 percent increase). The request includes a total of \$427 million (a 31.8 percent increase) for World Bank Environmental Trust Funds that address climate change and environmental degradation internationally. Specifically, the Global Environmental Facility (GEF) would receive \$144 million (a 60.0 percent increase), the Clean Technology Fund (CTF) would receive \$216 million (a 16.8 percent increase), and Strategic Climate Funds (SCF) would receive \$68 million (a 36.3 percent increase). As in

the FY 2013 request, Treasury would zero out programs under the Tropical Forest Conservation Act (TFCA).

Environmental Protection Agency (EPA). EPA's total FY 2014 request is \$8.2 billion (a 3.5 percent decrease). EPA requests \$126 million (a 5.4 percent increase) for the Science and Technology (S&T) Clean Air and Climate program, which would include a 13.9 percent increase in support for Vehicle and Fuels Standards and Certification and a 40.9 percent reduction in funding for the S&T Climate Protection Program. In addition, S&T Air, Climate, and Energy research would receive \$106 million (a 2.0 percent increase). EPA also requests \$308 million (a 9.2 percent increase) for the Environmental Program and Management Clean Air and Climate, including \$106 million (a 10.6 percent increase) for the Climate Protection Program that includes Energy Star, Methane to Markets, and the Greenhouse Gas Reporting Registry.