

Earth Sciences in the FY 2014 Budget

*Wilson Bonner and Maeve Boland
American Geosciences Institute*

HIGHLIGHTS

- ***Department of Energy (DOE)***: The budget proposes increases for the Office of Science and the Office of Energy Efficiency and Renewable Energy while continuing to decrease support for Fossil Energy R&D.
- ***U.S. Geological Survey (USGS)***: The President has requested a 9.3 percent increase for USGS over FY 2012. The budget would provide increases to most programs and initiatives, and includes \$18.6 million for science-based hydraulic fracturing studies, but it would cut the Mineral Resources Program by approximately 5 percent.
- ***National Science Foundation (NSF)***: The Geosciences Directorate, which now includes the former Office of Polar Programs, would receive a 5.5 percent increase over FY 2012. Beginning in FY 2014, NSF will reorganize the separate seismic and geodetic programs operated by the Incorporated Institutions for Seismology, UNAVCO, and EarthScope into two new facilities.
- ***National Aeronautics and Space Administration (NASA)***: Earth Science would see a 4.9 percent increase over FY 2012 while Planetary Science would see major mission cuts to cover other facilities.

INTRODUCTION

The earth sciences cover a broad range of activities across the R&D spectrum, from fundamental research into the processes of Earth's interior to highly applied, interdisciplinary investigations that address energy resources, water resources, land-use practices, natural hazards, and environmental issues. Although this chapter focuses on earth science programs in four key departments and agencies, earth science activities

can be found in 18 other departments and agencies spanning over 125 separate programs.

Table 1. Budget request for principal agencies and programs supporting Earth Science R&D (budget authority in millions of dollars)

	FY 2012 Enacted	FY 2013* CR*	FY 2014 Budget	Percent FY 12-14
Department of Energy				
Office of Science	4,935	4,903	5,153	4.4%
Basic Energy Sciences	1,645	1,698	1,862	13.2%
<i>Chemical Sciences, Geosci & Energy Biosci</i>	309	349	347	12.4%
Bio and Environmental Research	592	613	625	5.6%
<i>Climate and Env. Sciences</i>	290	316	304	4.9%
Office of Fossil Energy R&D**	337	495	421	24.8%
Coal	359	371	277	-23.0%
Efficiency & Renewable Energy	1,780	1,820	2,776	55.9%
Geothermal	37	38	60	62.3%
Department of the Interior				
U.S. Geological Survey**	1,068	1,075	1,167	9.3%
Natural Hazards	131	131	143	8.7%
Water Resources	210	212	223	6.3%
Energy, Minerals, and Env. Health	96	97	107	11.8%
Climate and Land Use Change	141	142	156	10.3%
Core Science	114	115	137	20.0%
NASA				
Earth Science	1,761	--	1,846	4.9%
National Science Foundation				
Geosciences Directorate	1,321	1,321	1,394	5.5%
Earth Sciences Division	183	184	191	4.2%

Source: Agency budget materials and OMB. All figures rounded to the nearest million, and include non-R&D components. Changes calculated from unrounded figures. Figures are not adjusted for inflation, which is expected to reach 4 percent between 2012 and 2014.

* - Administration estimates do not adjust for final appropriations or sequestration. These numbers are subject to significant revision.

** - Includes \$187 million in rescissions of prior year balances for FY 2012 and \$42 million for FY 2013.

*** - New mission areas listed based on 2010 USGS reorganization.

The President's budget request mostly supports the earth sciences across the Department of Energy, the United States Geological Survey, the National Aeronautics and Space Administration, and the National Science Foundation. The request would continue a cross-agency study on the health, environmental, and safety impacts of hydraulic fracturing in oil and gas development between DOE, USGS, and the Environmental Protection Agency (EPA) that was established last fiscal year.

DEPARTMENT OF ENERGY

Fossil Energy R&D: The budget proposal for the Office of Fossil Energy Research and Development (FE) appears to be an increase over FY 2012 spending levels, but factoring out rescissions of prior year balances, there is actually an 18.1 percent reduction. The President's budget would continue to provide no funding for the Clean Coal Power Initiative (CCPI) or Unconventional Fossil Energy Technologies. CCPI, a cost-shared partnership between the government and industry, would receive no funding because its five remaining demonstration projects were funded in the American Recovery and Reinvestment Act of 2009. Funding for the Carbon Capture program would increase by 67 percent and be used to scale up carbon dioxide capture technologies developed by the Advanced Research Projects Agency-Energy (ARPA-E) and Energy Frontier Research Centers since 2009. All other coal programs, including Carbon Storage and Power Systems, are cut significantly to give an overall reduction of 23 percent. \$25 million is requested to fund through a competitive inducement prize a solicitation to demonstrate the first commercial natural gas combined cycle plant to capture and store 75 percent or more of its carbon dioxide emissions.

Basic Energy Sciences: Earth science research resides within the Chemical Science, Geosciences, and Energy Biosciences Research division of the Office of Basic Energy Sciences, within the Office of Science. This program provides peer-reviewed grants to universities and DOE national laboratories for fundamental earth science research in geochemistry, hydrology, rock mechanics, and geophysics. The FY 2014 request for Basic Energy Sciences includes a 13.2 percent increase. The increase within the Chemical Science, Geosciences, and Energy Biosciences Research Office is primarily intended to fully forward fund some new and renewal Energy Frontier Research Center five-year awards. Geosciences would receive \$21 million.

Biological and Environmental Research: Earth science is a significant part of the Climate and Environmental Sciences division within the Office of Biological and Environmental Research. Under the \$304 million request for Climate and Environmental Sciences, \$72 million would support Environmental Systems Science, \$73 million would fund Climate and Earth System Modeling, and \$122 million would fund Climate and Environmental Facilities and Infrastructure. Environmental System

Science would reduce its emphasis on contaminant mobility and geologic barriers to groundwater contaminant transport while Climate and Earth System Modeling and Atmospheric System Research would continue supporting advanced modeling capabilities.

Geothermal: The Office of Energy Efficiency and Renewable Energy would receive another proposed increase with robust investments in renewable energy resources R&D. Geothermal would receive another large increase of 62.3 percent over the 2012 enacted funding level.

U.S. GEOLOGICAL SURVEY

The President's fiscal year (FY) 2014 budget request for the U.S. Geological Survey is \$1.2 billion. This figure is approximately \$100 million or 9.3 percent above the FY 2012 enacted budget.

The Natural Hazards Mission Directorate would receive an \$11.4 million increase under the President's proposal over FY 2012. An increase of \$1.2 million would fund improved seismic monitoring in the eastern U.S. and \$1.7 million would fund research in induced seismicity, particularly in relation to energy development. Volcano Hazards, Landslide Hazards, Geomagnetism, and the Global Seismographic Network Subactivity would all either stay flat or receive nominal increases above FY 2012. The Coastal and Marine Geology Program would receive a \$6.1 million increase to support the Science for Coastal and Ocean Stewardship initiative and full deployment of LiDAR capability to collect topographic-bathymetric data.

The FY 2014 budget proposal includes \$107.5 million for the Energy, Minerals, and Environmental Health Mission Directorate (+\$11.4 million). The Mineral Resources program would receive \$2.1 million in directed funding to conduct research on rare earth elements and other critical minerals such as tellurium, lithium, and the platinum group elements, but other cuts result in an overall reduction of \$2.4 million to the program. Energy Resources would receive \$31 million (+\$3.4 million) to support resource estimates and research, including \$5.9 million to support hydraulic fracturing research.

The Core Science Systems Mission Directorate would receive \$137.2 million (+\$22.9 million). The National Cooperative Geologic Mapping Program would receive \$28.3 million, including increases of \$2 million to

support research on the geological parameters of unconventional oil and gas basins under current or near-term development and \$0.2 million to provide 3D subsurface geologic frameworks of glacially-derived deposits in the northern U.S. The National Geospatial Program would see a \$9.8 million increase over its FY 2012 enacted level of \$63 million. Most of this increase would support the 3-D Elevation Project (3DEP) initiative, though roughly \$1 million is proposed to update topographic maps and geospatial data for Alaska.

The Water Resource Program would receive \$222.9 million, a \$13.3 million increase over FY 2012 enacted levels. The program would grant increases to the Groundwater Resources Program (+\$4 million), the National Water Quality Assessment (+\$0.5 million), the National Streamflow Information Program (+\$7.3 million), Hydrologic Research and Development (+\$5 million), Hydrologic Networks and Analysis (+\$1.7 million), and the Cooperative Water Program (+\$0.4 million). The increase to the National Streamflow Information Program is intended to retain streamgages that would otherwise be discontinued due to anticipated reductions in partner funding. A cut of \$5.5 million to the Water Resources Research Act Program would eliminate annual base grants to State Water Research Institutes at land grant universities.

Within the Climate and Land Use Change Mission Directorate, the President's budget would provide continued support for the Department of the Interior Climate Science Centers, Climate Research and Development, and Carbon Sequestration. Land Remote Sensing would receive a \$1.4 million decrease following the most recent Landsat satellite, Landsat 8, launch in February 2013.

NATIONAL AERONAUTICS & SPACE ADMINISTRATION

NASA's Science Mission Directorate, which includes Earth Science, Planetary Science, Astrophysics and Heliophysics, would receive \$5 billion in the FY 2014 request. An increase of \$80.4 million is requested for the Earth Science Division (ESD). The majority of the increases in ESD are for the Earth System Science Pathfinder program.

While the president's budget request for FY 2013 would have decreased many of the programs within ESD, the request for FY 2014 increases every program except for Earth Systematic Missions (ESM, -\$92.4 million)

and Applied Sciences (-\$1.4 million). The relatively large decrease requested for ESM is because the Surface Water Ocean Topography, Gravity Recovery and Climate Experiment Follow-On (GRACE-FO) mission, and the Stratospheric Aerosol and Gas Experiment III (SAGE III) missions are now funded under a separate budget line. Increases for the Earth Science Research program would support the Carbon Monitoring System and 200 new 3-year Research Opportunities in Space and Earth Science investigations. Work will continue on the development of the Soil Moisture Active Passive mission (SMAP), and the Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2).

The proposal would increase the Earth System Science Pathfinder (ESSP) program by \$107.3 million, which includes a near-quadrupling of the Venture Class Missions, a series of low-cost, competitively-selected Earth observing systems. The ESSP program funds the Carbon Observatory 2 (OCO-2) mission to collect space-based measurements of atmospheric carbon dioxide. OCO-2 was scheduled to launch in 2013 on a Taurus XL carrier rocket. NASA delayed the launch date, however, after the failed launch of the Glory mission due to a malfunction in the rocket. NASA has now entered into a contract with United Launch Alliance to use a Delta II launch vehicle for OCO-2, with an expected launch date of February 2015.

NATIONAL SCIENCE FOUNDATION

In FY 2013, the National Science Foundation (NSF) restructured some programs and added the former Office of Polar Programs (OPP) into the Geosciences Directorate (GEO). Accounting for this change, GEO would still receive a \$73 million increase over combined FY 2012 levels for the former OPP and GEO. Ongoing and emerging priorities within GEO include the Science, Engineering, and Education for Sustainability (SEES) initiative, Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21), and NSF's Innovation Corps (I-Corps). GEO is the principal source of federal funding for university-based research in the geosciences.

Earth Sciences would receive an increase of \$7.7 million over FY 2012 levels, for a total budget of \$191.2 million. Increases in research funding would mean modest cuts to facilities across the agency. Beginning in FY 2014, NSF will integrate the separate seismic and geodetic facilities

EARTH SCIENCES IN THE FY 2014 BUDGET

operated by the Incorporated Research Institutions for Seismology (IRIS), UNAVCO, and EarthScope into two new facilities, still to be operated by IRIS and UNAVCO. Seismological Facilities for the Advancement of Geosciences and EarthScope (SAGE) will be operated by IRIS and would receive \$25.7 million. Geodetic Facilities for the Advancement of Geoscience and EarthScope (GAGE) will be operated by UNAVCO and would receive \$12.7 million.