Geologic Hazards, Resources, and Processes

Subactivity	1999 Estimate	Uncontrol. & Related Chgs	Program	Program Changes	FY 2000 Budget Request	Change from 1999
Geologic Hazard Assessments	76,369	1,581	-10,890	1,750	68,810	-7,559
Geologic Landscape & Coastal Assessments	74,091	1,616	-13,606	-1,400	60,701	-13,390
Geologic Resource Assessments	88,690	2,187	-15,771	-6,000	69,106	-19,584
Total Requirements $000	239,150	5,384	-40,267	-5,650	198,617	-40,533

Note: The Program Redirect column reflects the redirection of funds to the Integrated Science, Science Support, and Facilities activities.

Activity Summary

Introduction

Through its programs within the Geologic Hazards, Resources, and Processes Activity, the USGS identifies and helps meet the earth science information needs of a wide variety of Federal, State, and local agencies, and the private sector. This information is used to evaluate resource potential, to define risks associated with natural hazards, and to characterize the potential impact of natural geologic processes on human activity, the economy, and the environment.

Hazards — These programs are designed to produce information and understanding that will lead to a reduced impact of natural hazards and disasters on human life and the economy. The United States is subject to a variety of natural hazards of geologic origin (earthquakes, volcanic eruptions, landslides, coastal storms, and erosions) that present grave threats to people and property. The occurrence and reoccurrence of these hazardous events are inevitable and uncontrollable. However, the extent of damage and loss of life can be reduced through pre-event planning, social and economic adaptations, provision of real-time warning capabilities, and more effective post-event emergency response. Central to the successful design and pursuit of loss mitigation strategies is the availability of accurate, scientifically based assessments that define, on a geographic basis, the nature and degree of risk. The more precisely that risks can be defined, the greater the likelihood that appropriate mitigation strategies will be adopted (e.g., building codes for new construction and retrofitting; insurance systems, land use plans; design and location/routing of critical infrastructure such as highways, bridges, subways, water, sewer, gas, electric, and petroleum distribution networks). USGS geologic hazards programs conduct basic and applied research, gather data, operate monitoring networks, perform assessments, and disseminate findings to the public all for the purpose of advancing capabilities to better define risk and encouraging appropriate societal response to these risks.

Resources — These programs assess the availability and quality of the Nation's mineral and energy resources to include the economic and environmental effects of resource extraction and use. The availability and cost (both economic and environmental) of energy and mineral resources, their extraction and use, are limiting factors to human development. Throughout its history, our Nation has faced important, and often highly controversial, decisions regarding the use of Federal lands, environmental management, and the supply of energy and mineral resources to sustain development and enable growth. Federal land management agencies are required to develop plans that reconcile competing demands for resource development with other human activities, while recognizing environmental values and providing for the sustainability of resources and natural environments.

Providing unbiased, scientifically valid assessments of the potential energy and mineral endowment of the United States, and the environmental consequences of developing these resources, are core functions of the USGS that date to the agency's creation in 1879. Historically, heavy emphasis within the USGS energy and mineral resource programs was given to fundamental research on ore genesis and the formation of mineral and energy deposits. The USGS energy and mineral resource programs have evolved significantly in recent years such that emphasis is now focused on: (a) developing and applying improved methods for oil, gas, coal, and mineral assessments, through use of advanced computer modeling, (b) routinely gathering resource quality information to companion availability data to enable assessment of environmental considerations by public and private entities involved in energy and mineral resource extraction and use, (c) gathering and disseminating census-style information on the development and use of mineral resources, and to a lesser extent energy resources, both domestically and internationally for use by other government agencies and the private sector.

Geologic Processes and Systems — These programs are designed to distinguish the effects of human activities from natural changes that are part of the dynamic processes operating at or near the earth's surface to enable more effective and efficient resource and environmental management decisions. Society needs to develop usable knowledge of the Earth's natural processes and cycles; their rates, frequencies, magnitudes, and how they affect each other. Armed with such knowledge, we can respond better to both natural and human-induced changes. Natural hazards are less costly if their likely effects can be mapped and quantified. Resources can be more efficiently used if the impacts of their extraction can be anticipated. Damaged or endangered ecosystems can be repaired more effectively if the natural processes that form and maintain them are accounted for in remediation plans. Strategies for conserving and using the Nation's lands and resources are improved when the natural processes at work are recognized as well as the costs of working against them.

FY 2000 Program Highlights

	($000) Program Change
Real-Time Hazards	+2,000
Comm/Fed. Info Partnership	+1,500
Coral Reefs	+ 600
Mineral Resources	-5,000
Coastal & Marine Geology	-3,500
Energy Resources	-1,000
Volcano Hazards	- 250

The FY 2000 Budget Request for the Geologic Hazards, Resources and Processes Activity includes four program increases totaling $4.1 million and four program reductions totaling $9.75 million. Program increases are proposed for the Earthquake and Geomagnetism Hazard Programs, within Coastal and Marine Geology Program in support of coral reef studies, and within the National Cooperative Geologic Mapping Program. Program reductions are proposed for the Mineral Resources Program ($5.0 million), Coastal and Marine Geology Program ($3.5 million), Energy Resources Program ($1.0 million), and Volcano Hazards Program ($250,000).

Real-Time Hazards (+$2.0 million)

- Earthquake Hazards Program (+$1.6 million) — Emergency managers, managers of transportation and utility networks, providers of public services and the public in general need earthquake hazard information quickly in order to respond promptly and effectively to the emergency. In a Los Angeles area pilot project, the USGS has demonstrated that, with suitable equipment and data processing, maps showing the level and distribution of shaking can be produced automatically within minutes of an earthquake. The proposed increase would be used to purchase and install some 80 modern seismographs to initiate similar pilot projects in San Francisco (40 stations), Seattle (20 stations) and Salt Lake City (20 stations).

- Geomagnetism Program (+$0.4 million) — The demand for current, reliable information on short-term changes in the magnetic field to avoid disruptions in navigation, communication, and operation of the nations power grids and satellite networks has outpaced the capability of the current USGS operated geomagnetic network. Under this increase, faster computers at the data management center and more rapid data transmission capability from observatories will be added to improve the reliability and speed of processing and delivery of geomagnetic data.

Community/Federal Information Partnership (+$1.5 million) — National Cooperative Geologic Mapping Program; This increase will expand the development of the Internet-based National Geologic Map Database and the production of National Spatial Data Infrastructure-compliant digital geologic map data that meet community needs to address hazards, resources, and environmental issues, in partnership with State geological surveys and universities. The intent of the USGS is to provide half of the requested funds for this activity to the matching-funds grants components of the program (STATEMAP and EDMAP) and half to the Federal mapping component (FEDMAP). The total USGS effort of $10.0 million is discussed in the General Statement.

Coral Reef (+$0.6 million) — Coastal and Marine Geology; This $600,000 increase will enable modest expansion of coral reef studies to gather geologic information on the extent and

character of reef ecosystems nationwide. These studies will be used to map coral reefs and define the natural processes related to reef health and growth and the effects of man's activities and natural processes causing the wide spread decline in reef health.

Mineral Resources (-$5.0 million) — A $2.0 million funding reduction for the minerals information project in Alaska is being proposed in order to fund higher priority needs. Over the past two years, the USGS has worked with stakeholders to complete several activities to improve the quality and accessibility of minerals information in Alaska. A $3.0 million reduction is proposed in lower priority activities as either phases or study components are being completed in the following areas: gold deposits in Nevada; investigations of industrial minerals along the Colorado Front Range; and work in support of EPA remedial studies in the Couer d'Alene Basin.

Coastal and Marine Geology (-$3.5 million) — This reduction is being proposed to fund higher priorities requested elsewhere in the budget. As phases and investigations are completed in lower priority activities, no further work will be conducted.

Energy Resources (-$1.0 million) — A reduction of $1.0 million is proposed as 110 Coal Availability Studies, about 50 follow-on Coal Recoverability Studies, and 2 regional extrapolation studies will be completed.

Volcano Hazards (-$0.25 million) — The proposed reduction of $250,000 will terminate a cooperative agreement with the University of Hawaii to support monitoring and research activities of the Hawaiian Volcano Observatory.

Federal Role

The Federal role in conducting science to understand geologic hazards, resources, and processes derives from the U.S. Government's responsibilities to protect the lives and property of its citizens, to support continued economic growth and competitiveness, and to assist society in anticipating and coping with the enormous forces of nature that shape and control the landscape.

Natural hazards such as earthquakes, volcanoes, and landslides have significant social and economic impact on our Nation. Annually, as many as 10 potentially damaging earthquakes strike the conterminous United States and more than 5,000 shocks large enough to be felt occur throughout the entire country. The United States has 65 active and potentially active volcanoes, more than all other countries except for Indonesia and Japan. During the 20th century, volcanic eruptions in Washington, California, Alaska, and Hawaii devastated thousands of square miles and caused substantial economic and societal disruption and, in the worst instances, loss of life. Notably, volcanic ash poses a unique threat to air traffic. Landslides, which cause about $1-2 billion in damages and more than 25 fatalities each year, pose serious threats to transportation and housing as well as infrastructure that supports fisheries, tourism, timber harvesting, mining, and energy production.

The USGS geologic hazards programs contribute to the reduction of human and economic losses and disruptions associated with these natural hazards by (1) defining, assessing, and

monitoring potential earthquake, volcano, and landslide hazards as the basis for loss-reduction strategies and actions by government and the private sector; (2) providing analyses and real-time information and warnings for improved disaster response, for reducing losses from future disasters, and for enhanced public awareness of these natural hazards; and (3) expanding the fundamental knowledge of earthquake, volcano, and landslide generation, effects, and geologic processes for more effective risk-mitigation and disaster-response strategies.

Minerals and mineral products account for about $400 billion of the Nation's gross domestic product. The expanding need for minerals in the United States and the world demands research in new techniques and concepts to assess the Nation’s mineral wealth and provide accurate mineral resource information for national policy. At the same time, Federal and State agencies and industry are concerned with the environmental consequences of past and current mineral extraction activities. The ability to make informed decisions about these issues depends on having current, accurate scientific information on known and potential resources and on environmental and economic implications of their development.

The Nation faces the challenge of simultaneously addressing an expanding appetite for energy, a growing dependence on imported oil, and an increasing demand that energy resource extraction and use be environmentally benign. The USGS addresses this challenge by generating and providing energy information essential for shaping policies regarding domestic and foreign energy resources, for making wise decisions regarding Federal land use, and for maintaining a healthy domestic energy industry increasingly composed of smaller companies. Knowledge of the national and world endowment of oil, natural gas, and coal is of fundamental importance to informed decisionmaking regarding the security and economic welfare of the United States.

Every year greater proportions of the landscape are built upon and paved; large amounts of carbon dioxide, sulfur dioxide, methane, and nitrous oxides are released to the atmosphere; marginal lands are stressed by agricultural practices encouraging the spread of deserts; and prodigious quantities of wastes are buried just beneath the Earth's surface. Human activities such as these can be directed toward working with natural processes to the extent possible (at acceptable cost to society) and away from activities in conflict with natural processes (which incur maximum costs). A comprehensive understanding of the dynamism of the Earth's surface is essential if the Nation is to enjoy, rather than endure, life through the next century.

Customers and Partnerships

Hazards — The USGS cooperates and coordinates closely with local, State, and other Federal agencies and the university community to determine and provide for their needs for earth science information critical for developing mitigation strategies. For example, the USGS is an important partner of the National Earthquake Hazards Reduction Program, cooperating closely with the Federal Emergency Management Agency (FEMA), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST). The USGS also monitors about 25 U.S. volcanoes posing the greatest risk and provides information on potential eruptions to Federal, State, and local emergency agencies. For example, the USGS cooperates with the National Weather Service and the Federal Aviation Administration who

provide warnings to the airline industry and aircraft on hazards due to volcanic ash from explosive eruptions. Through these and other cooperative arrangements, the USGS helps assure that the needs for risk assessments of hazards are met.

Resources — The Federal Government manages about one-third of the Nation's land area. It also manages the Exclusive Economic Zone, which extends 200 nautical miles from the Nation's coasts and encompasses an area that exceeds the Nation's land area. The USGS is the primary provider of earth science mineral and energy resource information and assessments for Federal agencies such as the Bureau of Land Management (BLM) and the U.S. Forest Service who are responsible for managing these areas. The USGS also works closely with the Department of Energy (DOE) in implementation of the National Energy Strategy. The USGS cooperates with many local and State agencies and coal and electric power producers to assess the availability and quality of coals resources. Every five years, the USGS publishes an assessment of the Nation's oil and natural gas resources. The assessment is used by land managers, energy producers, utility managers, and policymakers, among others. The USGS cooperatives with State geological surveys in conducting coal availability and coal quality studies. Regional consortia are being developed between USGS and the State geological surveys, electric utilities, coal producers, and with the Electric Power Research Institute to assess coal quantity and quality in several coal-producing basins. Finally, the USGS cooperates with hundreds of domestic and international producers and users of mineral commodities to compile reports on the supply and utilization of these resources for purposes of economic development and national security.

Geologic Processes and Systems — The USGS coordinates with a large number of local, State, and Federal agencies on a wide range of geologic, coastal, and marine studies. For example, the USGS cooperates and coordinates with Federal land management agencies, including the BLM, U.S. Forest Service, National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), Bureau of Indian Affairs (BIA) and others to provide basic geologic and interpretive information tailored to their issues. On environmental issues, the USGS coordinates with the U.S. Environmental Protection Agency (EPA), the Department of Energy (DOE), the Department of Defense (DOD), and State and local environmental agencies to assist in characterizing sites and providing needed information on the nature, magnitude, and source of contamination problems. In the coastal environment, the USGS cooperates closely with the National Marine Fisheries Service, and the Sanctuaries and Reserves Division of the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Army Corps of Engineers to provide the marine and coastal geologic information necessary for developing management plans. Locally, the USGS coordinates with State geological surveys and other State agencies, communities, and universities. The objectives of the close cooperation and coordination are to: (1) assure that the USGS is addressing priority issues and that the information is prepared and presented in a form that is readily usable, and (2) assure that the appropriate mix of scientific expertise, including personnel for State and local agencies and universities as necessary, is addressing identified problems.

Government Performance and Results Act

Performance Targets — The following table represents the performance elements contributed by this budget activity to the two GPRA Program Activities provided in aggregate in Exhibit A of the Performance Plan. Technical funding adjustments in FY 2000 were crosswalked to FY 1999 to establish base performance targets for the new Integrated Science budget activity and to normalize performance changes for the Environment and Natural Resources GPRA Program Activity. Linkages of budget and performance are further discussed in the FY 2000 Annual Performance Plan.

GPRA Program Activity	**Hazards**				
Goal Code	01.01.01. 01.00	01.01.01. 02.00	01.01.01. 03.00	01.01.01. 04.00	01.01.01. 05.00
Performance Measure	Monitoring Networks maintained	Risk Assess-ments delivered	Real-time Streamgages (cum) (rate 100/yr)	Real-time Earth-quake Sensors (cum.) (rate 20/yr)	Stake-holder Meetings
Bureau FY 98 Baseline	6	16	4,571	100	16
Bureau FY 99 Annual Target	6	14	4,671	120	16
Geo. Hazards, Res., & Proc.	4	9	0	120	8
Bureau FY 00 Annual Target	6	12	4,921	200	27
Geo. Hazards, Res., & Proc.	4	7	0	200	7

GPRA Program Activity	**Environment & Natural Resources**				
Goal Code	02.01.01. 01.00	02.01.01. 02.00	02.01.01. 03.00	02.01.01. 04.00	02.01.01. 05.00
Performance Measure	Long-term data collection & mngmnt efforts maintained & improved & large data infrastructures supported	New system-atic analyses & investiga-tions delivered	Decision support systems or predictive models developed or improved & delivered to customers	University-based partner-ships for natural systems analysis	Stake-holder Meetings
Bureau FY 98 Baseline	40	865	5	270	212
Bureau FY 99 Annual Target	40	843	6	272	228
Geo. Hazards, Res., & Proc. (current structure)	18	23	1	0	22
Geologic Hazards, Res., & Proc. (FY 2000 structure)	17	22	1	0	21
Bureau FY 00 Annual Target	36	875	7	272	241
Geologic Hazards, Resources, & Processes	13	22	1	0	22