



Photo by Benjamin R. Edwards via National Science Foundation

**Position Summary.** Strong and growing public investments in Earth-science research promote the general welfare of all citizens; ensure the health, vitality, and security of society; and provide sound stewardship of Earth. Investments are needed from all levels of government to address such issues as energy and mineral resources, water resources, climate change, and natural hazards. Public funding for Earth-science research forms the basis for training and educating the next generation of Earth-science professionals.

This position statement (1) summarizes consensus views of GSA regarding public investment in Earth-science research; (2) improves public and political awareness and understanding of how investment in Earth-science research benefits society and leads to greater well-being of the Earth and its inhabitants; and (3) provides recommendations for implementation of a strategy that strengthens the commitment to public investment in Earth-science research by GSA and its members.

## CONCLUSIONS AND RECOMMENDATIONS

- **GSA supports strong and growing public investments by all levels of government in Earth-science research and education.** Current public investments in Earth-science research and education are not sufficient. Increased funding is needed to meet the significant challenges posed by human interactions with Earth's natural systems, to ensure national security and economic vitality, to protect the Earth and its resources, and to sustain an overall high quality of life for Earth's inhabitants.
- **Earth-science research and education should be a component of broader initiatives to increase overall public investments in science and technology.** Public investment in long-term basic and applied research is critical, and key federal science agencies play a leadership role in Earth-science research and education. Decision makers at all levels of government should be aware of the significance of Earth-science data and expertise for informed policy initiatives.

## RATIONALE

Science and technology are engines of economic prosperity, environmental quality, and national security. Public investment in research pays substantial dividends. According to a report by the National Academies of Sciences, Engineering, and Medicine, "... the economic value of investing in science and technology has been thoroughly investigated. Published estimates of return on investment (ROI) for publicly funded R&D range from 20 to 67%" (*Rising Above the Gathering Storm*, National Academies Press, 2007).

The Earth sciences are critical components of the overall science and technology enterprise and require substantial increases in public funding to ensure the health, vitality, and security of society and for Earth stewardship. Earth-science research provides knowledge and data essential for developing policies, legislation, and regulations regarding land, energy, mineral, and water resources at all levels of government. Growing investments in Earth-science research will stimulate innovations that fuel the economy, provide security, and enhance the quality of life. These investments are necessary to address such issues as natural and anthropogenic hazards; climate change and its associated impacts; and water, energy and mineral resources, especially as they relate to the responsible development and maintenance of human infrastructures and stewardship of the environment.

- Natural hazards, such as earthquakes, tsunamis, volcanic eruptions, landslides, hurricanes, wildfires, and floods remain a major cause of fatalities and economic losses worldwide. An improved scientific understanding of geologic hazards will reduce future losses through better forecasts of their occurrence and magnitude so as to mitigate risk.
- Forecasting the outcomes of human interactions with Earth’s natural systems, including climate change and anthropogenic hazards, is limited by an incomplete understanding of geologic and environmental processes. Improved understanding of these processes in Earth’s history increases confidence in the ability to predict future states and enhance the prospects for mitigating or reversing adverse impacts to the planet and its inhabitants.
- Energy and mineral resources are critical to society, economic development, and national security. These resources are often costly and difficult to find, and new generations of geoscientists need the tools and expertise to discover them and develop next-generation energy systems. Management of their extraction, use, and residue requires a scientific approach that will maximize the derived benefits and minimize the negative effects.
- The availability, quantity, and quality of surface water and groundwater are vital to the well-being of both society and ecosystems. Greater scientific understanding of these critical resources—and communication of new insights by geoscientists in formats useful to decision makers—is necessary to ensure adequate water resources for the future.
- The increasing global population requires a sustainable infrastructure and environment in which to thrive. The design and engineering of future civil construction, such as roads, bridges, power plants, utilities, and waste management facilities necessitates a greater scientific understanding of the geology and underlying processes. This is especially relevant in regions prone to natural hazards. An improved understanding of the dynamics of terrestrial forces will enhance the security, reliability, and effectiveness of critical infrastructure as well as mitigate potential environmental liabilities.

Research in Earth science is fundamental to training and educating the next generations of Earth-science professionals. GSA recognizes the need to actively support policies and investments that strengthen Earth-science research; foster research partnerships among universities, government agencies, and industry; and provide support for the education of the next generations of geoscientists.

Public investment in Earth-science research and education should come from national, state, and local government sources and support mission-driven government agencies as well as academic research. The need for this investment comes at a time of reduced funding for Earth-science research by many private companies and government agencies, while many programs supporting Earth-science endeavors have been reduced or eliminated. Simultaneously, funding to federal agencies with strong programs in Earth sciences has remained level or decreased when adjusted for inflation over the past two decades. Policy makers need to be aware of the importance of Earth-science research to the future of our nation, states, municipalities, and industry. Increased investments in Earth-science research and education will help meet future challenges faced by the Earth and its inhabitants.

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## ABOUT THE GEOLOGICAL SOCIETY OF AMERICA

The Geological Society of America (<https://www.geosociety.org>) is a scientific society with members from academia, government, and industry in more than 100 countries. Through its meetings, publications, and programs, GSA enhances the professional growth of its members and promotes the geosciences in the service of humankind. GSA encourages cooperative research among earth, life, planetary, and social scientists, fosters public dialogue on geoscience issues, and supports all levels of earth science education. Inquiries about GSA or this position statement should be directed to GSA’s Director for Geoscience Policy, Kasey S. White, at +1-202-669-0466 or [kwhite@geosociety.org](mailto:kwhite@geosociety.org).

## OPPORTUNITIES FOR GSA AND ITS MEMBERS TO HELP IMPLEMENT RECOMMENDATIONS

To facilitate implementation of the goals of this position statement, GSA recommends the following actions:

- **GSA members should seek opportunities to effectively communicate the value of Earth-science research and education to society.** More than ever, the value of Earth-science research and education should be made clear to national, state, and local governments, community groups, local decision makers, and the general public. We should also seek opportunities to link Earth-science research and education funding with compatible public funding initiatives at various levels of government. Local examples of how Earth science has contributed vital information to water, energy, environmental, or infrastructure projects are essential to this effort. We should make clear the ways additional Earth-science information might prevent or lessen the effect of a costly, adverse land-use activity or reduce the otherwise devastating consequences of a natural disaster.
- **GSA members should participate in professional forums and town hall meetings and speak at gatherings, such as community service organizations, library lecture series, and at local nature centers on the range of issues associated with increasing public investment in Earth-science research and education.** Our discussions should emphasize the societal returns on public investments in Earth-science research and education and enable GSA members to be better-informed advocates for public funding of these priorities. GSA members who have experience with policy makers and policy decision making at various levels of government should lead discussions, encourage participation, and offer advice on best-practice communication skills.
- **GSA should provide members with readily accessible information that supports geoscientists' communications with decision makers regarding the value of public investment in Earth-science research and education.** Considerable expertise and resources are available to members through GSA's Geology and Public Policy Committee, GSA's Geology and Society Division, and GSA's Director for Geoscience Policy in Washington, D.C.
- **GSA and its members should actively seek opportunities for partnerships among universities, government and industry to train Earth scientists,** especially in the form of joint workshops, industry grants and contracts, donations, and on-site training programs, among other efforts.

## REFERENCES

1. National Academies of Sciences, Engineering, and Medicine. Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future, <https://doi.org/10.17226/11463> (The National Academies Press, 2007).