THE GEOLOGICAL SOCIETY OF AMERICA®

GSA Position Statement

ROLE OF GOVERNMENT IN MINERAL AND ENERGY RESOURCES RESEARCH

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Position Summary. **Sound scientific knowledge should guide decision making about the exploration, development, and stewardship of finite energy and mineral resources. Sustaining and enhancing that knowledge requires continued public investment in energy and mineral resource research, education, and stewardship.**

This position statement recognizes the essential role of government in conducting and supporting research that contributes to (1) developing secure mineral and energy supplies for a resilient society; (2) developing strategies to ensure the continued availability of mineral and energy resources through renewable energy, recycling, and resource substitution; (3) promoting evidence-based mineral and energy policies through assessments of mineral and energy resources including the environmental impacts from their extraction and use; and (4) enhancing public awareness of mineral and energy resource issues.

CONCLUSIONS AND RECOMMENDATIONS

GSA recommends increased public investments and public-private partnerships to improve our understanding of mineral and energy resources and to support programs for renewable energy resources, energy efficiency, and mineral resource recycling.

- **Public investments**—Continued funding by federal and state governments to science-mission agencies and academic institutions is essential to (1) advancing knowledge of energy and mineral deposit-forming processes; (2) improving exploration for new resources to replace depleted ones; (3) identifying new mineral resources for evolving technology and societal needs; (4) evaluating global biogeochemical and biodiversity impacts of resource material extraction, use, recycling, disposal, and dispersal; and (5) designing advanced technologies to increase the efficiency and reduce the risks of locating and extracting resources, and mitigating environmental impacts of resource extraction and use.
- **Resource Assessments**—Federal, tribal, state, and provincial governments should support non-proprietary mineral and energy resource assessments and related land management needs; collection and preservation of physical samples and related geochemical and geophysical data; and development of new knowledge about possible future resources by federal, state, and provincial surveys. Geoscientists and decision makers should evaluate existing and prospective mineral and energy resources from both “full-lifecycle” and “full-systems” perspectives considering all economic, environmental, and social impacts of their development and use.
- **Enhanced partnerships**—Government, industry, private foundation, and academic partnerships, including federal, state/provincial, and international collaborations, are encouraged in order to foster new technology developments and enhance understanding of the formation of the range of global deposits and commodity substitutes.
- **Education**—Government-supported mineral- and energy-resource education programs are essential to generating new knowledge. These endeavors also educate the general public and prepare the future Earth and environmental scientific and engineering workforce.
- **Renewables and resource recycling**—Governments, in partnership with other stakeholders (e.g., industry, private foundations), should provide funding and economic incentives to increase the use of renewable energy resources, improve

energy efficiency, increase mineral resource recycling, and identify recoverable resources from extraction and utilization waste.

RATIONALE

Economic prosperity, societal well-being, and national security require a safe and reliable supply of energy and mineral resources. Currently, global production of most non-renewable energy and mineral resources (including oil, coal, natural gas, and critical minerals required for renewable energy technologies) is at or near all-time highs. With a growing population, accelerating industrialization, and improving standards of living in many parts of the world, global demand for energy and mineral resources will increase in the future. However, the International Energy Agency (IEA) projects that global demand for oil, coal, and natural gas will begin decreasing by 2030 [1], while the total demand in critical minerals required for clean energy technologies will need to be four to six times greater than 2020 demand by the year 2040 to meet the 2015 International Paris Agreement goal of stabilizing global warming below 2°C of pre-industrial levels [2]. Demand for critical minerals used in electric vehicle batteries (particularly lithium, graphite, cobalt, and nickel) may need to increase by 20 to 40 times their 2020 levels to reach the Paris Agreement goal [2]. Moreover, in recent years, the U.S. and international governments have invested in the research and production of non-traditional geologic energy resources including geothermal heat and geological hydrogen gas [3-5]. Thus, the U.S. government and its international partners will need to provide robust investments and enact sound policies governing the exploration, development, and stewardship of finite energy resources.

Historically, the government's role in identifying and assessing energy and mineral resources has been crucial. For example, the U.S. Geological Survey (USGS, within the Department of the Interior [DOI]) was founded by Congress in 1879 for the "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain." [6] Besides mapping and fundamental resource research, the USGS publishes public assessments of undiscovered onshore mineral and fossil fuel resources, while the Bureau of Ocean Energy Management (DOI) completes offshore assessments. Now, other agencies in DOI plus Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Labor, and the Environmental Protection Agency also have programs that address aspects of resource evaluation; the lifecycles of energy/mineral products from mining through processing, use, and disposal; and surface and subsurface land-use issues at extraction sites. Additionally, state/provincial geologic surveys and environmental agencies are important archives of detailed regional current and historic data, including physical samples, that support ongoing research in the public interest. All these government agencies possess the broad perspectives for sound holistic evaluation of potential costs, benefits, and consequences associated with the extraction and use of mineral and energy resources that are required to develop sound public policies.

Energy and mineral resource programs of government agencies require constant reevaluation with the evolving material needs of society. Resource challenges associated with changing and advancing 21st-century technology needs and substitution of renewable and alternative energy resources require an expanding suite of minerals and chemical elements complicated by the irregular global distribution of vital mineral and energy resources, associated international trade and market economics, and supply chain disruptions. [7-9] To respond to these challenges, the U.S. federal government has enacted and enforced several major laws: the Energy Act of 2020 (Division Z of P.L. 116-260), the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), and the Inflation Reduction Act of 2022 (IRA; P.L. 117-169). [10-12] The Energy Act of 2020 mandated the publication of a critical minerals list by the USGS that is updated at least every 3 years, required the USGS Mineral Resource Program (MRP) to conduct a national assessment of every critical mineral resource, and requires the MRP to publish the Annual Critical Minerals Outlook [10]. The IIJA provided over $500 million in supplemental appropriations to the USGS for Fiscal Years (FY) 2022 - 2026 for the USGS Earth Mapping Resource Initiative (Earth MRI), a partnership between the USGS, State Geological Surveys, and industry to map, survey, and better understand the distribution and resource potential of critical minerals across the United States [11, 13]. Additionally, the IRA provided over $23 million in supplemental appropriations in FY22 for the USGS 3D Elevation Program, supporting the acquisition of lidar data that will further inform national energy and mineral resource assessments [12, 14].

To support ongoing energy and mineral resource development, extraction, and stewardship efforts, qualified geoscientists and engineering geologists from government, academia, and industry must continue providing a sound scientific foundation for effective mineral and energy resource decision making. Expert knowledge on location and extent of present and possible future resources, geological processes that formed and concentrated them, and the technological needs and environmental effects of their extraction and use at local, regional, and global scales is essential for informed discussions about:

- Resource exploration and production; climate and environmental consequences (land, water, atmosphere); reclamation;
- Applied and fundamental research, resource assessment, and analysis of future supply and demand;
- Identification of alternative and renewable supplies; recovery and recycling of materials from utilization waste products; [15]
- Regulatory compliance and waste disposal throughout the lifecycles of energy and mineral products; and
- Management and stewardship of public and private lands, including post-production reclamation and monitoring.

Qualified geoscientists are necessary for federal, tribal, state, and provincial governmental agencies to fulfill their missions as stewards of the land and its natural resources. In addition, private industry needs scientists for informed and responsible exploration, production, and remediation. Government scientific funding agencies, such as the U.S. National Science Foundation, support scientist training and university science education through research grants and student fellowships, while state-government-supported university budgets fund geoscience and other science programs. Importantly, pre-university education grants support Earth-science education in schools and science centers, and are essential in order to develop a broad consumer/citizen appreciation of relevant geologic issues and support for sound public policy.

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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 and External Relations, Emily Orzechowski, at +1-303-357-1093 or eorzechowski@geosociety.org.

Opportunities for GSA and its Members to Help Implement Recommendations

To facilitate implementation of the goals of this Position Statement, the Geological Society of America recommends that its members:

- Actively discuss with decision makers the role of government in mineral and energy resources research. To improve the technical basis for decision-making, geoscientists should clearly discuss: (1) the abundance, accessibility and geographic distribution of energy and mineral resources; (2) the value of the geosciences in stewardship of public lands; and (3) potential long-term benefits and consequences—including environmental and related consequences—of resource development.
- 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 mineral and energy resources. We should emphasize the critical use of geologic information regarding finite energy and mineral resources and the need for additional public investment to improve understanding of mineral and energy resources research, stewardship, and education.
- Participate in public education at the local level, in order to foster interaction among local, state, and federal governments; educational and research institutions; energy developers and industry; and the public. We should seek to better inform the public and to increase grassroots support for funding for geologic information about energy and mineral resource issues.

The Geological Society of America can

- Provide members with print, Web, and personnel resources to facilitate communication with decision makers regarding the role of government in mineral and energy resources. GSA's Geology and Public Policy Committee, Geology and Society Division, and Public Policy Office in Washington, D.C., have considerable expertise for providing such assistance.
- Raise awareness of the role of geology and government in mineral and energy resources by publishing articles and conducting symposia, technical sessions, and workshops at annual and sectional meetings on these subjects.

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