



FACING TOMORROW'S CHALLENGES: USGS SCIENCE IN THE DECADE 2007–2017

Energy and Minerals for America's Future

In 2007, the U.S. Geological Survey (USGS) developed a science strategy outlining the major natural science issues facing the Nation in the next decade. The science strategy consists of six science directions of critical importance, focusing on areas where natural science can make a substantial contribution to the well-being of the Nation and the world. This fact sheet focuses on energy and minerals and how USGS research can strengthen the Nation with information needed to meet the challenges of the 21st century.

understand the “life cycle” of energy and mineral resources—from their occurrence and formation processes, to extraction methods, use, and waste products. The Nation will have to plan for evolving and unanticipated future energy and mineral requirements within the broader environmental perspective of sustainability.

Importance of Energy and Minerals to the Nation

Reliable, accessible, and adequate supplies of energy and mineral resources are essential to sustain the American economy and standard of living. The Nation faces increasing demand for energy and mineral resources, a growing dependence on resources imported from other countries, increasing pressure to consider alternative energy sources, and a need to minimize environmental effects associated with use and development of resources.

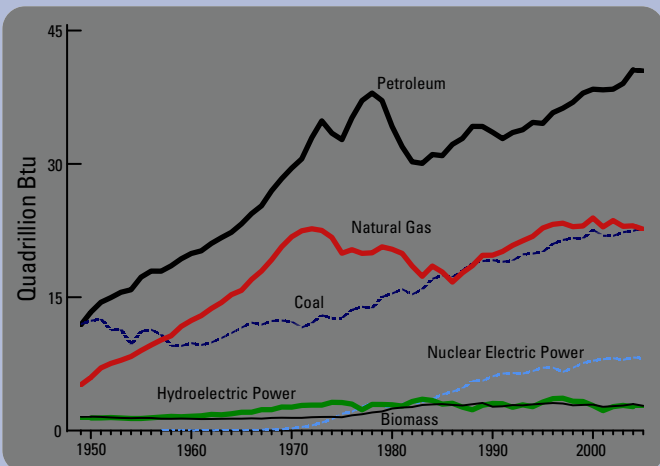
Availability of energy and minerals resources in the future will be dominated by two issues:

1. *Effects of globalization*—The global economy is increasing the competition for vital natural resources. This globalization of world markets and increasing demand for energy and mineral resources in other countries can lead to domestic scarcity, market volatility, and higher prices. We can reduce our vulnerability through knowledge and planning.
2. *Environmental effects*—Changes to land, water, and the environment resulting from the use of energy and mineral resources will factor more strongly into how society chooses to use these resources. We can take a multidisciplinary approach to

Why Action is Needed Now

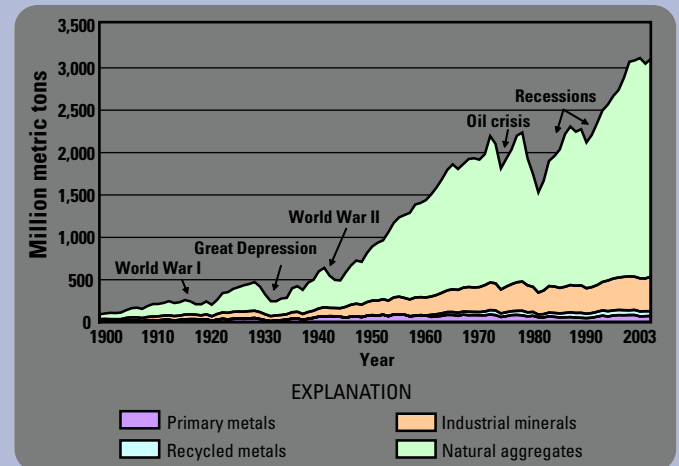
It is inevitable that the United States will move to diversify its energy sources to reduce dependence on foreign sources and to address issues of greenhouse gas emissions. It also is likely that the United States will be involved in building new technologies. The focus of USGS research will shift in anticipation of and as a reflection of national and international trends in diversifying energy resources and evolving needs for rare and scarce materials used in industry and defense. Developing alternative fuel sources such as gas hydrate, coalbed methane, oil shale, geothermal resources, wind, and biofuels will reduce depen-

Energy Resource Use in the United States, 1950–2005



United States energy consumption by source of fuel since World War II. For the past 20 years, consumption of hydrocarbon fuels has steadily increased (Energy Information Administration, 2005, Annual Energy Review. Online at <http://www.eia.doe.gov/emeu/aer/contents.html>.)

Mineral Resource Use in the United States



Unprocessed, nonfuel mineral materials put into use annually in the United States from 1900–2003. (From Matos, 2007, U.S. Geological Survey, Scientific Investigations Report 2006-5194.)

dence on fossil fuels and strengthen the economic vitality and competitiveness of the Nation. Resource management on Federal land will need to accommodate ecosystem-based practices to balance competing demands, particularly as off-shore Federal lands may face increasing pressure for development.

How the USGS Can Help

The USGS is uniquely qualified to implement this science strategy because of its broad range of expertise, experience in interdisciplinary thinking and action, and proven skills in building customer relationships. The science strategy unites and integrates all USGS capabilities and takes advantage of its strength and position as a nonregulatory Federal agency with national scope and responsibilities.

The USGS will build on its traditional strengths of mapping, modeling, and conducting fundamental research to improve the reliability and accuracy of national and global assessments of



Gold mining operation at the Waihi mining district, New Zealand. The USGS supports research and assessments of minerals, as well as collection of minerals information on a global scale. Photograph by Robert S. Seal, U.S. Geological Survey.

energy and mineral resources. Long-term databases and information summaries will be expanded to include a broader range of related land, water, and environmental concerns and to place a greater

emphasis on environmental consequences of resource use. The USGS, with its expertise in geology, hydrology, biology, and geography is ideally poised to move in this expanded direction.

USGS Science Can Meet the Challenge

The USGS is ready to take action by:

- Maintaining and updating USGS long-term geological and geophysical databases and geochemical baselines used to develop resource assessments.
- Producing, updating, and improving national and global assessments of energy and mineral resources, especially as energy sources diversify and new requirements for rare and scarce materials used by the Nation emerge.
- Developing multidisciplinary approaches to energy and mineral assessments to account for the “life cycles” of resources and the environmental effects of exploration, extraction, and use.
- Developing procedures to evaluate and understand the effects of resource use on ecosystem processes.
- Making USGS assessments and research available to the public and government officials so that science can inform, advise, and engage decisionmakers.
- Continuing to improve and expand geologic, biologic, and hydrologic understanding of assessment methodology for alternative energy resources as the Nation moves to a more diversified energy mix (such as coalbed methane, oil shale, tight gas sands, shale gas, gas hydrates, geothermal energy, uranium, and biofuels).
- Anticipating, identifying, and developing understanding of the occurrence, genesis, and risk associated with using new mineral resources.
- Improving scientific understanding of the origin and occurrence of energy and mineral resource deposits, using this knowledge to improve the accuracy and reduce the uncertainty of resources assessments.
- Developing scientific methods for monitoring and assessing biological and geological carbon sequestration resources, including assessment of interdependencies among land, water, and ecosystem resources that may be affected by carbon management decisions.

A Vision For the Future

Energy and minerals information from the USGS, including national and global resource assessments, remains the standard used by industry and government. Evaluation of alternative energy and mineral resources (including renewable resources) keeps pace with technological developments. Scientists in USGS continuously enhance their understanding of the formation of energy and mineral resources and routinely include environmental and “life-cycle” expertise into studies and assessments.

For Additional Information

U.S. Geological Survey, 2007, Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007–2017: Available online at <http://pubs.er.usgs.gov/usgspubs/cir/cir1309>

Also, visit the USGS home page at <http://www.usgs.gov/>