

## **DISCLAIMER**

**This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof. Reference herein to any social initiative (including but not limited to Diversity, Equity, and Inclusion (DEI); Community Benefits Plans (CBP); Justice 40; etc.) is made by the Author independent of any current requirement by the United States Government and does not constitute or imply endorsement, recommendation, or support by the United States Government or any agency thereof.**

**Final Report**  
**DE-SC0020665**  
**3/15/20-3/14/23**

**Project Title:** Board on Earth Sciences and Resources and Its Activities  
**Federal Award Identification Number:** DE-SC0020665  
**Agency Code:** 8900  
**Organization:** Office of Basic Energy Sciences  
**Project Period:** 03/15/2020 - 03/14/2023  
**Reporting Period:** 03/15/2020 - 03/14/2023  
**Budget Period:** 03/15/2020 - 03/14/2023

**Principal Investigator Information:**

Dr. Deborah Glickson  
Board Director  
500 Fifth Street, NW  
Washington, DC 20001  
Email: dglickson@nas.edu  
Contact: (202) 334-2024

**Recipient Organization:**

National Academy of Sciences  
500 5th St. NW  
Washington, DC 20001-2736  
USA

**DUNS:** 041964057

**EIN:** 530196932

**Submitting Official Information:**

Dr. Deborah Glickson  
Board Director  
500 Fifth Street, NW  
Washington, DC 20001  
Email: dglickson@nas.edu  
Contact: (202) 334-2024

## **EXECUTIVE SUMMARY**

The National Academies' Board on Earth Sciences and Resources (BESR) and its standing committees provide an ongoing forum for advancing the understanding and communication of Earth sciences and resource topics, including emerging topics and innovative techniques. BESR activities help to provide evidence-based information to members of the executive and legislative branches of the federal government, the private sector, states and tribes, academia, non-governmental organizations, and the public to support decision-making. BESR and its standing Committee on Solid Earth Geophysics (COSEG), also supported by this award, fulfill this role through development and administration of consensus studies, as well as workshops and other convening activities related to the Earth sciences; overseeing selected activities of the Board's standing committees, such as disciplinary meetings and webinars; and communicating, sharing information, and providing opportunities for interaction and exchange among technical and non-technical stakeholders.

The core support received from DOE helps BESR and COSEG maintain a central body of volunteer experts and National Academies staff who can respond to pressing needs and requests from federal sponsors and other members of the Earth science community, to maintain the health and relevance of the Earth sciences discipline, and to provide the Earth science community with a privileged interface to the government to support scientific and engineering advances and decision making related to Earth sciences and engineering. Initiation and oversight of Earth science activities at the National Academies is an enduring function of the BESR and COSG that helps to ensure development and completion of projects and activities that are responsive to the needs of sponsors and the broader Earth science and research enterprise.

## **PROJECT ACTIVITIES**

### **Accomplishments**

#### **What are the major goals and objectives of the project?**

BESR and its standing committees provide an ongoing forum for advancing the understanding and communication of geoscience research and information to Congress, the federal government, the private sector, state and tribal governments, academia, non-governmental organizations, and the public. With broad implications for society, the activities of the board and standing committees contribute evidence-based information to support geoscience research and decision making from local to national levels.

BESR has four standing committees, including COSEG (formerly the Committee on Seismology and Geodynamics). The board and the standing committees serve DOE through the development and oversight of consensus studies and convening activities related to the geosciences; and through interaction and exchange among technical and non-technical stakeholders.

As the locus for coordination of geoscience activities at the National Academies, the primary goals for this project include:

- 1) Identifying opportunities for advancing basic geology and geophysics research;
- 2) Developing and executing new projects, including consensus studies and workshops;
- 3) Communicating the information from these projects and studies to government, academic, non-governmental, and private sector audiences for policy and decision making;
- 4) Reporting on applications of geosciences to important societal issues;
- 5) Providing a forum for balanced discussion of scientific and technical questions and solutions associated with a range of geoscience issues; and
- 6) Accessing the overall health of research and education programs related to geosciences.

## What was accomplished under these goals?

### ***Public Meetings***

During the award period, BESR hosted the following public meetings:

- 2020 Fall Meeting: [Increasing Diversity and Inclusion for Underrepresented Scholars in Earth Sciences](#), 200 attendees
- 2021 Spring Meeting: [Energy and Resources Needs for a Nation in Transition](#), 125 attendees
- 2021 Fall Meeting: [Natural and Prescribed Wildland Fire Impacts on Soil Health](#), 225 attendees
- 2022 Spring Meeting, held jointly with the Water Science and Technology Board: [Future of Managed Aquifer Recharge in the U.S.](#), 200 attendees
- 2022 Fall Meeting: [Remining as a Domestic Critical Mineral Resource](#)
- 2023 Spring Meeting: Site Visits to Agencies (USGS, DOI, NASA)

COSEG organized the following public meetings:

- 2020 Fall Meeting: [Solid Earth Science and Sea Level Change](#), 150 attendees
- 2021 Spring Meeting: [Novel Geophysical Datasets for Environmental Applications: Moving from Discovering Signals to Societal Benefits](#), 200 attendees
- 2021 Fall Meeting: [How are Plates Made and Preserved?](#), 200 attendees
- 2022 Spring Meeting: [Time-Dependent Earthquake Hazard](#), 100 attendees
- 2022 Fall Meeting: [Electromagnetic Methods to Study the Solid Earth](#), 100 attendees
- 2023 Spring Meeting: [Bathymetry and Topography at the Land-Ocean Interface](#), 250 attendees

BESR and COSEG Spring and Fall meetings provide independent, scientifically based forums for discussing issues of importance to the Earth science community, including federal and state agencies, the academic community, the private and non-profit sectors, and the public. These discussions help stakeholders identify key questions, challenges, opportunities, and scientific and technical resources to address areas where Earth sciences play an important role in decision making.

At each meeting, BESR and COSEG also met in executive session to discuss topics of interest, opportunities, and challenges with the sponsors, and met in closed session to discuss its oversight responsibilities, ongoing projects, and study ideas.

Members serve pro bono in 3-year rotations to meet the evolving needs of its sponsors and the Earth science community and to ensure diverse representation of science and policy perspectives, professional expertise, and knowledge, with considerable effort also to represent different demographic characteristics.

### ***Consensus Studies, Workshops, and Meetings of Experts***

BESR also oversees specific ad hoc committees of experts that carry out consensus studies and organize convening activities to draw upon experts in different fields to share scientific and technical information in an objective way.

BESR conducted the following activities during the award period:

- [A Vision for NSF Earth Sciences 2020-2030: Earth in Time](#) (sponsored by NSF)
- [Evolving the Geodetic Infrastructure to Meet New Scientific Needs](#) (sponsored by NASA)
- [Corrosion of Buried Steel at New and In-Service Infrastructure](#) (sponsored by FHWA, NSF, trade groups, and the NASEM Day Fund)

- [Scoping Meeting on Increasing Quantitative Skills for Solid Earth Geophysics.](#)
- [Potential Impacts of Gold Mining in Virginia](#) (sponsored by the Virginia Department of Mines, Minerals, and Energy and the NASEM Day Fund)
- [Future Directions for Southern Ocean and Antarctic Nearshore and Coastal Research](#) (sponsored by NSF)
- Meeting of Opportunity on Critical Minerals (sponsored by NSF)
- [Representing Lived Experience in the Climate and Economic Justice Screening Tool: Proceedings of a Workshop](#)—in Brief (sponsored by Bezos Earth Fund)
- Meeting of Experts on Methods, Tools, and Applications for Managing Changes in Geographic Area Boundaries and Bridging Breaks in Statistical Data Series (sponsored by U.S. Census Bureau)
- [Constructing Valid Geospatial Tools for Environmental Justice](#) (sponsored by Bezos Earth Fund)

BESR has been a key collaborator (with other units of the National Academies) on several other consensus studies and workshops.

- [Advancing a Systems Approach to Studying the Earth: A Strategy for the National Science Foundation](#) (sponsored by NSF)
- [Identifying New Community-Driven Science Themes for NSF's Support of Paleo Perspectives on Climate Change \(P2C2\): A Workshop](#) (sponsored by NSF)
- [Exploring a Dynamic Soil Information System: Proceedings of a Workshop](#) (sponsored by DOE, NSF, USDA, the NASEM Day Fund, and the National Corn Growers Association)
- [Leading Practices for Improving Accessibility and Inclusion in Field, Laboratory, and Computational Science – A Conversation Series](#) (sponsored by NSF)
- [Tipping Points, Cascading Impacts, and Interacting Risks in the Earth System: Proceedings of a Workshop](#) (sponsored by NSF)
- [Climate Intervention in an Earth Systems Science Framework: Proceedings of a Workshop—in Brief](#) (sponsored by NSF)
- [Workshop on Climate Change and Human Migration: An Earth Systems Science Perspective](#) (sponsored by NSF)

### **What opportunities for training and professional development has the project provided?**

Award support has provided training and professional development opportunities for early career staff, including the opportunity to interact with academic experts, federal and state agency representatives, and stakeholder communities.

### **How have the results been disseminated to communities of interest?**

As part of building its communication and outreach strategy, the board and its standing committees focused efforts on reaching different audiences through their websites and email subscription lists. Concerted efforts in reaching virtual audiences have resulted in increased registrations for the email lists. Staff also work with the National Academies Press, our publishing arm, to reach their subscribers and target those who have downloaded National Academies reports of topical relevance to a specific board event.

Additionally, BESR and COSEG meetings are available for remote viewing the day of the meeting and are posted on the National Academies' websites afterward. This allows for asynchronous viewing after the event, which has increased the reach of the meetings by hundreds of people.

National Academies reports also garner interest from communities of interest. Reports are freely available on the National Academies Press website and have been downloaded hundreds to thousands of times.

## **Products**

### **Publications**

Links to all of the publications (consensus studies, proceedings, proceedings-in-brief) produced by BESR are in the accomplishments section.

### **Websites**

The main BESR website is: <https://www.nationalacademies.org/besr/board-on-earth-sciences-and-resources>.

The COSEG website is <https://www.nationalacademies.org/our-work/committee-on-solid-earth-geophysics>.

Webpages for BESR and COSEG meeting are linked above in the accomplishments section.

### **Other Products**

None

### **Participants**

| <b>Name</b>     | <b>Person-Months</b> | <b>Project Role</b>                  | <b>Contribution to Project</b>   | <b>Foreign Collaborators?</b> | <b>Travel to Foreign Countries?</b> |
|-----------------|----------------------|--------------------------------------|--|-------------------------------|-------------------------------------|
| Benjamin Ulrich | 1                    | Comms Associate                      | Assists with all external communications, including social media and email lists   | No                            | No                                  |
| Calla Rosenfeld | 1                    | Program Assistant                    | Assisted with BESR member and meeting logistics  | No                            | No                                  |
| Charles Burgis  | 1                    | Associate Program Officer            | Helps with management of the board members and assists with meeting content  | No                            | No                                  |
| Courtney DeVane | 2                    | Admin Coordinator                    | Managed meeting, board, and committee logistics  | No                            | No                                  |
| Cynthia Getner  | 1                    | Financial Associate                  | Manages all financial aspects of the board and committee   | No                            | No                                  |
| Deb Glickson    | 2                    | Senior Program Office/Board Director | Provides oversight of the board and committee, including management of all activities. Previously assisted with management of the board members and managed COSEG. | No                            | No                                  |
| Elizabeth Eide  | 1                    | Board Director                       | Provided oversight of the board and committee, including management of all activities  | No                            | No                                  |
| Emily Bermudez  | 1                    | Program Assistant                    | Assisted with BESR member and meeting logistics  | No                            | No                                  |
| Eric Edkin      | 1                    | Internal Comms Manager               | Managed internal meeting logistics, including AV and webcasting  | No                            | No                                  |

|                   |   |                           |   |    |    |
|-------------------|---|---------------------------|---|----|----|
| Jonathan Tucker   | 1 | Associate Program Officer | Manages COSEG committee members and meeting content, assists with the board   | No | No |
| Katalyn Voss      | 1 | Associate Program Officer | Helped with management of the board members and assisted with meeting content | No | No |
| Margo Regier      | 1 | Program Officer           | Helps with management of the board members and assists with meeting content   | No | No |
| Miles Lansing     | 1 | Program Assistant         | Assists with COSEG member and meeting logistics                               | No | No |
| Nicholas Rogers   | 1 | Financial Associate       | Managed all financial aspects of the board and committee                      | No | No |
| Oshane Orr        | 1 | Program Assistant         | Assisted with BESR member and meeting logistics                               | No | No |
| Padraigh Hardin   | 1 | Program Assistant         | Assisted with BESR member and meeting logistics                               | No | No |
| Sammantha Magsino | 1 | Senior Program Officer    | Helps with management of the board members and assists with meeting content   | No | No |

### Other Collaborators

Current BESR membership is [here](#) and the current COSEG membership is [here](#), although there have been some rotations of membership in the past 3 years. Each board and committee member contributes time and intellectual insight to the activities of the board and committee through monthly conference calls, developing the programs for the biannual meetings and webinars, and providing feedback to proposed activities.

As BESR chair, Dr. Isabel Montanez, University of California, Davis, works closely with BESR staff to plan and facilitate all public meetings and events of the board, develop new project ideas, and communicate with board sponsors and other stakeholders. Dr. Thorsten Becker, COSEG chair, similarly works closely with COSEG staff to plan and facilitate all public meetings and events of the board, develop new project ideas, and communicate with board sponsors and other stakeholders. Dr. Becker is also a member of BESR.

### Impact

#### What is the impact on the development of the principal discipline(s) of the project?

BESR and COSEG contribute to the advancement of research methods and techniques, disciplinary interests, and policy discussions in geology, geophysics, and the broader geosciences through its convenings of experts and its consensus reports. While not primary scholarship, BESR and its standing committees help to raise the profile of the Earth sciences to broad audiences and identify key issues for future work across sectors and fields of study, thus impacting the development of the science itself.

#### What was the impact on other disciplines?

BESR and COSEG often look to discuss topics that are relevant to other disciplines, including energy resources, climate change, water resources, agriculture, and workforce development.

#### What is the impact on the development of human resources?

BESR and COSEG have both been continuing dialogue on diversity, equity, and inclusion in the geosciences. This is a critical discussion for the future of the geosciences as a field of relevant and robust

research and for the health and resilience of the future geosciences workforce. By drawing together geoscientists from across many sectors to participate in these conversations, BESR and COSEG support an ongoing foundation for continued discussion of DEI among professional societies, government agencies, the private sector, and academia.

**What was the impact on teaching and educational experiences?**

Our meetings and reports are freely available to watch and/or download and have been used in high school and university courses.

**What is the impact on physical, institutional, and information resources that form infrastructure?**

BESR staff maintain connections with professional societies and geoscience interest groups in addition to federal and state agencies. This includes discussions with the Association of American State Geologists, American Geophysical Union, and the Geological Society of America. These meetings help to maintain consistent communication and exchange of information and ideas among geoscience groups and staff. These types of discussions support the professional infrastructure that ensures advancement of Earth science research and Earth science as a critical input to policy and decision making across the country.

**What was the impact on technology transfer?**

Nothing to report

**What is the impact on society beyond science and technology?**

BESR has an important function at the interface between science and policy, affording the Earth science community a unique connection to policy- and decision-makers in the federal government, and in the opposite way, providing access for policy- and decision-makers to experts in the Earth sciences who can help inform development of new policies. BESR staff work to maintain communications across federal agencies with Earth science in their missions and to inform congressional staff of the board's activities and products.

**PROJECT OUTCOMES**

The National Academies' Board on Earth Sciences and Resources (BESR) and its standing committees provide an ongoing forum for advancing the understanding and communication of Earth sciences and resource topics, including emerging topics and innovative techniques. BESR activities help to provide evidence-based information to members of the executive and legislative branches of the federal government, the private sector, states and tribes, academia, non-governmental organizations, and the public to support decision-making. This award has supported meetings on increasing underrepresented scholars in Earth science; the energy transition; wildfire impacts on human health; managed aquifer recharge; remining as a source of critical minerals; sea level change; environmental applications of geophysical datasets; tectonic plate formation; earthquake hazards; electromagnetic methods; and the land-ocean interface. Most meetings had 100-250 attendees (in person and virtual) and are all freely available to watch on the BESR website. BESR also produced or collaborated on 7 consensus studies, 6 workshop proceedings, and several scoping meetings. The reports are available at [www.nap.edu](http://www.nap.edu).