Scientific Foresight: Capacities and Needs

Richard E. Bissell, Ph.D.
US National Academy of Sciences
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Road Map

- Needs
  - Field
  - Problem
  - Agency
- NAS Capacities
- Audiences
- Outcomes
- Lessons

Needs by Field

- *Astronomy and Astrophysics in the New Millennium*
- *Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century*
- *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*
- *New Frontiers in the Solar System: An Integrated Exploration Strategy*
- *The Sun to the Earth—and Beyond: A Decadal Research Strategy in Solar and Space Physics*

Needs by Problem

- Implementing the New Biology: Decadal Challenges Linking Food, Energy, and the Environment
- Sustainability Linkages in the Federal Government
- Abrupt Climate Change: Inevitable Surprises
- Future of the Nuclear Security Environment in 2015
- America's Energy Future: Technology and Transformation

Needs by Agency

- Incorporating Sustainability in the US EPA
- Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation
- Toward a Sustainable and Secure Water Future: A Leadership Role for the U.S. Geological Survey
- Fostering Visions for the Future: A Review of the NASA Institute for Advanced Concepts

NAS Capabilities

- CONSENSUS STUDIES
  - Balance and Composition of Committees
  - Report Review
- CONVENING ACTIVITIES
  - Workshops
  - Roundtables
- OPERATIONAL PROGRAMS
  - Fellowships and Associateships
  - Research/Surveys
  - Education and Training
  - Data Banks

Audiences

- Practitioners in the research community, who expect fairness, wisdom, and advocacy;
- Students, who expect to see a big picture of the field and how the pieces fit;
- Government agencies, which expect direction and judicious advocacy; and
- Congress, which expects unambiguous priorities.

Outcomes

- Research Investments
- Infrastructure
- People
- Data

Lessons

- Utilize broad expertise in foresight exercises but highlight the science
- If asked, be willing to make the hard decisions in setting priorities.
- Attention to applications as well as fundamental science
- Be prepared to follow up for a decade.

Lessons for Surveys

- Start survey preparations early, including early identification of the steering committee. At least 2 years should be allocated to conducting a survey.
- Good surveys are expensive. Provide adequate funds for the survey itself and for public outreach.
- Establish a formal follow-up connection between implementing agencies and the NAS to ensure that survey goals reflect new discoveries and personnel, budgetary, and policy changes.
- Create explicit interfaces to the international scientific community.
- Appoint a committee chair highly respected both by scientific community and funding agencies.

Lessons for Infrastructure

- In addition to recommending construction of new facilities, surveys should be prepared to consider what existing facilities might be phased.
- Identify opportunities for international partnerships, which can help make development, construction, and operations costs more affordable to the United States.
- Explicit considerations of programmatic roles and relationships between agencies and opportunities for interagency collaboration.
- Phasing of projects.
- Include life-cycle costs. Operating costs far exceed construction costs over the operational lifetime of a facility.

For further information

http://www.nationalacademies.org/

Or e-mail me at

rbissell@nas.edu