

NATIONAL
ACADEMIES

*Sciences
Engineering
Medicine*

National Academies Decadal Surveys

History • How they work • Why they matter

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National Academies of Sciences, Engineering, and Medicine

<https://tinyurl.com/286s4fas>



A Dialogue with Private Sector Leaders and End-Users

February 3, 2026

AGENDA

9:00am Introduction to the National Academies and the Decadal Survey Process

- *Dr. Arthur Charo (for Dr. Arul Mozhi), Senior Program Officer, Space Studies Board, National Academies*

9:30am Key Takeaways from the 2017 Decadal Survey for Earth Science and Applications from Space and the 2023 “Midterm Assessment” 35/10 min

- *Dr. Waleed Abdalati, Director, Cooperative Institute for Research in Environmental Sciences, CU Boulder*
- *Dr. Anna Michalak, Carnegie Institution for Science/Professor (by courtesy), Stanford University*
- *Dr. Christian Kummerow, Professor, Department of Atmospheric Science, Colorado State University*

10:15am Planning for the Next Decadal Survey for Earth Science and Applications from Space 20/10 min

- *Dr. Willam B. Gail, co-chair, National Academies Cmte. on Earth Science and Applications from Space*

10:45am Break (15 minutes)

11:00am Shaping the Next Earth Science Decadal Survey: NASA Earth Science Division Perspectives 40/10

- *Dr. Karen St. Germain, Director, Earth Science Division, NASA HQ*

11:50am Roundtable Discussions/Wrap -- All participants

12:15pm Meeting Adjourns (we can extend to 12:30 pm if needed)

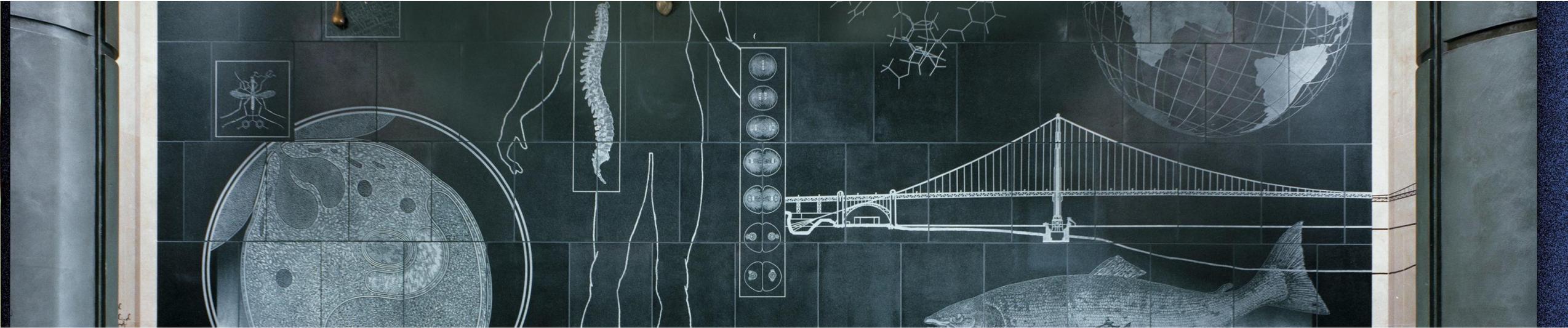
About the National Academies



Established under a congressional charter in 1863, the National Academies are a nonprofit, nonpartisan organization that provides objective analysis on science, engineering, and health topics affecting the nation.

The National Academies unite three distinct yet closely affiliated institutions—the National Academy of Sciences, the National Academy of Engineering, and the National Academy of Medicine.

Our Consensus Studies



Our objective, evidence-based reports are written by top domestic and international experts who serve pro bono to carry out the study's statement of task.

Committee members are carefully screened for conflicts of interest and represent a mix of perspectives, expertise, and institutional experience to enhance the quality, credibility, and balance of deliberations.

Our reports represent the consensus view of the committee and undergo extensive peer review before publication. Report recommendations help identify science priorities, guide federal investments, and inform legislation.



National Academies of
Sciences, Engineering,
and Medicine



Center for Advancing Science
and Technology (CAST)



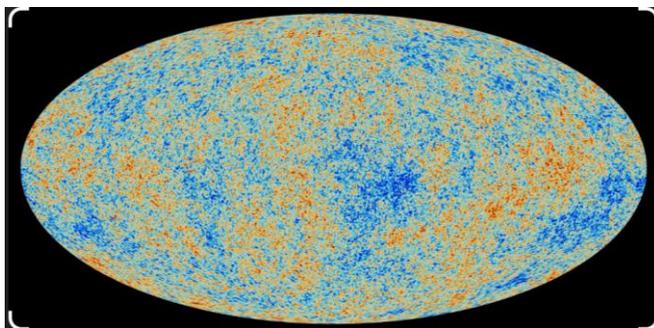
Aeronautics, Space,
and Astronomy (ASA)



Space Studies Board (SSB)



Committee on Earth Science
and Applications from Space



Committee on Earth Science and Applications from Space (CESAS)

CESAS is a standing National Academies committee of the Space Studies Board that provides continuing oversight, advice, and strategic guidance on Earth science and applications conducted from space. **CESAS serves as the institutional home for the Earth Science and Applications from Space Decadal Survey.** In this role, it:

- **Comments on the study charge, advises on committee and panel composition, and provides continuity across successive decadal surveys.**
- **Helps organize midterm assessments, which are required by law.**
- May, upon agency request and Academy approval, conduct short studies related to implementation of the survey.
- Promotes sustained engagement with federal agencies and the broader Earth science and applications communities.
- Further information: <https://www.nationalacademies.org/projects/DEPS-SSB-16-10>



Decadal Surveys: Characteristics and Utility

A community-consensus blueprint for a field's next ~10 years

- Take a long-term look at the field and recommend top **priority scientific goals** and directions for the future
- Direct **recommendations to the principal agencies** that support facilities/research in the relevant fields
- Provide recommendations for programmatic directions and **explicit priorities for government investment** in research facilities, including space flight missions
- Address issues of advanced technology, infrastructure, interagency coordination, education, and international cooperation
- **Designed for decision makers:** clear priorities, tradeoffs, and rationale
- Typical cadence: approx. every 10 years; study process from start to publication is approx. 2 years
- NASA is **required by statute** (51 U.S.C. § 20305) to engage the Academy to conduct independent decadal surveys.
 - *Although NASA is the primary statutory sponsor of the space and Earth science decadal surveys, other federal agencies frequently participate financially and programmatically in the process because the survey recommendations influence their own research programs, facilities, and missions.*

Decadal surveys create a durable consensus roadmap. They facilitate planning, coordination, advocacy, and outreach.

Community Input and Engagement: A Key Feature of a Decadal Survey

- **Open community input:** Decadal surveys solicit broad participation through open calls for white papers and public input across the research, applications, and stakeholder communities.
- **Representative expert committees:** Steering committees and panels are constituted to reflect disciplinary breadth, institutional diversity, and a range of perspectives across academia, government, industry, and nonprofit sectors.
 - Participants are vetted for bias and conflicts of interest.
 - Steering committee members in particular are expected to wear big hats.
- **Transparent, iterative engagement:** Public meetings, workshops, and follow-on assessments (including midterm reviews) provide ongoing opportunities for feedback and community engagement throughout the decade.

Where did decadal surveys come from?

Origins in 1960s astronomy/physics → adopted across space & Earth science

1964

2000s

2007

Today

Ground-based
astronomy
“Ten-Year Program”

First surveys for planetary
and solar and space
physics/heliophysics

First Earth science &
applications from
space decadal

Regular cadence
across NASA
science domains

Why they expanded

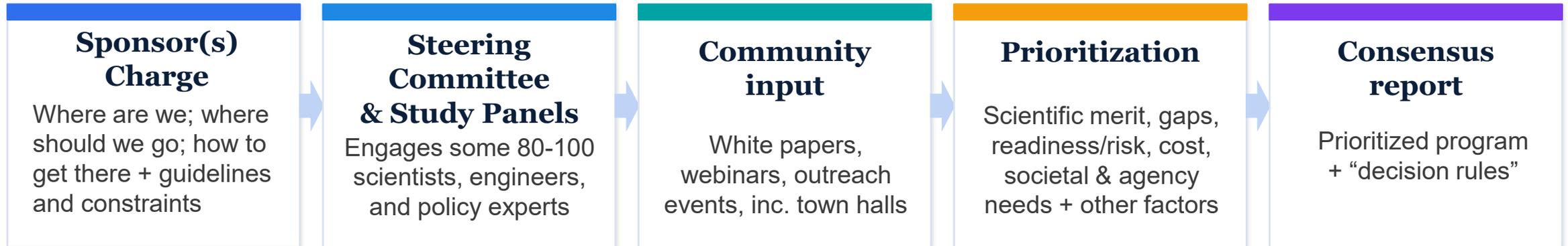
As federal investments became large and interdependent, agencies needed transparent prioritization, credible community consensus, and a plan resilient to the next budget cycle. Decadal surveys became a repeatable way to do that.

A signature National Academies product

Across space & Earth science, decadal surveys are widely used by agency sponsors (e.g., NASA, NSF, NOAA, USGS, DoE) and inform OSTP/OMB and Congress.

How the Process Works (Simplified Version)

Statement of task → community input → priorities + implementation guidance



KEY PRINCIPLES

- **Optimize limited resources** to address the highest-priority objectives over a decade
- **Construct balanced portfolios** that span large, medium, and small activities; multiple scientific disciplines; and near-term and longer-term investments.
 - Needed to manage technical and programmatic risk, maintain continuity of scientific capability, enable steady progress as well as transformative advances, sustain progress even when individual elements experience delays, cost growth, or failure
- Ground priorities in **technical, cost, and programmatic realism**
- **Serve broad scientific and stakeholder communities**

What Decadal Surveys Deliver

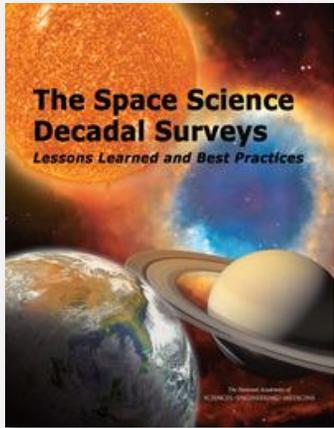
A package of products that make priorities implementable

Core outputs

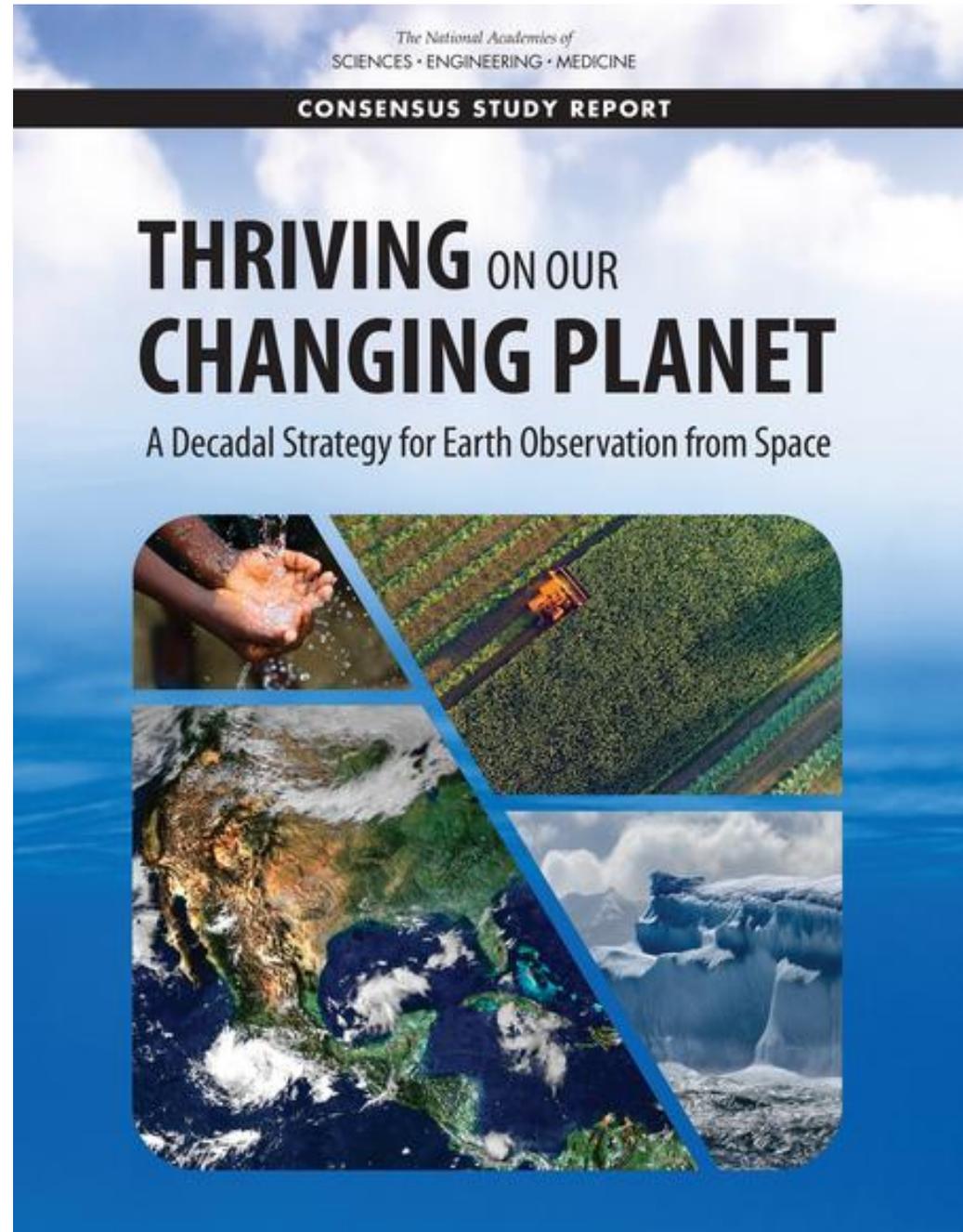
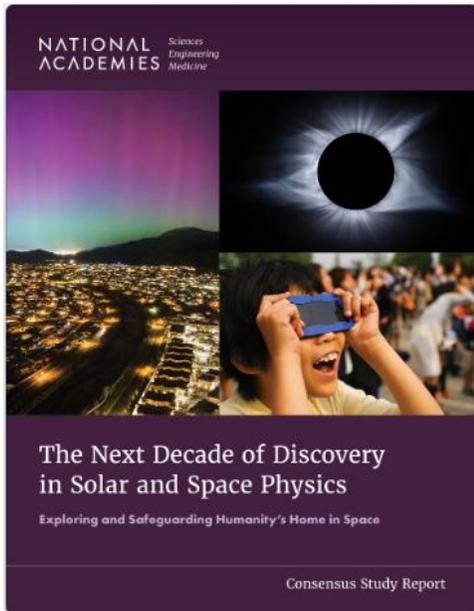
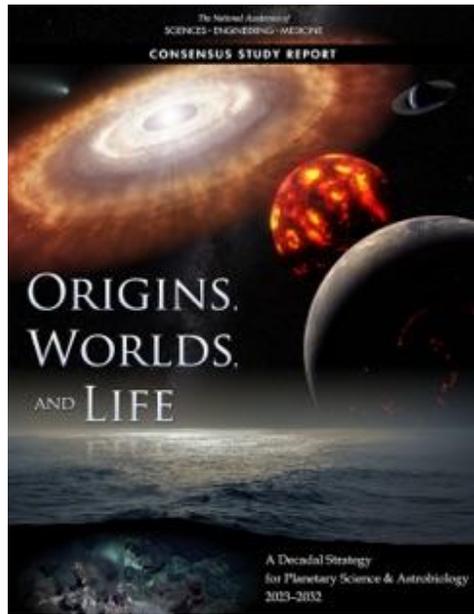
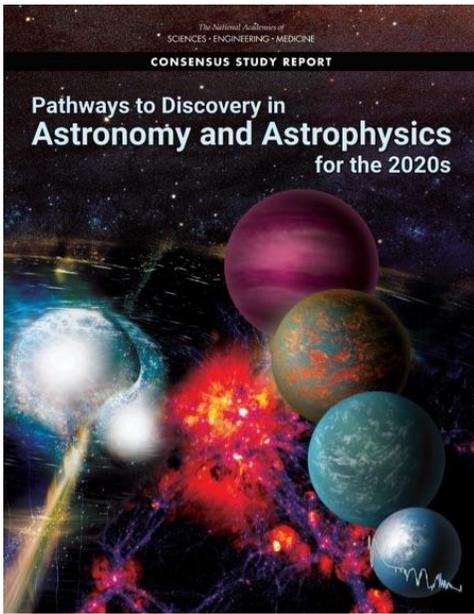
- Prioritized science questions and objectives
- Recommended missions / facilities / programs
- Rationale for the ordering (and what's “not in”)

Implementation tools

- Budget scenarios and portfolio balance
- Risk & readiness considerations (e.g., technical risk and cost evaluation-TRACE)
- Guidance for replanning if assumptions break



NASEM’s 2015 report, *The Space Science Decadal Surveys: Lessons Learned and Best Practices*, notes agencies often treat decadal surveys as a “guidebook/blueprint” — and even a “sword and shield” for sustaining consensus priorities through turbulence.



Next Steps

- A call for volunteers/nominations for service on one of the survey committees will go out after we have an agreed task statement, approval by the National Academies, and a contract with the sponsor(s)
- Information about the survey will be available on the CESAS website: <https://www.nationalacademies.org/projects/DEPS-SSB-16-10> (<https://tinyurl.com/286s4fas>).
- National Academies Survey POC: Art Charo: acharo@nas.edu

Backups

References / Grounding

National Academies of Sciences, Engineering, and Medicine (2015).
The Space Science Decadal Surveys: Lessons Learned and Best Practices.
Washington, DC: The National Academies Press.

Used as a foundational reference for:

- History, purpose, and credibility of decadal surveys
- Community consensus and prioritization mechanisms
- Stewardship, midterm assessments, and policy impact

Note: This report predates the 2018 Earth Science and Applications from Space decadal survey.

Why decadal surveys are useful

They align communities, agencies, and decisionmakers

For the scientific & applications community

- A transparent way to set collective priorities
- Balance discipline and user needs
- A shared rationale for “hard choices”

For agencies & program managers

- A defensible portfolio plan
- Input for budgeting and sequencing
- A basis for partnerships (U.S. agency/commercial/international)

For Congress / OSTP / OMB

- A credible, community-backed rationale for investments and budget formulation
- Clear priorities to match resources to objectives
- Supports program oversight

Inaugural Earth Science Decadal--Congressional Reactions



Dr. Rick Anthes
Survey Co-chair

Dr. Berrien Moore
Survey Co-chair

“When accurate weather forecasting & climate research is increasingly important to the well-being of our citizens, this distinguished panel of experts is warning in no uncertain terms that *'the United States' extraordinary foundation of global observations is at great risk.'*”

"I don't think the National Academies could be clearer voicing its concern over the current state of affairs," added **Chairman Gordon**. "It's not easy to find the money, but given the consequences of inaction, we must try."

13 February 2007

Earth2007 impact: priorities → missions → data products

Examples of major missions that trace back to 2007 priorities

Selected implementations (illustrative):

SMAP

Launched 2015

Soil moisture & freeze/thaw
→ drought, agriculture, hazards

ICESat-2

Launched 2018

Laser altimetry
→ ice, sea level, vegetation
structure

GRACE-FO

Launched 2018

Gravity
→ water storage, ice mass
change

SWOT

Launched 2022

Surface water & ocean
topography
→ hydrology + ocean
circulation

Takeaway: decadal recommendations create a long-lived reference point that can survive schedule/budget turbulence while preserving the “why” behind the portfolio.

Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond (final pub. 2007)

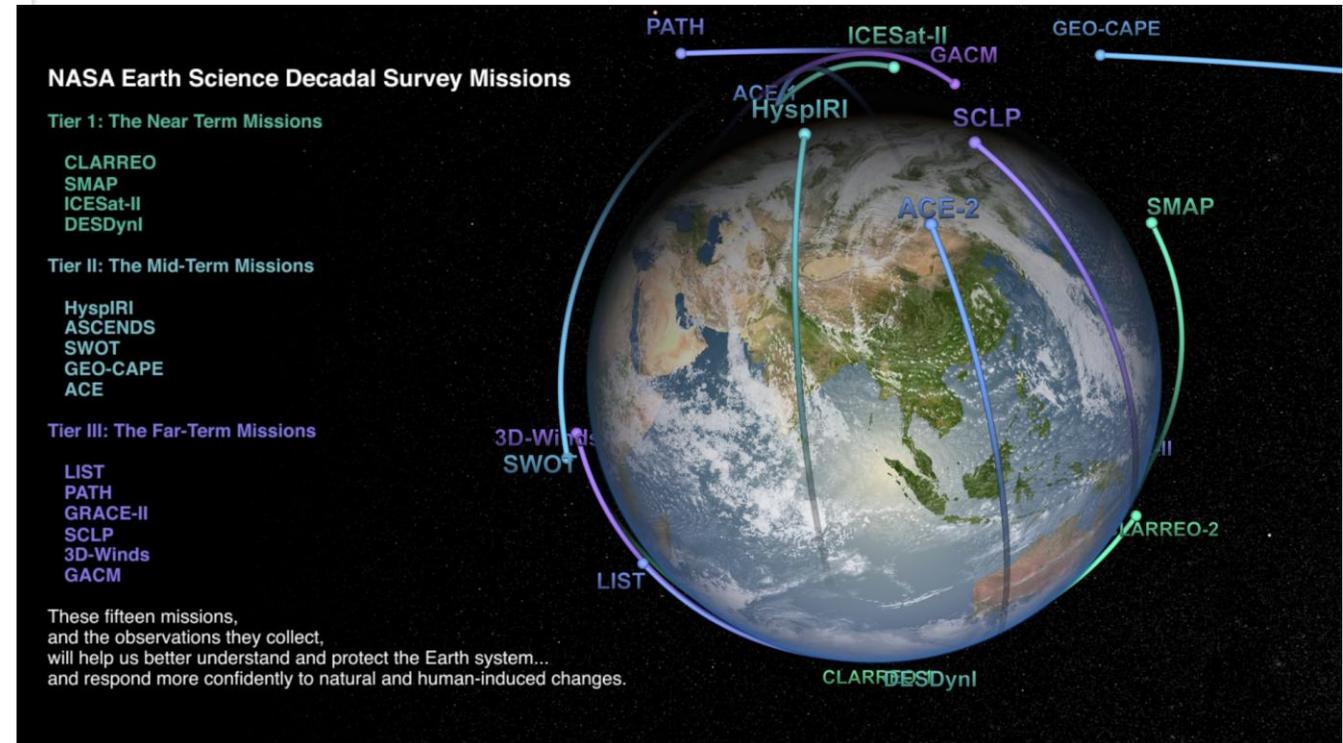
Published: 2007 (doi:10.17226/11820)

Overarching message

Renew U.S. investment and leadership in Earth-observing systems to support both science and societal benefits.

Provided

- A sequenced, integrated space-based observing program
- A prioritized mission list (15 recommended NASA missions)
- Supporting elements: research and analysis, data systems, applications



NASA SVS visualization of the 15 recommended Earth science missions (2007 survey)

Published: 2018 (doi:10.17226/24938)

Five “Designated” priority observables

- Aerosols (climate + air quality)
- Clouds / convection / precipitation
- Mass change (oceans–ice–groundwater–atmosphere)
- Surface biology & geology
- Surface deformation & change

Portfolio elements (beyond “Designated”)

- Program of Record (with cost cap guidance)
- Earth System Explorer (competed, cost-capped missions)
- Incubation (technology + innovation fund)
- Earth Venture (incl. Venture-Continuity)

Built around priority “targeted observables” and cost-capped programs

A deliberate shift: specify priority measurements/observables (not single fixed implementations), so the program can adapt to new tech (small sats, sensors, computing) over the decade

The National Research Council

The NAS was chartered in 1863. As scientific issues became even more complex, the small number of NAS members could not keep up with requests for advice.

- In 1916, the National Research Council was established as the mechanism by which the Academy would fulfill its mandate to advise the U.S. government.
- The NRC is an independent, nonprofit entity that produces reports that provide advice at the request of a sponsor
- The Federal Government is the largest (but not only) sponsor of NRC studies
- The NRC is not itself part of the government
- The studies are conducted by “ad hoc” committees created specifically in response to a request from a sponsor and cease to exist once the report is delivered
- The study committee reports provide expert, objective advice to the sponsor, usually in the form of findings and recommendations