National Aeronautics and
Space Administration

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Earth Science to Action Strategy Discussion

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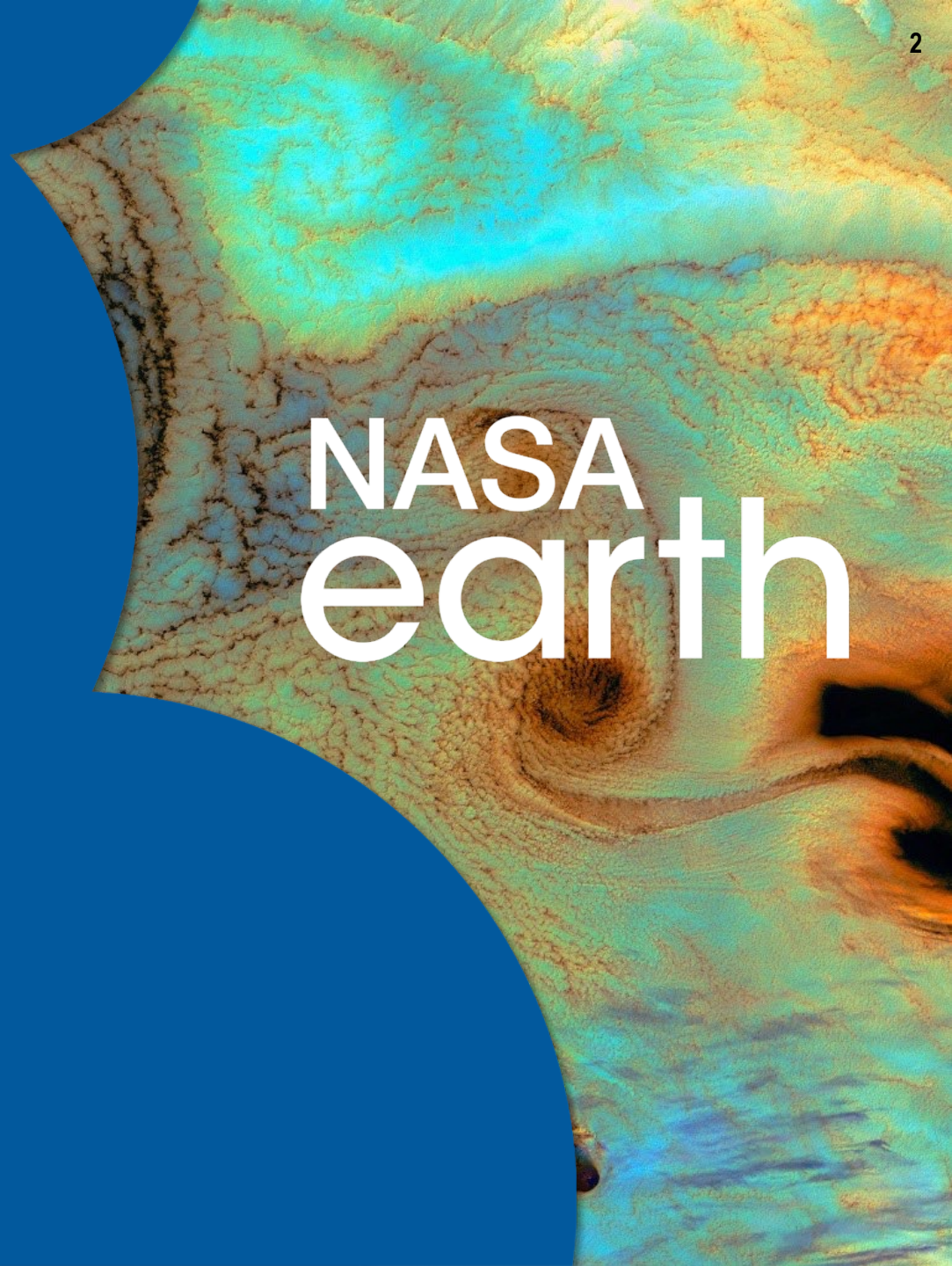
Agenda

01 Background and Context

02 Key Results Discussion



https://science.nasa.gov/earth-science/earth-science-to-action/

Earth Science to Action Strategy

Virtuous Cycle
- User needs inform next iteration of programs, missions and initiatives

Public Understanding & Exchange
- Put more scientific understanding into public sphere
- Deliver applied science to users
- Participate in multi-way info exchange
- Use input to inform subsequent work

Solutions & Societal Value
- Offer models, scientific findings and info through Open-Source Science principles
- Support climate services
- Provide science applications and tools to inform decisions

Earth System Science & Applied Research
- Grow scientific understanding of Earth's systems
- Develop predictive modeling for science applications and tools to mitigate, adapt and respond to climate change

Foundational Knowledge, Technology, Missions & Data
- Technology innovation
- Earth observations missions
- Data collected from space, air and ground

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Development and Rollout

- Strategy developed with HQ and Center Earth Science leadership team Spring 2023 – Spring 2024
  - Released Spring 2024
    - Joint HQ/Centers team held roadshows at each Center
    - Held Community Forum to discuss strategy with the community
- First update to ESD's strategic plan since 2003
- Upcoming events to discuss aspects of implementation with the community starting today, at AGU

Objective 1

Holistically observe, monitor and understand the Earth system

Key Result 1.1: The most advanced Earth observing system in the world

Key Result 1.2: Cutting-edge technology

Key Result 1.3: Integrated and trusted Earth system data

Key Result 1.4: Scientific breakthroughs to better understand Earth

Objective 2

Deliver trusted information to drive Earth resilience activities

Key Result 2.1: Models that capture the intricacies of the Earth system

Key Result 2.2: Co-designed solutions and tools to support users

Key Result 2.3: Science-based information we can trust and act on

Key Result 2.4: Promotion of Earth information as a national asset

Discussion for each Key Result:

Key considerations for success

Advice on engaging the community

Key Result 1.1

The most advanced Earth observing system in the world

We will develop a holistic and integrated system of observing systems. Working with partners nationally and internationally in a variety of areas, we will develop and sustain a comprehensive global Earth System Observatory to provide critical parameters for probing Earth processes, their monitoring, and understanding their changes. We will increase capability, enhance performances, and retain world leadership in advancing state-of-the-art Earth system sensing, while ensuring continuity of critical environmental records.

Key Result 1.2

Cutting-edge technology

We will pursue a set of innovative technology demonstrations and continuously modernize our assets. We will test and mature new technologies, data systems, and innovative techniques to enable new, cost-effective, and better science or more efficient processing, as well as more advanced observing systems and infrastructure. We will create a mechanism to support ideas to promote innovation to explore, discover, and break barriers.

Key Result 1.3

Integrated and trusted Earth system data

Working with partners nationally and internationally, we will integrate data from various sources and calibrate and validate them to provide a reliable source of consistent and trusted Earth system data and to simultaneously facilitate a seamless continuity of critical observations. For this purpose, we will build an agile infrastructure – IT and science – to allow various sources of data and observations to be combined and curated. This will contribute to building a representation of the Earth system with all its components that will satisfy the needs of a broad user base and encompass a range of disciplines. When appropriate, this consolidation and fusion of various parameters will employ modern and innovative approaches (such as Artificial Intelligence/Machine Learning) and will enable new applications and generate added-value information to benefit society and the economy. To increase efficiency and cost effectiveness, we will also consolidate, when feasible, the ground processing and dissemination mechanisms of the different missions, simultaneously ensuring free and open access and wide availability of the data.

Key Result 1.4

Scientific breakthroughs to better understand Earth

We will advance Earth science knowledge by addressing the various science questions posed by the science community, through formalized and structured processes, such as the decadal surveys and other community efforts. Similarly, we will address new and emerging science questions that are responsive to the needs of stakeholders and users, and those resulting from co-developing applications with stakeholders in different disciplines. We will reflect this acquired knowledge in consolidated models and tools to accelerate its use in various areas. This advanced knowledge includes the need to understand the complex interconnectedness of the various Earth system components, including human and other relevant systems, and their complex feedback mechanisms. It also includes seeking understanding of specific environmental phenomenology (such as cloud convection, air composition and chemistry, water cycle, energy cycle, etc.), as well as interdisciplinary topics, and understanding causative linkages and cascading effects of different processes in various thematic areas.

Key Result 2.1

Models that capture the intricacies of the Earth system

We will develop an advanced and integrated end-to-end Earth system modeling capability. We will maintain, enhance, and develop the necessary models with expanded scope to provide the information needed to support Earth resilience activities. We will leverage modern observing, computing, modeling, and information system infrastructure and techniques to achieve efficiency and enhance resolutions, without degradation to scientific value. These models will serve as a mechanism to leverage the vast scientific knowledge, such as mentioned in Key Result 1.4 and acquired from observations and research, including about the complex interconnectedness of different Earth system components. We will work with partners nationally and internationally to jointly leverage resources, science assets, and expertise and will particularly use satellite and other observations, such as those developed as part of KR1.3, to initiate, validate, adjust, and overall improve the quality of the modeling enterprise. We will build and apply these end-to-end models of the Earth system to predict future changes and flexibly answer what if scenarios, and therefore develop the capability to support the scientific evaluation of mitigation and adaptation activities and help with risk assessment and other climate resilience frameworks.

Key Result 2.2

Co-designed solutions and tools to support users

We will co-develop user-centered solutions options and solutions-oriented applications and support tools with various partners and stakeholders. This will encompass providing science-based information and designing solutions options, as well as easy-to-use, interactive, and solutions-oriented tools to support decision- and policy-making. We will develop and demonstrate applications with benefits in various thematic areas. We will build these tools based on modern efficient techniques, leveraging, when appropriate, the advanced modeling capabilities in KR2.1, and with the aim of enhancing scale and speed of execution. We will construct and demonstrate these realistic science-based systems to provide the foundation for actionable information in critical environmental areas. These tools and solutions will be tailored to specific needs and are also expected to support the economy and its infrastructure.

Key Result 2.3

Science-based information we can trust and act on

We will provide trusted, actionable, and science-based information. Engaging and working jointly with various partners, nationally and internationally, we will generate fit-for-purpose, trusted information combining environmental observations, past and current, with other datasets and with model projections generated from various sources, including from space, airborne platforms, or ground-based systems. To build this information, we will use integrated data from multiple sources, as referred to in KR1.3, and will use models, tools, and co-developed solutions, as referred to in KR2.1 and KR2.2. As part of our engagement with various partners, we will conduct efforts, when necessary, to transition mature products and services into appropriate routine environments. The information will be provided at the relevant temporal and spatial scales and with the needed latency to be useful for different stakeholders and to make it readily available to people, communities, and decision- and policymakers, where and when they need it, to enable them to take action.

Key Result 2.4

Promotion of Earth information as a national asset

We will scale up information sharing, dissemination, and outreach to enhance awareness. We will establish and expand the Earth Information Center (EIC) and will gradually enhance its capabilities and benefits. In this context, we will, for example, increase the topics covered and highlighted by EIC (including the water cycle, biodiversity, greenhouse gases, etc.). EIC will allow increased data accessibility and a centralized, smoother interface with a wide range of users, stakeholders, and decision- and policymakers, as well as the public. EIC will serve as one centralized gateway to providing access to data, information, tools, and solutions. It will serve to collect, and then highlight, test cases and success stories, which in turn will help illustrate the value of Earth science and expand outreach.


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