

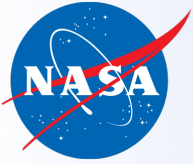
National Aeronautics and  
Space Administration

NASA  
earth

# An Overview of NASA's Earth Science-to-Action Strategy

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National Aeronautics and  
Space Administration

# Agenda

## 1. Context and Drivers

- *Decadal Survey Challenge, Urgency, Complexity and Gaps*

## 2. Strategy Description

- *Vision, Mission Statement, Goal, Objectives and Key results*

## 3. Anticipated Role of LCLUC



# We are at a pivotal moment

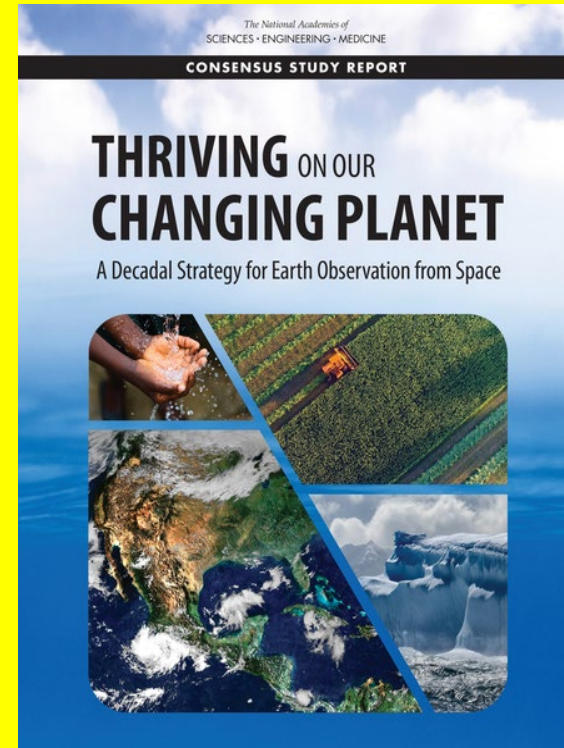
## THE CHALLENGES WE FACE

- Global changes at an accelerated rate
- Non-Linear changes
- Interconnected nature of Earth systems
- Need to Scale Information
- Increased Society Reliance on Technology
- Risks of Cascading Effects and Tipping Points
- Emergence of new, complex societal challenges

## Key National Academies Guidance

“Pursue increasingly ambitious objectives and innovative solutions that enhance and accelerate the science/applications value of space-based Earth observations and analysis to the nation and the world in a way that delivers great value, even when resources are constrained, and ensures that further investment will pay substantial dividends.”

*Thriving on Our Changing Planet: A Decadal Survey for Earth Observations from Space, 2017*



## OPPORTUNITIES FOR A GOLDEN AGE:

- Quality and diversity of Earth data (e.g., quantum, ... and compute: AI, DT.)
- Support Earth resilience activities
- Engage all nations
- Commercial sector for data buy
- Engage academia, philanthropies, etc as partners

**Challenges  
(to address)**

**Opportunities  
(to leverage)**

The NEW NASA STRATEGY, IS DESIGNED TO INCREASE IMPACT OF OUR WORK AND MEET THE URGENCY OF THE CHALLENGES BEFORE US.

**For more Info: <https://science.nasa.gov/earth-science/earth-science-to-action/>**

# Why are we doing this? Examples of Gaps

- ❖ Need significant scaling of Earth science tools/applications to apply in other regions and to relevant stakeholders.
- ❖ Some of Earth observations require increases in temporal, spatial sampling to be actionable.
- ❖ Information needs to be integrated from multiple sources and curated for specific purposes.
- ❖ Science questions remain to be addressed through research to enhance our understanding.
- ❖ Better understanding of the interconnected Earth system, including human and feedbacks
- ❖ Better appreciation for the cascading effects of interconnected processes.
- ❖ Coalesce vast amount of existing knowledge and more readily reflect it into end-to-end tools and systems that efficiently support decision and policy-making strategies.

An aerial topographic map of a mountainous region, likely the Colorado Rockies, with a network of rivers. The map is overlaid with semi-transparent blue shapes that highlight specific river segments and confluences. The background is a mix of green and brown, representing vegetation and elevation. The word "Strategy" is centered in a dark brown horizontal band.

# Strategy

# OUR VISION

A thriving world, driven by trusted, actionable Earth science

# OUR MISSION

Compelled by our planet's rapid change, we innovate and collaborate to explore and understand the Earth system, make new discoveries, and enable solutions for the benefit of all

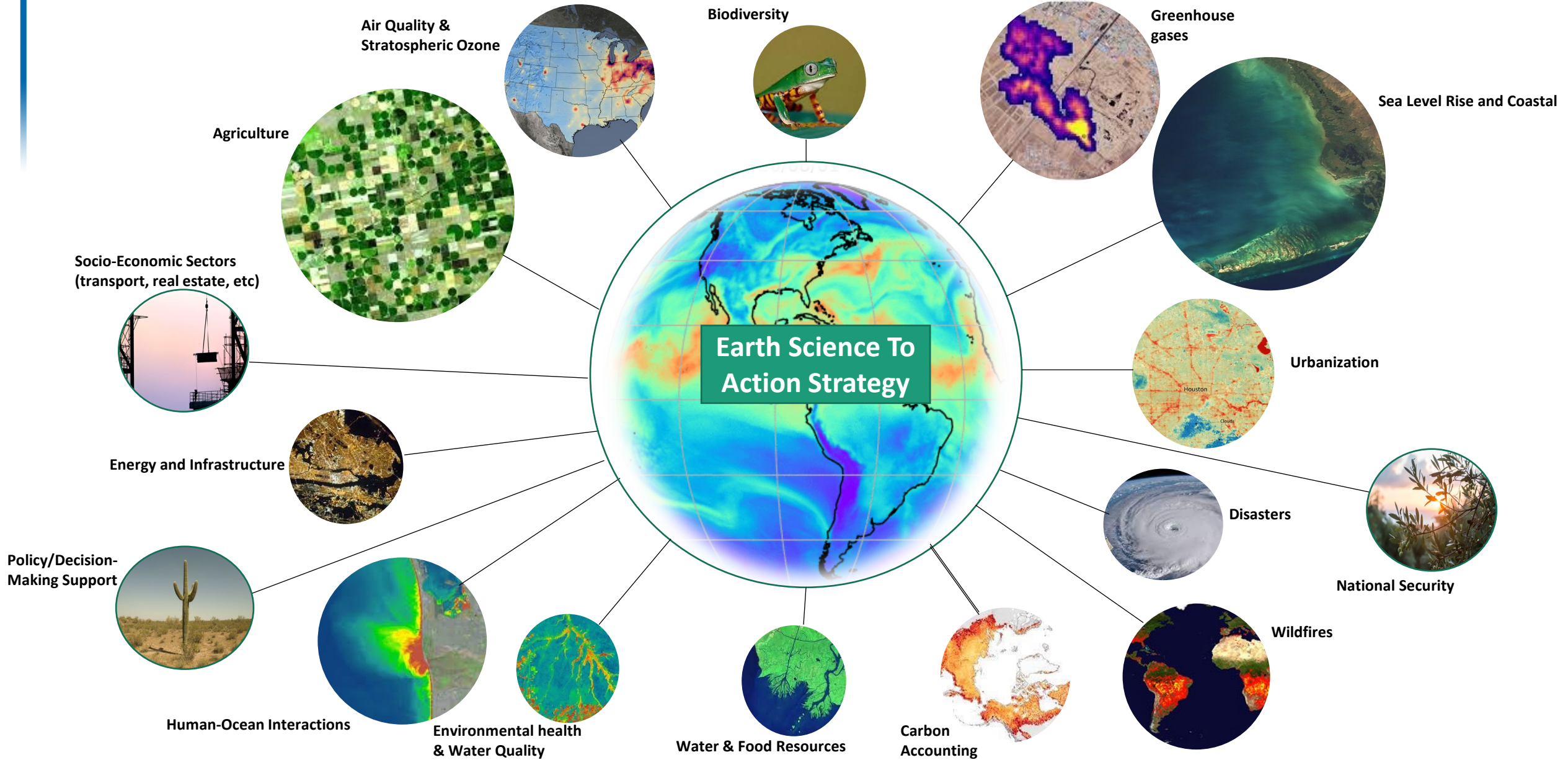
Use of the word *thriving* in this vision was chosen carefully and to be consistent with how it is defined in the National Academy of Science, Engineering, and Medicine report [2018].

*“It encompasses economic success, intellectual progress, societal prosperity, personal well-being, scientific exploration, and much more.”*

**Sense of Urgency and time constraint**

# Focus Areas

The strategy identifies 16 systems that sustain the well being of humanity:



# STRATEGIC GOAL

**Within a decade, we will advance and integrate Earth science knowledge to empower humanity to create a more resilient world.**







# 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

# NASA Core Values

# Areas of Emphasis for Earth Science

We adopt and adhere to the fundamental five NASA core values:

- **Safety:** NASA's constant attention to safety is the cornerstone upon which we build mission success.
- **Integrity:** NASA is committed to maintaining an environment of trust, built upon honesty, ethical behavior, respect, and candor.
- **Inclusion:** NASA is committed to a culture of diversity, inclusion, and equity, where all employees feel welcome, respected, and engaged.
- **Teamwork:** NASA's most powerful asset for achieving mission success is a multidisciplinary team of diverse, talented people across all NASA Centers.
- **Excellence:** To achieve the highest standards in engineering, research, operations, and management in support of mission success, NASA is committed to nurturing an organizational culture in which individuals make full use of their time, talent, and opportunities to pursue excellence in conducting all Agency efforts.

Augmenting NASA's core values of integrity, teamwork, and excellence, Earth science emphasizes three additional values critical to mission success:

## • Trustworthiness:

*Our work is undertaken with transparency and attention to detail and with quality-control processes in place to ensure a high level of credibility and quality. We engage with our partners, users, and stakeholders, as well as the public, with a sense of responsibility, truthfulness, and humility to establish and maintain social trust. We share all aspects of what we do (data, science, knowledge, methodologies) to the maximum extent possible to ensure high confidence in our findings.*

## • Collaboration:

*We work collaboratively, we co-develop with our partners and users, and reach out across agencies, across sectors, nationally and internationally, to achieve maximum value and build added-value partnerships.*

## • Innovation:

*We initiate and encourage activities with a potential to improve our mission, even if the end result is uncertain. We take thought-out risks to ensure we can explore bold and innovative ideas, keep us at the edge of science and technology, and allow us to advance the state of the art and remain an innovation hub for Earth science.*

# Guiding Principles (for Strategy Implementation)

## Guiding Principles

### 1. Amplify Impact and Augment our Capabilities Through Enhanced Partnerships:

- To increase the value of Earth observations overall, and to amplify the benefit to humanity of the Earth science and actions developed in NASA, we will build capacity through an extensive and diverse set of partnerships –traditional and new-. In other words: scale up, build strong partnerships, and be user-centered when developing solutions and actions.
- Our partners will include National and International governmental agencies, academia, non-governmental and international organizations, the private sector, and philanthropies. We will reinforce our existing partnerships and align them with the strategic objectives, and seek new ones, including with emerging space-faring nations and institutions seeking to be active in Earth Science.
- When appropriate and cost-effective, we will leverage existing value-amplifying initiatives or initiate new ones if necessary. These initiatives could be National or International.
- This multivariate partnership approach will allow us to achieve both depth and wide breadth in our impacts and support to humanity while being cost-effective.
- NASA Earth Science will maintain its role as a strong participant in interagency, international community and a major player at high-level organizations and high-impact initiatives

### 2. Engage a Diverse Workforce and the Wider Earth Science Community:

- Enable an inclusive Earth science community that attracts and retains top talent and positions NASA to address the challenges (and leverage the opportunities) of the future
- Implement approaches to coalesce the various Earth science communities across disciplines and across academia and the private sector, to achieve the strategic goal and objectives of ES2A
- Amplify the value of Earth Science through global-reaching Training, Education, Outreach and Capacity Building
- Nurture, continue to rely on a vibrant research community to leverage its expertise and dynamism.

### 3. Use Balanced Approach when Competing Factors Exist:

- Balance investments between innovation and sustainability/continuity of critical records
- Balance the need for open and fair competition and the need to promote a collaborative environment.
- Balance the pursuit of and investment in new developments, when necessary, with leveraging what already exists through collaborations and cooperations with partners, to achieve maximum value and avoid redundancy of investments across the global Earth science enterprise.
- Keep a broad view of the various Earth system components and their interconnected nature, their feedbacks, cascading impacts. An area where many questions remain.
- Incentivize collaboration across disciplines and among urgent science questions.
- Balance and enable activities across the spectrum of science, applications, and translational research.
- Consider end-to-end initiatives approaches that cross boundaries of disciplines, sectors, themes, etc.

### 4. Encourage Innovation to Maintain Cutting-Edge Capabilities:

- Regularly review, assess, modernize infrastructure and science assets via transition/upgrade process.
- Develop tools, information with cross-cutting applicability and scalability, to ensure maximal value
- Promote open data, open-source science to leverage/enable community's creativity and innovation
- Maintain NASA Leadership in science and technology excellence by building on heritage in understanding the Earth system, and striving for excellence in technology, sensors and satellites design, in research and understanding of science and applications and developing new and emerging capabilities

### 5. Ensure Robustness and Resilience in our Processes:

- Commit to have missions and Flights be delivered on time and on budget through sound planning approaches
- Account for the rapidly changing landscape in the Earth Science by implementing processes that ensure agility, innovation and cost-effectiveness.
- Implement strategies to make balanced, nimble decisions. This includes mechanisms for regularly assessing return on investment and potential new opportunities, through active engagement with NASA centers and U.S. Government agencies, and in consultation with partners, stakeholders, and the broader Earth science community.

# NASA Earth Science-To-Action Strategy: Stakeholders & Partners





# Anticipated Role of LCLUC



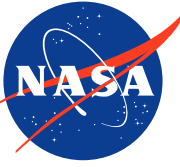
# Earth as a Complex Interrelated System



- LCLUC activities are globally distributed and with global/regional/local impacts.
- LCLUC activities help observe, monitor and understand the Earth system
- LCLUC Activities connect to multiple components of the Earth System (hydrology, air quality, wildfire, agriculture, urban, socio-economic and human components, etc)
- LCLUC activities lead to new knowledge and answer new questions
- LCLUC activities and findings enhance modeling capabilities

# Earth Science to Action Strategy

(Anticipated role of LCLUC Activities)



**Vision:**  
A Thriving World Driven by Trusted,  
Actionable Earth Science

## Strategic Goal:

**Within a Decade, we will Advance and Integrate Earth Science Knowledge to Empower Humanity to Create a more Resilient World**

### Objective 1:

Holistically Observe, Monitor and Understand the Earth System

#### Key Result 1:

A Holistic and Integrated System of Observing Systems

#### Key Result 2:

A set of Innovative Technology Demonstrations and Continuous Modernization of Assets

#### Key Result 3:

An Integrated, Calibrated, Validated and Trusted Earth System Data

#### Key Result 4:

An Advanced Earth Science Knowledge



### Objective 2:

Deliver Trusted Information to Drive Earth Resilience Activities

#### Key Result 1:

An Advanced Integrated Earth System End-To-End Modeling Capability

#### Key Result 2:

Users-Centered Solutions Options and Solutions-Oriented Applications and Support Tools

#### Key Result 3:

Trusted, Actionable and Science-Based Information

#### Key Result 4:

Initiatives to Increase Visibility of Earth Information and Promote it as a National Strategic Asset

## Implementation Guiding Principles to:

- (1) Amplify Impact and Augment our Capabilities Through **Enhanced Partnerships**,
- (2) Engage a Diverse **Workforce** and the Wider Earth Science Community,
- (3) Use **Balanced Approach** when Competing Factors Exist,
- (4) Encourage **Innovation** to Maintain Cutting-Edge Capabilities,
- (5) Ensure **Robustness and Resilience** in our Processes



**“We undertake this challenge and opportunity with a sense of urgency and responsibility. I invite you to join us.”**

*Karen St Germain, NASA Earth Science Division Director,  
Earth Science To Action Strategy 2024-2034, March 2024.*



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