OAR Strategy 2020-2026

Deliver NOAA's Future

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Introduction

Message from Craig McLean

The National Oceanic and Atmospheric Administration (NOAA) was created to include a major Line Office, Oceanic and Atmospheric Research (OAR), focused on determining the relationship between the atmosphere and the ocean. That task has been at the core of OAR's work for the past half century, performed by federal and academic scientists and in the proud company of our other Line Offices of NOAA. Principally a research organization, OAR has contributed soundly to NOAA's reputation as being among the finest government science agencies worldwide. Our work is actively improving daily weather forecasts and severe storm warnings, furthering public understanding of our climate future and the global role of the ocean, and helping create more resilient communities for a sound economy. Our research advances products and services that protect lives and livelihoods, the economy, and the environment.

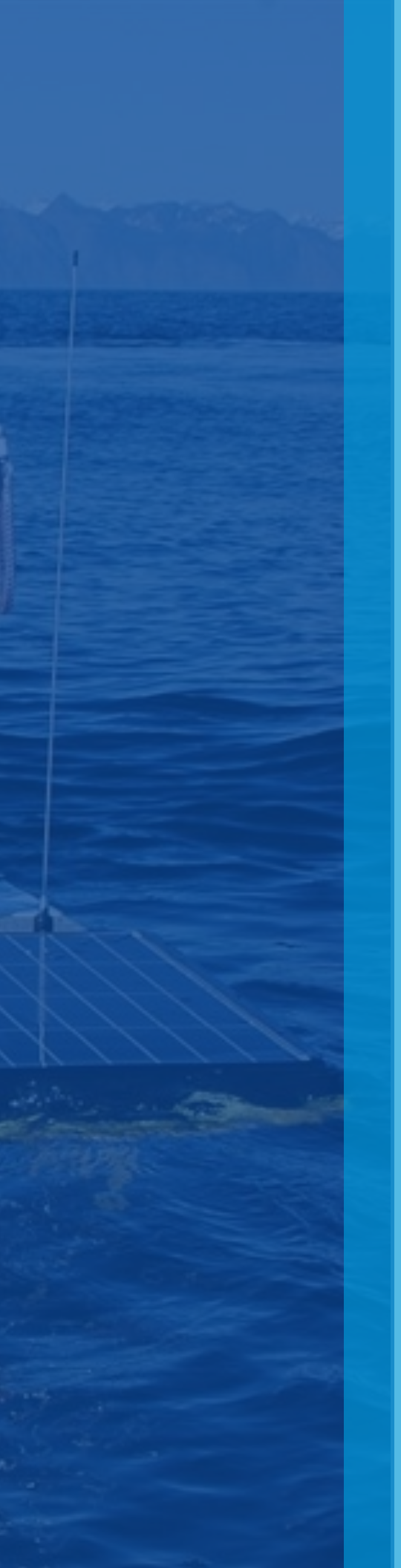
The research landscape of tomorrow will be different from that of today. There will likely be additional contributors to the sciences we study, including more involvement from the private sector, increased philanthropic participation, and greater academic integration. There will always be a unique role for long-term research exclusively dedicated to NOAA's diverse missions, and that is OAR's sole job. Our science is foundational to the core NOAA mission and is aligned with Congressional and NOAA priorities of reducing impacts to extreme weather and water events, exploring and understanding the ocean and maximizing the sustainable economic contributions of the American blue economy, understanding the changing climate, and advancing innovation. We do this collaboratively, working closely with the NOAA Line Offices we serve, and with our partners in government, academia, and the private sector. We deliver NOAA's future.

This 2020-2026 Strategy outlines the broad future for OAR, balancing the continuation of our past work and the future needs of the agency. As we transform for the future, we are driving new behaviors across our organization and setting a research agenda to solve the public's most pressing environmental challenges. Our current workforce is world-class, and we must maintain the ability to attract and retain leading scientists and professionals.

This document outlines our strategies, goals, and objectives, targeted to embrace the future. We will meet these ambitions, and will do so in the dedicated loyalty of serving the needs of the American people through sound science, a focused mission, collaborative partnerships, and achieving results.

Craig McLean

Assistant Administrator,
Oceanic and Atmospheric Research



Vision

Deliver NOAA's Future

Conduct and deliver world-class science dedicated to the NOAA mission of science, service, and stewardship.

Mission

Research, Develop, Transition

Conduct research to understand and predict the Earth system; develop technology to improve NOAA science, service, and stewardship; and transition the results so they are useful to society.

Values

Commit to Diversity

OAR is enriched by diverse perspectives, celebrating each other's unique experience and expertise.

Explore to Solve

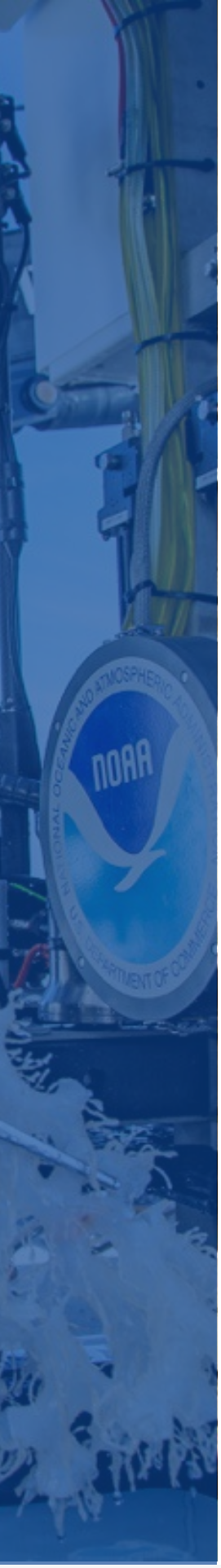
OAR is dedicated to advancing science, making discoveries, and investing in the end-to-end process to deliver results.

Uphold Scientific Integrity

OAR is resolute in its commitment to scientific truth and how it is conveyed.

Engage from Local to Global

OAR is involved locally and internationally to understand the changing environment and inform the public.



Organization

The Office of Oceanic and Atmospheric Research (OAR) provides the research foundation for understanding the complex systems that support the planet. Working in partnership with other organizational units of the National Oceanic and Atmospheric Administration (NOAA), a bureau of the Department of Commerce, OAR enables better forecasts, earlier warnings for natural disasters, and greater understanding of the Earth system. Home to hundreds of world-class scientists and leading professionals, OAR conducts pioneering research, from the earliest stages of conception through transition. OAR provides unbiased, innovative science that supports better management of the environment, both nationally and globally.

OAR's people, and the intellectual capability they provide, are its greatest asset. OAR's delivery of rigorous research and pioneering programs have established the organization as a leader of environmental science. As complexity grows and the pace of change and advancement in environmental science increases, OAR's world-class workforce will continue to be important to the management of weather, water, and climate issues.

The primary components of OAR are:

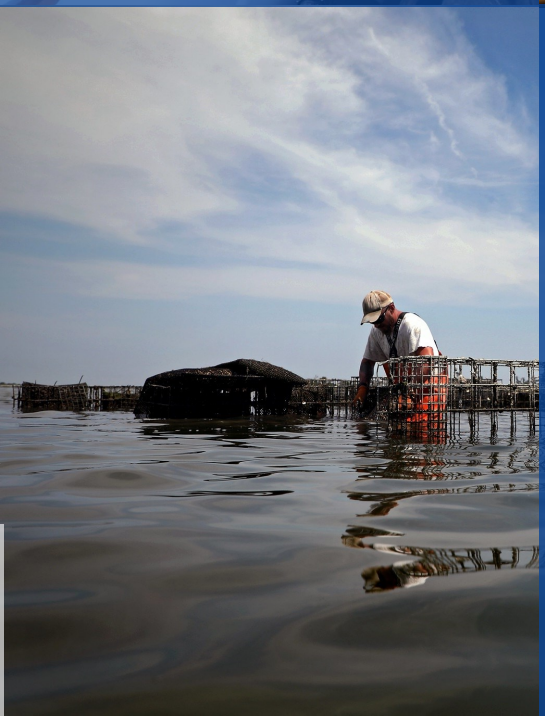
Laboratories conduct an integrated program of research, development, and services to improve the understanding of the Earth system and describe and predict changes occurring in them. The laboratories and their field stations are located across the country and around the world.

Program offices select, fund, and manage high-priority, competitive research that includes assessments, decision support, outreach, education, and capacity-building activities. Program offices support and foster collaboration within NOAA's labs and across the environmental science community to advance understanding of the Earth system and foster the application of this knowledge in risk management and resilience efforts.

External partnerships are essential for achieving NOAA's mission and support the delivery of world-class science. Partnerships include, but are not limited to, NOAA Cooperative Institutes, National Sea Grant College Program, state and local governments, academia, and the private sector.

For more information on OAR, please visit: https://research.noaa.gov/


NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE



OAR's Changing Operating Landscape

The changing planet has increased stress on resources that Americans rely on for food, employment, recreation, and security and the Nation has more at risk from natural hazards. As a result, more people are impacted by NOAA science than decades ago and the importance and magnitude of the management decisions being made upon OAR science is greater. Simply put, the stakes are higher than before, and they will be even higher in the future. In addition, the dynamic pace of innovation, the number of connections within networks, and the societal perceptions of the value of science are impacting the environmental science community in new ways. As OAR's operating landscape changes, complex challenges and new opportunities will arise. Based on the increasing complexity of the operating environment and the escalating importance of NOAA's mission, OAR undertook a series of efforts to scan the horizon, look to the future, and shape its strategic direction.

Beginning in September 2017, OAR studied the challenges and opportunities the organization will face in the next 20 years. Based on scenario planning and external analysis of the changes in the environmental science community, OAR identified six major factors that would impact its strategic direction and its delivery of world-class science.

Every level across the organization had a role in developing these six factors, as well as OAR's goals and objectives. OAR leadership engaged every lab, program, and staff office to gather expertise, gain insight, and set the foundation for future success. This effort provided OAR with a perspective on the changing nature of its operating environment and how to remain relevant. The following six factors will impact OAR's future operating environment and its ability to remain a leader in the environmental science community:

We need OAR to look into the future. They need to keep us on the edge of what we need to do for public safety. – NOAA stakeholder

Society's perception of the natural environment

Public perception, understanding, and demand will influence attention, or lack thereof, on the environment and the environmental science community.

Integrated approaches and skill sets

Problems are increasingly complex, requiring interdisciplinary solutions. Diverse teams and interdisciplinary science will be increasingly valuable.

Shifts in funding

The investments made by industry and foreign government in research continue to outpace those of the U.S. government. Industry and foreign governments' focus on environmental science continues to grow in response to societal demands.

On-demand culture

The expectation of immediacy is driving societal demands, workforce desires, and industry behaviors. This need for instant results may affect what science is conducted; however, it will affect how the science is packaged and communicated.

Technology is lowering barriers to entry

Advances in technology have led, and will continue to lead, to new and increased participation in the environmental science community.

Increased competition for STEM talent

There are more competitors (domestically and globally) seeking to recruit from the limited U.S. science, technology, engineering, and mathematics (STEM) talent pool.

These changes in the operating landscape will influence the environmental science community and present challenges and opportunities for OAR. When taken together, these six factors drive three major impacts for OAR:

1. New sources of funding, heightened participation, and increased commercial presence are changing "who" is executing both basic and applied research.
2. A workforce with interdisciplinary skill sets will be increasingly valuable and sought by high-paying commercial organizations.
3. Expectations of immediacy will continue to put a strain on long-term science and increase the importance of how the value of the science is communicated.

Strategic Approach

In response to OAR's changing operating landscape and the specific factors influencing the environmental science community, OAR has developed five strategies that will help deliver NOAA's future.

These strategies support the delivery of OAR's goals and objectives, as well as the advancement of NOAA's four science and technology focus areas: unmanned systems, artificial intelligence, omics, and cloud computing. Established to position OAR for future success, the following five strategies will enable the continued delivery of world-class science and the fulfillment of NOAA's mission.

1. Deliver world-class science together

OAR will operate as an integrated, connected, and aligned organization with a shared vision to deliver world-class products. Leadership will prioritize mission-driven research agendas to drive the delivery of NOAA's future. Recognizing that OAR cannot succeed alone, OAR will collaborate with other NOAA Line Offices, government, academia, nonprofit, industry, and international partners.

2. Develop the next-generation workforce

OAR will grow the leaders of tomorrow. With a focus on diversity and inclusion, OAR will broaden its talent pool to reflect multidisciplinary skill sets. OAR will develop leadership and management skill sets across the workforce to prepare for succession planning and the demands of the future.

3. Prioritize mission-relevant research

OAR will continue to contribute to fulfilling NOAA's vision of resilient ecosystems, communities, and economies. OAR will anticipate future scientific and operational needs, while delivering on current expectations. To strengthen and scale the relationship between OAR and the other Line Offices, OAR will leverage communication and process improvement experts, social scientists, and other relevant subject matter experts.

4. Strengthen internal and external collaboration

OAR will leverage the breadth of expertise across OAR, NOAA Line Offices, and external domestic and international communities to improve mission effectiveness. OAR will identify and improve processes and structures that facilitate stronger and more consistent collaboration across the organization, expanding the use of existing tools and forums. OAR will establish a standard approach for partnerships to maximize the value of each relationship, promote a unified message, and accelerate shared objectives.

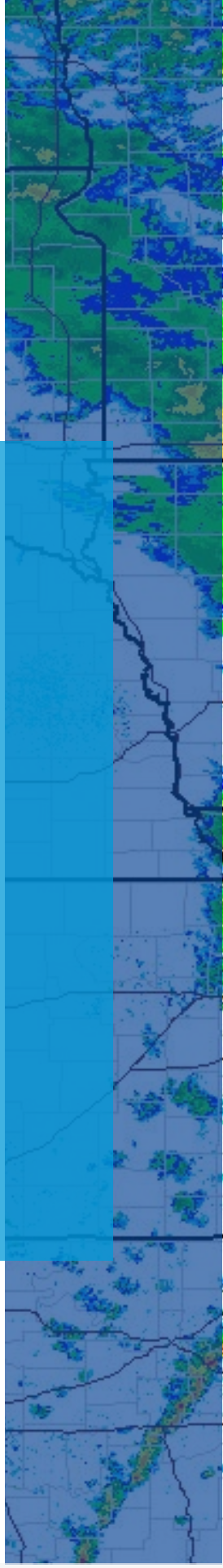
5. Leverage new technology and advance computing capability

OAR will engage the external community to maintain awareness of new technology and explore innovative ways to acquire and use it. OAR will work across NOAA to develop a requirements-based approach to computing, accelerating its adoption and investing in its infrastructure to advance environmental modeling and achieve next-generation research.

Our work is driven by the institutional framework in which we live – and by NOAA. We do what NOAA needs, from research to operations. – OAR Laboratory

Goals and Objectives

Four goals reflect what OAR desires to achieve, where to focus activities, and, ultimately, how to improve the organization's ability to deliver NOAA's future. The objectives, nested under each goal, are the areas of focus needed to help OAR achieve its goals.



1 Explore the Marine Environment

Increase knowledge of the oceans, coastal areas, and Great Lakes to support resource management and public awareness.

2 Detect Changes in the Ocean and Atmosphere

Produce, analyze, and interpret observation records to understand the Earth system and inform the public.

3 Make Forecasts Better

Improve accuracy, precision, and efficiency of forecasts and predictions to save lives and property and support a vibrant economy.

4 Drive Innovative Science

Cultivate and deliver mission-relevant research to lead the environmental science community.

GOAL 1

Explore the Marine Environment

Increase knowledge of the oceans, coastal areas, and Great Lakes to support resource management and public awareness.

1.1 Map and characterize the deep ocean frontier

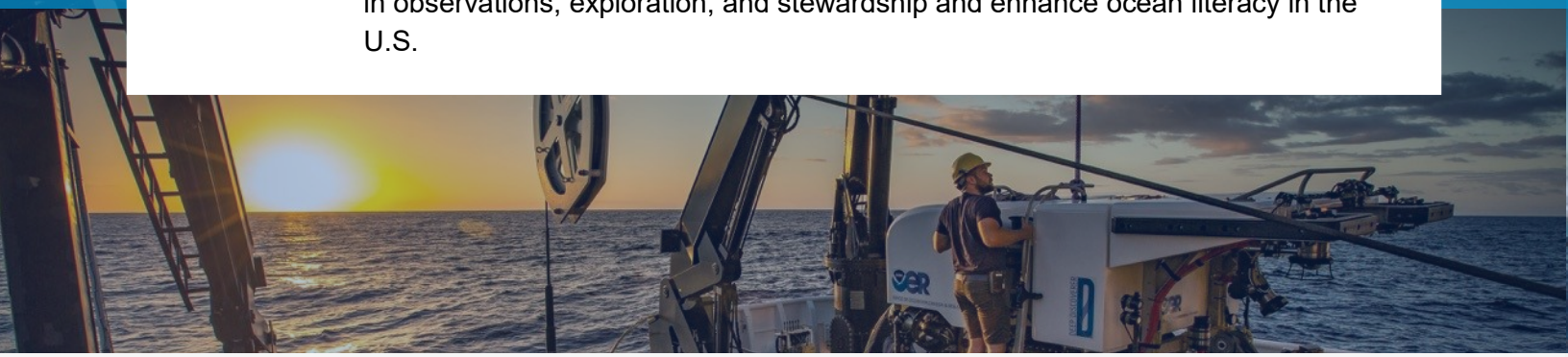
Explore the deep portions of the U.S. Exclusive Economic Zone (EEZ) and beyond to discover and inform decision making regarding resources. Coordinate and partner with others using a variety of characterization methods and techniques to acquire data for environmental, physical, and biological parameters. Develop a catalog of standard measurements that aid understanding of the resource potential of a location and create high-resolution maps of the seafloor. Provide critical information to evaluate the economic potential within the U.S. EEZ.

1.2 Determine how climate change impacts marine ecosystems, coastal communities, and the global ocean system

Integrate physical, chemical, biological, ecological, geological, and compositional processes and observations to improve predictions of the marine ecosystem. Expand the knowledge base of how extreme events and changes in the atmospheric and oceanic conditions are affecting the marine environment.

1.3 Communicate the value of oceans, coasts, and Great Lakes

Provide marine environmental data for services and tools that inform decisions, policies, and resource management. Communicate value to stakeholders by conducting economic evaluations, leveraging established networks, and creating new communities of practice. Engage the public to increase citizen participation in observations, exploration, and stewardship and enhance ocean literacy in the U.S.



GOAL 2

Detect Changes in the Ocean and Atmosphere

Produce, analyze, and interpret observation records to understand the Earth system and inform the public.

2.1 Sustain and optimize observation system management and use

Maximize the value of the observation portfolio by making observing systems more efficient and environmentally sustainable. Establish criteria to assess current observation systems and sunset those that do not meet criteria. Encourage the development of integrated observing strategies within, and external to, NOAA.

2.2 Identify and address gaps in observation requirements needed to understand causes of variability and change

Assess the current suite of observations and modeling capabilities to identify gaps and prioritize needs. Improve understanding, forecasts, applied knowledge, and predictions in regions of significant change and for high-impact events. Test and develop observation technologies and capabilities through partnerships and/or research efforts to better address these needs in the coming decade.

2.3 Increase ability to access and use Earth system data

Leverage technologies and approaches to share relevant information within OAR, across NOAA, and throughout the external community to heighten understanding of the Earth system, the management of its resources, and the effects on society. Engage with stakeholders early and regularly throughout research and development to understand user requirements, needs, and expectations for the interoperability and usability of observational data. Deliver informational products that inform decision making.

GOAL 3

Make Forecasts Better

Improve accuracy, precision, and efficiency of forecasts and predictions to save lives and property and support a vibrant economy.

3.1 Develop interdisciplinary Earth system models

Develop models that reflect the Earth system and the intersecting human, ecosystem, and environmental factors as an integrated system. Cutting across disciplines and specializations, encourage the growth of innovative model components and new model applications. Develop and operate next-generation Earth system models using a community-based approach in concert with advances in high-performance computing. Enhance data assimilation and modeling across spatial and time scales. Conduct value-driven assessments of models and sunset models that do not meet current or future NOAA requirements.

3.2 Design tools and processes to forecast high-impact weather, water, climate, ocean, and ecosystem events

Invest in the development of tools, technologies, and processes to advance models and increase the relevancy of forecasts. Improve the capability to understand observation and forecast uncertainty and better communicate the uncertainty.

3.3 Transition science that meets users' current and future needs

Work with NOAA Line Offices and stakeholders to define requirements for future science and operational needs. Integrate social science early to understand societal factors, account for stakeholder behavior, and design tools and products that meet end-user needs and expectations.

GOAL 4

Drive Innovative Science

Cultivate and deliver mission-relevant research to lead the environmental science community.

4.1 Reinforce a culture of innovation and adaptability

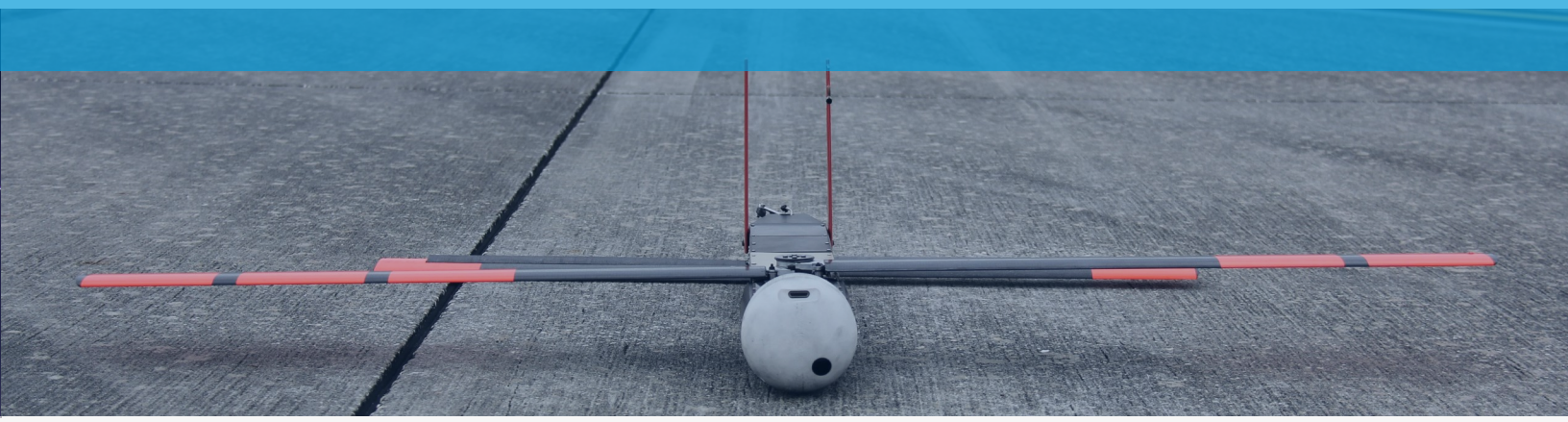
Strengthen processes, governance, and structures that cultivate innovation and the behaviors of innovation. Establish processes for risk acceptance and management across the organization. Create a culture of resilience by fostering an appreciation for risk, failing fast, and creating a structure that is adaptive and flexible.

4.2 Invest in high-risk, high-reward science

Identify new and innovative science and assess the impacts, risks, and opportunities. Lead research on identified high-risk, high-reward areas to advance NOAA's mission and guide the environmental community.

4.3 Accelerate the delivery of mission-ready, next-generation science

Expedite the delivery of mission-ready science, services, and technologies. Prioritize mission-driven science and research agendas, addressing NOAA's most pressing requirements in a relevant, timely manner.



Appendix I: Strategic Mapping

The following figure shows the OAR goals and objectives mapped to the NOAA Research and Development (R&D) Vision Areas 2020-2026.

		NOAA R&D Vision Areas 2020-2026		
		Vision Area 1: Reducing societal impacts from hazardous weather and other environmental phenomena	Vision Area 2: Sustainable use and stewardship of ocean and coastal resources	Vision Area 3: A robust and effective research, development, and transition enterprise
Goal 1: Explore the Marine Environment	1.1 Map and characterize the deep ocean frontier		●	
	1.2 Determine how climate change impacts marine ecosystems, coastal communities, and the global ocean system	●	●	
	1.3 Communicate the value of oceans, coasts, and Great Lakes		●	●
Goal 2: Detect Changes in the Ocean and Atmosphere	2.1 Sustain and optimize observation system management and use			●
	2.2 Identify and address gaps in observation requirements needed to understand causes of variability and change	●		●
	2.3 Increase ability to access and use Earth system data	●	●	●
Goal 3: Make Forecasts Better	3.1 Develop interdisciplinary Earth system models	●	●	●
	3.2 Design tools and processes to forecast high-impact weather, water, climate, ocean, and ecosystem events	●	●	●
	3.3 Transition science that meets users' current and future needs	●	●	●
Goal 4: Drive Innovative Science	4.1 Reinforce a culture of innovation and adaptability			●
	4.2 Invest in high-risk, high-reward science			●
	4.3 Accelerate the delivery of mission-ready, next-generation science	●	●	●

Appendix II: Congressional Mandates

General

NOAA innovative and transformational research: Ocean and Atmospheric Research and Development, 33 U.S.C. §§ 893-893c; The America COMPETES Reauthorization Act of 2010, , 42 U.S.C. § 1861 note.
Cooperative Institutes: Agreements to Aid and Promote Scientific and Educational Activities, 15 U.S.C. § 1540

High Performance Computing

High-Performance computing for applied research in weather prediction, ocean sciences, and computational fluid dynamics: High-Performance Computing Act of 1991, 15 U.S.C. §§ 5501-5528

Climate Research

Climate research:

- **National Climate Program Act**, 15 U.S.C. §§ 2901-2908;
- **Global Change Research Act of 1990**, 15 U.S.C. §§ 2921-2961

International climate research: International Cooperation in Global Change Research Act of 1990, P.L 101-606, 15 U.S.C. §§ 2951-2953
Drought research: National Integrated Drought Information System Reauthorization Act of 2018, P. L. 115-423, 15 U.S.C. § 313d
Arctic research: Arctic Research and Policy Act of 1984, as amended, P.L 101-609, 15 U.S.C. §§ 4101-4111

Weather Research

Weather research:

- **Weather Research and Forecasting Innovation Act of 2017**, 15 U.S.C. § 8501;
- **Weather Service Modernization Act**, Title VII, 15 U.S.C. § 313 note, §§ 701-709;
- **National Oceanic and Atmospheric Administration Authorization Act of 1992**,, Title I, § 108, 15 U.S.C. § 313 note

Water prediction research activities: Inland Flood Forecasting and Warning System Act of 2002, 15 U.S.C. § 313c
Tsunami research: Tsunami Warning, Education, and Research Act of 2017, Title V, 33 U.S.C. § 3201 note
Air chemistry and air quality research: Clean Air Act as amended, 42 U.S.C. §§ 7401-7431

Ocean and Coastal Research

National Sea Grant College Program: National Sea Grant College Program Act, 33 U.S.C. §§ 1121-1131 & National Sea Grant College Program Act Amendments of 2008, 33 U.S.C. § 1121 note.
Aquaculture competition: National Aquaculture Act of 1980, 16 U.S.C. §§ 2801-2810
Ocean Exploration and Research Program: Ocean Exploration, 33 USC § 3401

- **Titanic site activities:** R.M.S Titanic Maritime Memorial Act of 1986, 16 U.S.C. §§ 450rr-450rr-6
- **Exploration and mapping of sanctuaries:** National Marine Sanctuaries Act, 16 U.S.C. § 1431-1445c-1
- **Exploration and mapping of areas of commercial recovery:** Deep Seabed Hard Mineral Resources Act, 30 U.S.C. §§ 1401-1473
- **Mapping activities:** Ocean and Coastal Mapping Integration Act, 33 U.S.C. §§ 3501-3507
- **Unmanned Maritime Systems**: Commercial Engagement Through Ocean Technology (CENOTE) Act of 2018, 33 U.S.C. §§ 4101-4106

Ocean Acidification Program: Federal Ocean Acidification Research and Monitoring Act of 2009, 33 U.S.C. §§ 3701-3708
Ocean observations: Integrated Coastal and Ocean Observation System Act of 2009, 33 U.S.C. §§ 3601-3611
Great Lakes Environmental Research Laboratory: Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387
Harmful Algal Bloom and Hypoxia research: Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2014, 16 U.S.C. § 1451 note)
Coral research activities: Magnuson-Stevens Fishery Conservation and Management Act, as amended, 16 U.S.C. §§ 1801–1891d & Reef Conservation Act of 2000, 16 U.S.C. §§ 6401-6409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