

NOAA R&D: Analysis of the Portfolio and Organization

A Proposal for Engaging the SAB in Reviewing NOAA's R&D Portfolio

Purpose

To examine the current state of NOAA research and development and recommend needed adjustments. Important aspects of NOAA R&D include its strategic alignment, how it functions as a system of innovation, its structure and organization, and its ability to meet new challenges. This study should provide answers to two overarching questions:

- A) **What portfolio of R&D activities does NOAA need to achieve its vision and strategic goals?** What R&D portfolio does it currently have? What are the differences? What changes should be made? What changes take priority?
- B) **How should NOAA's R&D portfolio be organized and managed to achieve its vision and strategic goals?** How is it organized and managed now? What are the differences? What changes should be made? What changes take priority?

Scope

The functional scope of this study should include the continuum of exploratory and innovative activities commonly referred to as "research and development," or "R&D," through which NOAA improves the conduct of its mission. This includes basic research, applied research, development, and deployment activities (per the definitions in NAO 216-115: Strengthening NOAA's Research and Development Enterprise¹), as well as the transfer of knowledge and technology created in the conduct of R&D.

The organizational scope of the study should include the R&D activities of all of NOAA's Line Offices (both its service lines and its central research unit), as well as the R&D activities of external partners that are conducted with NOAA support. NOAA's extended "R&D enterprise" includes internal laboratories, science centers, Cooperative Institutes, grant recipients, and other external partners (e.g., Sea Grant). R&D activities of this enterprise should include activities of R&D itself, as well as those activities to manage them and support them through the distribution of resources.

Background

NOAA's research investments are broad and conducted through a variety of mechanisms. In recent years NOAA has improved how it characterizes the long-term scientific and technical challenges facing the organization and corresponding near term objectives, both in the context of NOAA's overall strategy^{ii, iii} and as a research enterprise^{iv, v}. NOAA also has improved its annual description of its R&D assets and accomplishments for the budget^{vi}, and has taken significant steps to strengthen the management of science across the organization through administrative orders^{vii, viii} and scientific career track documents. As demands continue to grow for interdisciplinary research and cost-effective technology development and deployment, NOAA is facing increasing challenges in managing its research portfolio as a whole and optimizing the development, acquisition, and use of new science and technology. Challenges include:

- Generating and communicating a compelling, coherent vision for NOAA's R&D enterprise;
- Optimizing the composition of its research portfolio through systematic reviews of R&D needs and opportunities that are broad yet mission-focused;
- Using R&D to improve operations and catalyze the development of future mission capabilities;

- Managing and evaluating NOAA's R&D enterprise w.r.t. current and emerging mission requirements;
- Balancing internally conducted and externally acquired R&D;
- Defining the functioning of OAR as a central R&D unit and the scale and composition of R&D conducted in OAR, versus that of NOAA's mission Line Offices; and
- Leveraging collaboration among all of NOAA's principal research elements (e.g., science centers, laboratories) and with the external community.

NOAA has begun to tackle aspects of these challenges in its new planning and evaluation processes (with NAO 216-115, Corporate Portfolio Analysis, development of an ecosystem research agenda, etc.) but needs to approach these topics more holistically, more aggressively, and with greater external input and guidance.

Approach

To answer the two lines of questions in the statement of need above, it is proposed to ask the NOAA Science Advisory Board to conduct a baseline review and portfolio assessment (either directly or by commissioning one or more specialized task teams). While the Administrator would commission the work, it is envisioned the NOAA Chief Scientist supported by the NOAA Research Council would serve as the prime interface to the SAB team, and that the SAB would have the opportunity to draw extensively from the broader NOAA scientific community. Through an internal team, NOAA would provide the baseline description of NOAA's research and respond to the needs of the SAB Team. The work would be accomplished in approximately eighteen months and would be divided into two phases, the first focusing on NOAA's R&D functions and the second on the organizational and managerial mechanisms for executing those functions:

Phase 1: Analyze R&D Portfolio

- 1) Establish Framework: To describe and assess NOAA's R&D portfolio, the SAB should first establish the relevant attributes with which to describe and assess it. Methods for collecting and analyzing information and evaluating progress and performance should also be defined. This step may require literature reviews and consultation with subject matter experts.
- 2) Review Baseline: Per the framework established in step A.1, this step would yield a baseline of NOAA's portfolio of current investments (including linkages to NOAA programs, the academic community and broader stakeholder community). This task would entail SAB review of the baseline R&D portfolio developed by NOAA during the upcoming FY 2014 planning cycle, and would incorporate discussions with the NOAA scientific community as appropriate.
- 3) Assess Needs and Opportunities: Based on the results of steps A.1 and A.2, this step is intended to identify both needs and opportunities for NOAA R&D, in terms of portfolio investments. NOAA has initiated planning for FY 2014 and associated R&D needs that will be provided to the SAB Team. These will include both short and long term needs. It is expected that the SAB Team will draw extensively from NOAA's scientific community, seek additional input external to NOAA, and critically evaluate NOAA's internal portfolio assessment.
- 4) Recommend Changes: Based on current and projected resources and needs and opportunities, the SAB Team is requested to recommend changes in the composition of NOAA's research portfolio. Recommendations should be designated as being of higher or lower priority.

Phase 2: Analyze Organization and Management

- 1) **Establish Framework**: To describe and assess how NOAA conducts R&D, the parameters for organization and management must also be established. Methods for collecting and analyzing information and evaluating progress and performance should also be defined. This step may require literature reviews, consultation with subject matter experts, and comparisons with cognate R&D-intensive organizations with multiple business lines.
- 2) **Review Baseline**: Per the framework established in step 2.a, this step would yield a baseline review of how NOAA is currently organized to manage its R&D portfolio.
- 3) **Assess Needs and Opportunities**: Based on the results of steps 2.a and 2.b, this step is intended to identify both needs and opportunities for NOAA R&D, in terms of organization and management. These will include both short and long term needs. However, it is expected that the SAB Team will seek additional input external to NOAA.
- 4) **Recommend Changes**: Based on current and projected resources and needs and opportunities, the SAB Team is requested to recommend potential adjustments to the organization and management of research. Recommendations should be designated as being of higher or lower priority.

The two phases of this inquiry, and the central questions within each phase, are summarized in the table below:

	Step 1. Establish Framework	Step 2. Review Baseline	Step 3. Assess Needs and Opportunities	Step 4. Recommend Changes
Phase 1: Analyze R&D Portfolio	<i>How do we describe/assess the NOAA R&D portfolio?</i>	<i>What R&D portfolio does NOAA currently have?</i>	<i>What portfolio of R&D activities does NOAA need?</i>	<i>What changes should be made? What changes take priority?</i>
Phase 2: Analyze Organization and Management	<i>How do we describe/assess organization and management of NOAA R&D?</i>	<i>How is NOAA R&D organized and managed now?</i>	<i>How should NOAA's R&D portfolio be organized and managed?</i>	<i>What changes should be made? What changes take priority?</i>

Notional Schedule:

July 2011 SAB	Initial Discussion
September 2011	NOAA preparation of review material, FY2014 planning guidance SAB discussion on teleconference: assess feasibility and requirements
November 2011	SAB formal review of proposal, terms of reference. Decision to proceed
April 2012	Preliminary report on steps A.1, 2 and 3
October 2012	Final report on steps A.1, 2, 3, and 4.
February 2013	Preliminary report on steps B.1, 2 and 3
April 2013	Final report on steps B.1, 2, 3, and 4.

Appendix: Overview of NOAA Strategy

(excerpted from the Next Generation Strategic Plan)

NOAA's Mission: Science, Service, and Stewardship

- *To understand and predict changes in climate, weather, oceans, and coasts,*
- *To share that knowledge and information with others, and*
- *To conserve and manage coastal and marine ecosystems and resources.*

NOAA's Vision of the Future: Resilient Ecosystems, Communities, and Economies

- *Healthy ecosystems, communities, and economies that are resilient in the face of change*

Resilient ecosystems, communities, and economies can maintain and improve their health and vitality over time by anticipating, absorbing, and diffusing change. This vision of resilience will guide NOAA and its partners in a collective effort to reduce the vulnerability of communities and ecological systems in the short-term, while helping society avoid or adapt to long-term environmental, social, and economic changes. To this end, NOAA will focus on four long-term outcomes within its primary mission domains.

NOAA's Long-term Goals:

Climate Adaptation and Mitigation

- *An informed society anticipating and responding to climate and its impacts*

Objective: *Improved scientific understanding of the changing climate system and its impacts*

Objective: *Assessments of current and future states of the climate system that identify potential impacts and inform science, service, and stewardship decisions*

Objective: *Mitigation and adaptation choices supported by sustained, reliable, and timely climate services*

Objective: *A climate-literate public that understands its vulnerabilities to a changing climate and makes informed decisions*

Weather-Ready Nation

- *Society is prepared for and responds to weather-related events*

Objective: *Reduced loss of life, property, and disruption from high-impact events*

Objective: *Improved freshwater resource management*

Objective: *Improved transportation efficiency and safety*

Objective: *Healthy people and communities due to improved air and water quality services*

Objective: *A more productive and efficient economy through environmental information relevant to key sectors of the U.S. economy*

Healthy Oceans

- *Marine fisheries, habitats, and biodiversity are sustained within healthy and productive ecosystems*
 - Objective: *Improved understanding of ecosystems to inform resource management decisions*
 - Objective: *Recovered and healthy marine and coastal species*
 - Objective: *Healthy habitats that sustain resilient and thriving marine resources and communities*
 - Objective: *Sustainable fisheries and safe seafood for healthy populations and vibrant communities*

Resilient Coastal Communities and Economies

- *Coastal and Great Lakes communities are environmentally and economically sustainable*
 - Objective: *Resilient coastal communities that can adapt to the impacts of hazards and climate change*
 - Objective: *Comprehensive ocean and coastal planning and management*
 - Objective: *Improved coastal water quality supporting human health and coastal ecosystem services*
 - Objective: *Safe, efficient and environmentally sound marine transportation*
 - Objective: *Safe, environmentally sound Arctic access and resource management*

NOAA's S&T Enterprise Objectives:

- *A holistic understanding of the Earth system through research*
- *Accurate and reliable data from sustained and integrated Earth observing systems*
- *An integrated environmental modeling system*

Overarching, long-term scientific and technical challenge to NOAA:

- *To develop and apply holistic, integrated Earth system approaches to understand the processes that connect changes in the atmosphere, ocean, space, land surface, and cryosphere with ecosystems, organisms, and humans over different scales.*
 - *Acquire and incorporate knowledge of human behavior to enhance understanding of the interaction between human activities and the Earth system;*
 - *Understand and quantify the interactions between atmospheric composition and climate variations and change;*
 - *Understand and characterize the role of the oceans in climate change, and variability and the effects of climate change on the ocean and coasts;*
 - *Assess and understand the roles of ecosystem processes and biodiversity in sustaining ecosystem services;*
 - *Improve understanding and predictions of the water cycle from global to local scales;*
 - *Develop and evaluate approaches to substantially reduce environmental degradation;*
 - *Sustain and enhance atmosphere-ocean-land-biology and human observing systems;*
 - *Characterize the uncertainties associated with scientific information; and*
 - *Communicate scientific information and its associated uncertainties accurately and effectively to policy makers, the media, and the public at large.*

Citations

- ⁱ National Oceanic And Atmospheric Administration, US Department of Commerce. (2011). *NOAA administrative order 216-115: Strengthening NOAA's research and development enterprise*. Retrieved from http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-115.html
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- ^{viii} Op. cit, *NOAA administrative order 216-115*.

Other References

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