

Procedural Handbook for NOAA Administrative Order (NAO) 216-115A: Research and Development in NOAA

Table of Contents

Chapter 1: Introduction to the NAO for Research and Development at NOAA (NAO 216-115A) and this Procedural Handbook	3
Chapter 2: Planning of the NOAA Research and Development Portfolio.....	8
Chapter 3: Monitoring the NOAA Research and Development (R&D) Project Portfolio	13
Chapter 4: Evaluation of NOAA Research and Development.....	17
Chapter 5: Reporting of the NOAA Research and Development Portfolio.....	25
Appendix 1.1: Glossary for NAO Procedural Handbook	29
Appendix 1.2: References	33
Appendix 1.3: Abbreviations	35
Appendix 2.1: Evaluation Descriptions for Quality, Relevance, and Performance of NOAA Research Programs.....	37
Appendix 2.2: Requirements for Peer Review Panel.....	42
Appendix 2.3: Potential Evaluation Questions for NOAA Portfolio Reviews.....	45
Appendix 2.4: Further Reading.....	46

NAO 216-115A Procedural Handbook: Research and Development at NOAA

Issuing Office: NOAA Research Council, National Oceanic and Atmospheric Administration (NOAA)

Release Date: 2/23/2018

Explanation of Material Transmitted: This Handbook establishes procedures for the planning, monitoring, evaluation and reporting of the NOAA Research and Development (R&D) Portfolio in support of NAO 216-115A

Filing Instructions:

1. **Remove:** NAO 216-115, Procedural Handbook, dated: 03/2014
2. **Insert:** NAO 216-115A, Procedural Handbook, dated: 2/23/2018

Information: For information on the content of the Handbook, contact the issuing office listed above. To access the Handbook Chapters on-line, use this URL: [PENDING]

Chapter 1: Introduction to the NAO for Research and Development at NOAA (NAO 216-115A) and this Procedural Handbook

A. Purpose

This chapter serves as an introduction for aligning the Procedural Handbook to the NAO on Research and Development in NOAA (NAO 216-115A).

B. Policy Background

NAO 216-115A¹ establishes the principles, policies, and responsibilities by which Research and Development (R&D) throughout NOAA can be continually reviewed, evaluated and rebalanced in light of evolving mission needs, thus allowing the Agency to apply a logical approach to its R&D investment portfolio. NOAA will use this Order to strengthen the quality, relevance, and performance of its corporate R&D portfolio.

This Handbook is established in accordance with NAO 200-3² which specifies that NOAA handbooks and manuals containing policy or procedures be elements of the NAO series, providing in-depth coverage of those subjects so complex or extensive as to benefit from coverage in the form of a handbook or manual (NAO 200-3 §4.03.a).

NOAA handbooks and manual s establishing policy and responsibilities shall be authorized by an NAO and shall have the same force and effect as that NAO (NAO 200-3 §4.03.b).

C. NOAA Research and Development (R&D) Framework

The remaining chapters of this Procedural Handbook provide the details needed to implement NAO 216-115A and address Planning, Monitoring, Evaluation, and Reporting of R&D.

1. Planning

The Planning Chapter provides the details needed to ensure the R&D enterprise is relevant to and optimally aligned with the NOAA Strategic Plan, the Strategic Research Guidance Memorandum (SRGM), and other relevant documents as appropriate (e.g., Annual Guidance Memoranda (AGM), Annual Operating Plans (AOP), the Department of Commerce (DoC) Strategic Plan, statutory requirements, etc.). The Planning Chapter sets the context for subsequent chapters; planning is the basis for monitoring, evaluation, and reporting, such that NOAA's understanding of what and how it is doing is based upon an understanding of what it should be doing and why.

2. Monitoring

Consistent with principle of Accountability (NAO 216-115A §3.08), and in line with the need to maintain information on NOAA's R&D portfolio (NAO 216-115A §5.07), the

¹ http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-115A.html

² http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_200/200-3.html

Monitoring Chapter provides the implementation details for collecting and tracking NOAA's R&D project and performance data that are essential to managing NOAA's R&D portfolio, as well as the transition portfolio managed by the Line Office Transition Managers (see NAO 216-105B on Transition of R&D³). Systematic monitoring of NOAA's R&D through a NOAA-wide R&D Database is essential for improving the efficiency and effectiveness of the organization and evaluating and reporting on the R&D enterprise. The data will enable NOAA to make informed investment decisions, optimize the project portfolio, and track advancements in quality, relevance, and performance.

3. Evaluation

The Evaluation Chapter provides the implementation details for conducting the evaluations critical to determining program success in achieving intended outcomes. Evaluations are performance management tools used to inform strategic planning and decision-making regarding execution of future R&D activities, and to report on the performance of NOAA's R&D enterprise. Rigorous independent evaluations are a key resource in determining whether R&D programs are delivering high quality scientific advancements and achieving their intended outcomes. These evaluations will enable policy makers and agency managers to strengthen the Federal science enterprise (OMB, 2009c). NOAA's evaluations comply with Administration (including the Office of Management and Budget (OMB)), Congressional, DoC, and other requirements for evaluation at all levels of execution. The chapter describes periodic evaluations, laboratory/science center/program evaluations, portfolio reviews, and benchmark evaluations.

4. Reporting

The Reporting Chapter provides the details on implementation of NOAA's standardized reporting for its R&D enterprise. This is necessary to document the current state of the enterprise, highlight strategic R&D investment needs for the future, and communicate the return-on-investment and overall benefits to society derived from NOAA's current R&D portfolio. This Chapter also provides implementation guidance for the Chief Scientist's Annual Report (CSAR).

³ http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-105B.html



Figure 1. The cyclical steps of planning, monitoring, evaluation, and reporting are essential to good management of an R&D portfolio.

D. Principles of NOAA Research & Development

The eight principles of NOAA R&D are essential to the successful planning, monitoring, evaluation, and reporting of R&D:

1. Mission Alignment (NAO 216-115A §3.01)
2. Transitioning R&D (NAO 216-115A §3.02)
3. Research Balance (NAO 216-115A §3.03)
4. Partnerships (NAO 216-115A §3.04)
5. Facilities and Infrastructure (NAO 216-115A §3.05)
6. Workforce Excellence (NAO 216-115A §3.06)
7. Scientific Integrity (NAO 216-115A §3.07)
8. Accountability (NAO 216-115A §3.08)

E. Maintenance of the NAO and this Procedural Handbook

1. Schedule

NAO 216-115A and this associated Procedural Handbook will be periodically reviewed and reconfirmed or revised, as needed (NAO 216-115A §5.10). It is recommended that a

review should be conducted no more frequently than once every three years and not less frequently than every 5 years.

2. Responsibilities for Maintenance

The Office of the NOAA Chief Scientist is responsible for preparing and maintaining NAO 216-115A and for answering questions regarding its provisions or subject matter (NAO 216-115A §1.05).

The NOAA Research Council is responsible for developing, reviewing, approving and promulgating this Procedural Handbook (NAO 216-115A §6.02).

F. Responsibilities

The NAO and this Procedural Handbook are intended to strengthen the corporate nature of R&D, and as such require NOAA-wide participation and sharing of information in the execution of this guidance.

1. The NOAA Research Council

The NOAA Research Council will assist the NOAA Chief Scientist in execution of this NAO and the Assistant Administrator (AA) for the Office of Oceanic and Atmospheric Research (OAR) will provide additional support for execution, including providing a Vice Chair for the Research Council. The Research Council will:

- a. Advise the Chief Scientist concerning R&D priorities for budget formulation;
- b. Maintain a website to provide access to relevant R&D plans, reviews and reports;
- c. Develop, review, approve and promulgate a Procedural Handbook as needed to facilitate implementation of this NAO; and
- d. Ensure the intent of this NAO is being fulfilled (NAO 216-115A §6.02).

2. Line Office Assistant Administrators (AAs)

Line Office AAs and the Director of the Office of Marine and Aviation Operations (OMAO) will:

- a. Ensure R&D activities comply with the intent of this NAO;
- b. Oversee input to the Research Council and Office of the Chief Scientist for plans and reports; and
- c. Ensure evaluations are conducted and reported in accordance with this NAO (NAO 216-115A §6.03).

3. NOAA Science Advisory Board (SAB)

The NOAA SAB will conduct activities which support the intent of this NAO, including:

- a. Advise the Under Secretary for Oceans and Atmosphere on strategies for bringing scientific research and application to operations and information services (R2X), so as to better understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet the Nation's economic, social and environmental needs;
- b. Advise the Under Secretary on other matters upon request;
- c. Submit reports to the Under Secretary; and
- d. Conduct or participate in laboratory, cooperative institute, and program reviews, as requested (NAO 216-115A §6.04).

4. Program and Staff Offices

Program Offices and Staff Offices, coordinate with Line Office (LO) planning and budgeting units, as well as with each other, and across LOs as appropriate, to align their plans with implementation plans (IPs) and AOPs. Program Offices and Staff Offices develop analysis and recommendations for annual updates to these plans.

Chapter 2: Planning of the NOAA Research and Development Portfolio

A. Purpose

This chapter establishes a framework for the Research Council to conduct corporate planning of the NOAA R&D portfolio, which includes programs, projects, and activities (hereafter referred to collectively as “activities”) conducted in NOAA’s Line Offices (LOs) and Staff Offices (SOs).

B. Scope

Planning includes strategic planning (i.e., long-term, ultimate goals), implementation planning (i.e., near-term objectives), and execution planning (i.e., annual milestones, performance targets, and resource requests).

The scope shall also be limited to the continuum of exploratory and innovative activities commonly referred to as R&D. This shall be inclusive of basic research, applied research, development, and deployment activities (per the definitions in NAO 216-115A and NAO 216-105B, and to the extent that these activities apply to NOAA’s portfolio), as well as to the transfer of knowledge and technology created in the conduct of R&D (i.e., transition of R&D per NAO 216-105B).

The NAO and this Procedural Handbook apply to all NOAA R&D activities, whether internal or external, and includes R&D conducted by NOAA and sponsored by others (NAO 216-115A §2.01).

C. The Purpose of Planning

To achieve its mission, NOAA must continually strengthen the quality, relevance, and performance of its R&D, and balance its activity portfolio. The purpose of R&D planning is to establish objectives, priorities, performance expectations, and resource requirements for R&D activities. R&D planning enables consistent and coordinated management of these activities both within and across organizational units, as well as establishes the foundation for assessing the performance of NOAA’s R&D enterprise.

The products of planning (i.e., plans) codify and communicate programmatic cause-and-effect, thus providing a structure for monitoring and evaluation. R&D plans can also serve as an important tool to communicate the importance and value of NOAA science to the Administration, DoC, the Congress, academia, regulated and user communities, and the public at large.

D. Planning Documents

1. The Department of Commerce (DoC) Strategic Plan

It is typical for the DoC Strategic Plan to be revised every two to four years, or on the occasion that a new Secretary of Commerce is appointed. The DoC Strategic Plan is the top-level guidance document for NOAA R&D: all R&D projects at NOAA should be able to identify which part of the DoC Strategic Plan they contribute to.

2. The NOAA Strategic Plan

The NOAA Strategic Plan⁴ establishes a Mission and Vision for the agency based upon an understanding of the agency's statutory and regulatory duties, Administration priorities, demands and concerns of internal and external stakeholders, and assessments of possible developments in NOAA's external environment over the long-term. The Vision is detailed by a set of clearly defined long-term, outcome-oriented Goals. The Strategic Plan also establishes five-year, outcome-oriented Objectives and is updated approximately every four years⁵.

3. The 20-Year NOAA R&D Vision

The 20-Year NOAA Research & Development Vision is a vivid description of the desired outcome of NOAA R&D 20 years from the time of writing. Its purpose is to inspire and direct all NOAA R&D to a common, long-term end point. The R&D Vision has the same timeframe as NOAA's corporate Vision, per the NOAA Strategic Plan, however its scope is limited to NOAA's R&D activities and their particular outcomes. The NOAA R&D Vision may offer additional detail to the corporate strategy laid out in NOAA's Strategic Plan. The Chief Scientist, advised by the Research Council, and, if needed, in consultation with the NOAA Science Advisory Board, shall periodically update NOAA's 20-Year Research Vision, not less than every five years (NAO 216-115A §5.02).

4. The Strategic Research Guidance Memorandum (SRGM)

Each year the Chief Scientist, advised by the Research Council, shall issue a SRGM^{6 7} highlighting those areas of R&D that merit special consideration for budget formulation (NAO 216-115A §5.03). While issued on an annual basis, the SRGM is intended to guide R&D investments on the budgetary time scale of two to five years. As such, there is an expectation that changes to the SRGM each year will be gradual, except in the case of external forcing factors.

5. Other R&D Plans

The Chief Scientist, advised by the Research Council, may develop plans to facilitate alignment of NOAA's R&D with NOAA's corporate strategic plan and the Department of Commerce strategic plan (NAO 216-115A §5.04).

⁴ Most recently issued in 2010 as the NGSP (http://www.performance.noaa.gov/wp-content/uploads/NOAA_NGSP.pdf)

⁵ At the time of this publication, in the first year of a new Administration, the current NOAA Strategic Plan is necessarily due for an updated release, but the function of the plan cited here should hold true regardless of Administration.

⁶ <http://nrc.noaa.gov/sites/nrc/SRGM%20August%202015.pdf>

⁷ <http://nrc.noaa.gov/LinkClick.aspx?fileticket=BPiCcAnn18s%3d&portalid=6>

6. Implementation Plans (IPs)

IPs detail how NOAA, through the activities of its component line and staff offices, will implement strategy for particular objectives over a given period, starting with the immediate execution year. They are typically created approximately every four years (per updates to the NOAA Strategic Plan), and revised annually by the senior executives accountable.

An IP should detail R&D activities that are planned for strategic objectives. This is the basis for demonstrating relevance of R&D activities. Further, the IP should demonstrate how activities address the outcomes identified in the NOAA R&D Plan. Metrics should be distinguished as outputs (including, but not limited to, scientific “quality” measures), outcomes (which aggregate up to NOAA-level objectives to demonstrate “relevance”), and efficiency (to indicate how well NOAA operates as an organization to produce outputs and outcomes, given the assets at its disposal).

7. Annual Guidance Memorandum (AGM)

The AGM focuses agency attention on the NOAA Administrator’s priorities and identifies fiscal assumptions for planning. The Office of the NOAA Administrator typically prepares the AGM every year. In the determination of corporate priorities, the Research Council can offer recommendations to the Administrator from the perspective of NOAA R&D.

8. Annual Operating Plans (AOPs)

AOPs address how, on an annual basis, the objectives of the NOAA Strategic Plan are achieved. Though organized according LOs and SOs rather than by corporate strategic objectives, the content of the AOPs are directly tied to implementation. The AOP is a contract between the LO/SO and NOAA senior leadership, forming the basis for management accountability for budget execution as well as LO/SO performance. The LO/SO Senior Executive Performance Plans must include a version of the milestones reported in the AOP.

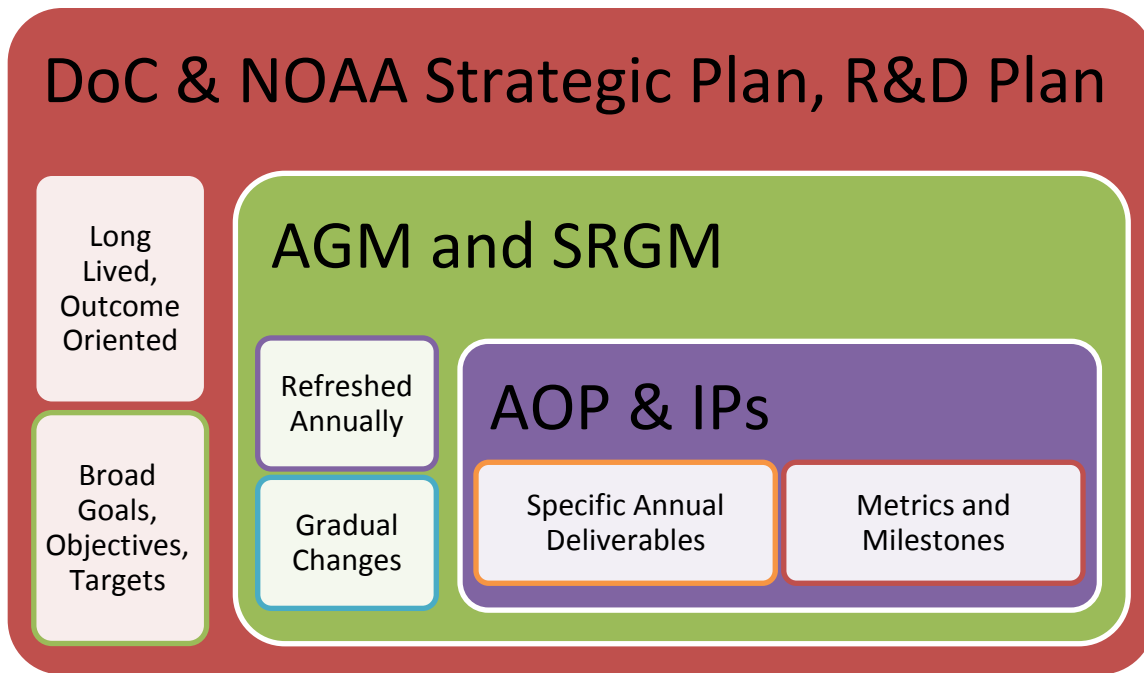


Figure 2. Plans are nested and support the goals, objectives, targets, and milestones of the plans that they are nested under.

9. Transition Plans

Transition plans identify the comprehensive activities necessary to transfer a research result. Please refer to NAO 216-105B §3.01-3.09 and the respective Procedural Handbook⁸ for further guidance on transition plans. Example transition plans can be found on the NOAA Research Council website⁹.

E. The Planning Process

1. Strategic Planning

Strategic planning for R&D occurs on a multiannual basis, typically every four years. The NOAA Strategic Plan establishes a long-term strategy for NOAA as a whole, with IPs detailing near-term approach to achieving corporate strategic objectives. Strategic R&D plans respond to the NOAA Strategic Plan and the long-term (20-year) R&D vision by

⁸ http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/Handbook_NAO216-105B_03-21-17.pdf

⁹ <http://nrc.noaa.gov/NOAARDPolicies/ExampleTransitionPlans.aspx>

detailing a near-term strategy for the agency's R&D enterprise. The strategic R&D plan objectives and targets should be reflected in the R&D components of the relevant IPs.

The strategy represented in a strategic R&D plan should align with the NOAA Strategic Plan and be developed in coordination with relevant stakeholders (particularly NOAA's operational units). A strategic R&D plan should additionally be informed by the DoC Strategic Plan, portfolio and baseline evaluations of NOAA's R&D enterprise, assessments of the possible developments in science and technology, and the perceived constituent landscape over the long-term (a.k.a., “futures” scenarios).

2. Annual Planning

Annual planning establishes tactical priorities within longer-term strategies. It typically begins by analyzing the strategic context for NOAA R&D, and how it may have changed over the year. Change can be exogenous, such as in scientific or technological capabilities, economic or budgetary context, political or legislative context, environmental conditions, and evolving stakeholder demands. Change can also be endogenous, such as recent and historical performance with respect to strategy. Key inputs for annually assessing the strategic context for NOAA's R&D enterprise include evaluations (internal and external) of R&D projects, programs, and portfolios, as well as the Chief Scientist's Annual Report (CSAR).

Based upon corporate priorities, an understanding of program-level capabilities, and recommendations from program managers, Line and Staff Offices coordinate to determine portfolio options. This includes setting performance expectations and resource requirements for inclusion in IPs and AOPs. Expectations and requirements will serve as a basis for monitoring in execution and evaluation after execution. They should also serve as the basis for updates to program- and project-level plans. This coordination process should involve input or review at various stages by Line and Staff Office Chief Scientists, Chief Financial Officers, Deputy Assistant Administrators (DAAs), and AAs at least once per year.

Chapter 3: Monitoring the NOAA Research and Development (R&D) Project Portfolio

A. Purpose

Consistent with principle of Accountability (NAO 216-115A §3.08), and in line with the need to maintain information on NOAA's R&D portfolio (NAO 216-115A §5.07), this chapter establishes procedures for monitoring NOAA R&D through a project-level corporate database.

B. Policy Background

Monitoring NOAA's R&D portfolio involves tracking NOAA's internally and externally supported R&D projects, including such information as mission alignment, transition pathways, partnerships, facilities and infrastructure, workforce, and performance measures. This chapter focuses on the procedures, requirements and content for monitoring via the NOAA R&D Database (NRDD; formerly referred to as the Projects Database and Management System, or PDMS).

Corporate participation and implementation of the NOAA R&D Database is imperative. The NOAA R&D Database enables NOAA to assess and optimize its R&D portfolio, make informed investment decisions, track advancements in quality, relevance, and performance, and support and enable other relevant NOAA policies. Systematic monitoring of NOAA R&D is needed to:

1. Collect, track, analyze, and monitor R&D projects and funding;
2. Catalogue and manage Research to Applications transition projects in their various states of readiness levels (RLs);
3. Provide capabilities for querying and reporting on NOAA's R&D projects; and
4. Calculate metrics that can be used to analyze and demonstrate the performance, quality, and relevance of NOAA's R&D projects and the associated programs.

After extensive development, review, and NOAA-wide engagement, the Research Council voted on September 29, 2016 to implement a NOAA R&D Database. Furthermore, in a memorandum dated December 13, 2016, the NOAA Chief Scientist specifically requested all AAs to fully implement the NOAA R&D Database across all NOAA's R&D units.

C. Benefits of the NOAA R&D Database

With complete and accurate entries, there are many benefits to having a NOAA R&D Database, including the ability to:

1. Identify, track, and facilitate transition projects (i.e., research-to-applications using NOAA-adopted RLs (as recommended by SAB, 2004));
2. Track and align funds with the source of funding;

3. Share information across NOAA's enterprise to improve communication, collaboration, coordination, and planning across NOAA and decrease project redundancy;
4. Improve performance management through a system of interdependent, corporate decision-making processes for planning, budget, execution and evaluation. Strengthen the linkages between strategy and execution and across line and staff offices;
5. Provide corporate reporting of performance (as mandated in the reports for Government Performance and Results Act (GPRA), DoC performance reporting, Annual Performance Plan (APP), AOP, and other ad-hoc customizable requests);
6. Plan, schedule, and track execution and evaluation of progress;
7. Identify, assess, and mitigate risk; and
8. Capture trends in R&D investments.

D. Procedures

1. Scope

The NOAA R&D Database includes information about NOAA's R&D projects, including those conducted and/or funded by NOAA.

2. Schedule

The NOAA R&D Database was initially populated with Fiscal Year 2017 (FY17) projects as of July 31, 2017. Thereafter, project data will be entered by the end of the second quarter (March) of each FY. After passage of the appropriations bill each FY, a second update may be necessary to adjust project data in response to actual appropriations. Where appropriate, actual milestones including deliverables from the previous FY are also updated by the end of the second quarter. Most data fields will remain open for editing throughout the year.

3. Responsibilities

The responsibilities for the NOAA R&D Database are as follows:

- a. The NOAA Research Council has oversight of the NOAA R&D Database;
- b. The R&D Enterprise Committee (RDEC) and Database Manager are responsible for changes to the core and common database fields (additions or deletions), upgrades to the NOAA R&D Database, and other modifications approved by the NOAA Research Council;
- c. The NOAA Office of Oceanic and Atmospheric Research (OAR) Assistant Administrator (AA) appoints a NOAA R&D Database Manager to lead the operations and maintenance of the NOAA R&D Database, including authorization, and security at a central computing site and a backup site. The NOAA R&D Database Manager responds to any changes to the core and common NOAA R&D

Database fields (additions or deletions), ensures the integrity of the NOAA R&D Database, upgrades the NOAA R&D Database, and performs other modifications and improvements approved by the NOAA Research Council;

- d. A NOAA R&D Database coordinator in each NOAA LO appointed by the LO's AA is responsible for ensuring data are populated into his/her LO's portion of the core and common database fields and that those data have been reviewed for quality, accuracy, and currency. Each LO, through its NOAA R&D Database coordinator, provides a first evaluation of the measures of progress to evaluate their adequacy. The LO NOAA R&D Database coordinator provides suggestions to the NOAA R&D Database manager on process improvements;
- e. Quality control of the data field entries is the responsibility of the LOs and each LO establishes a process for such control which is reviewed and approved by the NOAA R&D Database Manager; and
- f. Office Directors, Program managers, and Project managers shall be engaged and attentive to the projects in the database under their purview to assure that content of the database is up to date, complete, and accurate in accordance with their LO policy on quality control and data entry into the NOAA R&D Database.

4. Content

The NOAA R&D Database consists of the NOAA-wide core and common fields plus additional fields at each LO AA's discretion (LO-specific). The system is dependent on the accurate completion of all data fields. The NOAA R&D Database delivers the capability to calculate a range of project administrative functions such as counts, number of days past a due date, summation, average, median, and percentage.

5. Distribution and Access

Distribution of the contents within and access to the R&D Database is contingent upon the following:

- a. The core and common fields are accessible to individuals with NOAA credentials for read-only access;
- b. Access to LO-specific portions, in addition to the core and common fields of the database, is at the discretion of the LO AA;
- c. Public read-only access may be granted to the core and common database fields only via a public facing website or through periodic publication of reports of NOAA R&D Database results on a public facing website;
- d. Write access is under the control of the NOAA NOAA R&D Database Manager and is open to authorized data entry personnel throughout the fiscal year; and

- e. The NOAA R&D Database Manager has write access to the entire database at all times and upon request and at the manager's discretion, grants temporary access to LO NOAA R&D Database coordinators as needed.

Chapter 4: Evaluation of NOAA Research and Development

A. Purpose

This chapter establishes policy and procedures for evaluating the quality, relevance, scientific performance, and balance of the NOAA Research and Development (R&D) portfolio. Scientific evaluations assess the strength and appropriateness of R&D endeavors, and make recommendations for improving scientific innovation and output. They are often a component of programmatic evaluations. Rigorous independent evaluations within a framework of informative performance data connect planning to execution to validate whether government programs are achieving their intended outcomes. They provide an opportunity to learn what is working well and how performance can be improved in the future.

B. Policy Background

Evaluation of NOAA's R&D activities will include regular, independent peer reviews performed at least every five years, but more frequently if preferred. These reviews shall assess R&D activities for quality of the science, as well as how well the activities meet NOAA's mission needs and/or requirements (i.e., relevance and performance). These reviews shall be separate from and not duplicative of existing reviews for grants, cooperative agreements, contracts, purchase orders, interagency agreements, or project agreements (NAO 216-115A §5.08). Evaluations detailed in this handbook will cover five categories: periodic evaluations, program evaluations (encompassing Programs, Laboratories, Science Centers, and science themes), Ad Hoc evaluations, R&D Progress to Plan evaluations, and NOAA Portfolio reviews. All reviews should focus on the quality, performance, and relevance of R&D (see Appendix 2.1).

C. Relationships Among Evaluations

Evaluation activities roll up hierarchically from the individual principal investigator to the corporate level.

1. Peer Review is conducted on NOAA research projects and publications.
2. Periodic evaluations track execution progress and inform annual and long term planning activities.
3. Program evaluations examine quality, relevance and performance at a rolled up level of a laboratory, center, program, or science theme.
4. Portfolio reviews incorporate the Program evaluations to examine NOAA-wide performance issues, the relevance of NOAA's research enterprise to its strategic and research goals, and the balance of the NOAA research portfolio relative to those goals, priorities, and characteristics critical to strategic planning

Evaluation is an integral component of the strategic planning, execution and budgeting processes. Periodic and Program evaluations assess execution relative to IPs, AOPs and other strategic documents (Chapter 2) and support recurrent NOAA reporting activities (Chapter 5).

Program R&D Progress to Plan, and Portfolio evaluations inform future planning efforts (e.g., AGM, SRGM, IPs, and Program and NOAA-wide strategic plans).

Table 1: Overview of R&D evaluations described in the handbook

Evaluation	What is being evaluated?	Purpose	Who conducts evaluation?	Criteria	Relative to which plan?	Methods	How often?
Periodic	LO/Goal current FY execution	Determine the state of execution relative to plans for a given FY (AOP)	PRSS/NEP/NEC	Variable	IP or AOP	Process evaluation	Variable
Laboratory / Science Center / Program	All entities conducting or funding research	Evaluate criteria relative to research within a Program	Independent review panel	Quality, Relevance, Performance of Science	Program Strategic or R&D strategic plan	Outcome evaluation	Every five years
Ad Hoc	Variable	Evaluations outside the normal cycle to address specific topics or science themes	Variable	Variable	Variable	Variable	As needed
R&D Progress-to-Plan	NOAA R&D enterprise	Evaluate critical/timely priorities in the science portfolio relative to the R&D plan	NOAA Research Council	Quality, Relevance, Performance, Balance	R&D strategic plan	Process & Outcome evaluations	Every two years
Portfolio Review	NOAA R&D enterprise	Evaluate the entire research portfolio relative to the R&D plan to inform subsequent strategic and R&D plans	NOAA Research Council	Relevance, Performance, Balance	R&D strategic plan	Process & Outcome evaluations	Every four years

D. Review of Fundamental Research Communications

Procedures for review of Fundamental Research Communications (FRC) including, but not limited to, peer-reviewed publications, conference presentations, and other communications, are described in the Handbook for the NAO on Scientific Integrity (NAO 202-735D)¹⁰ and the NOAA Framework for Internal Review and Approval of Fundamental Research Communications¹¹.

E. Performance Measurement

Performance measurement is integrated into all phases of R&D under this NAO. Performance measures and milestones (also referred to as metrics) are monitored over time and reported periodically, to evaluate progress toward achieving objectives set in planning. Performance measurement is essential for good management of research as well as communication of the value of research, by serving to:

1. Gauge whether research is producing desired outputs and achieving desired outcomes on the desired schedule;
2. Act as an early warning system – to identify the need for targeted improvements or adjustments, thereby improving execution;
3. Understand connections and interdependencies among performance targets;
4. Understand the resource requirements and risks (including the risks of not properly resourcing a project);
5. Message to NOAA, DoC, OMB, Congress, the SAB, and others;
6. Quantify and justify Federal budget requests and current programs; and
7. Communicate program goals and achievements

Where practical and commensurate with the size and importance of the work, performance measures should be developed for key aspects of activities. A variety of topics may be informed by performance measures, such as:

1. Research and development achievements

¹⁰ http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_202/202-735-D.html

¹¹

http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_202/FRC%20Guidance%20Nov%208%202016.pdf

2. Quality of research and products
3. Relevance of research to NOAA mission/goals/objectives
4. Response to customer/user needs (usage of research and products)
5. Efficiency and/or cost benefit analyses
6. Output achievements
7. Outcome achievements

Performance measures should include a baseline, an endpoint or target, a unit of measure, and a timeframe to achieve the target(s). They should also include an explanation if the meaning and importance will not be clear to a non-specialist.

Performance measures will be an important part of the evaluation process. It is useful to have a broad set of performance metrics that address multiple levels of NOAA's research activities (e.g., milestones, outcome, output, efficiency).

Measures should integrate hierarchically. Specific performance measures at the program level (e.g., milestone or output measures) should contribute to broader measures at the NOAA, DoC or Federal government level to provide information on broader outcomes.

F. R&D Evaluations

1. Periodic R&D Evaluations

Such reviews often focus on progress toward meeting the performance expectations documented in the IPs and AOPs. They may include evaluating Line Office (LO) performance metrics relative to their targets, such as milestones, performance measures, OMB GPRA measures, and contributions to the DoC and NOAA Strategic Plans. Many of these monitoring data will be tracked in the NOAA R&D Database (Chapter 3). Current examples include quarterly, mid-year and year-end execution reviews.

2. Laboratory/Science Center/Program R&D Evaluations

A laboratory/science center/program R&D evaluation is conducted by an independent peer review panel (see Appendix 2.2) and will cover the quality and relevance of the R&D and the performance of the program/laboratory/center conducting that R&D. The primary benchmarks upon which to evaluate these criteria are the NOAA strategic and R&D plans, and their associated derivatives (e.g., IPs, a laboratory strategic plan). As a component of "performance" (see core evaluation criteria below), evaluation of the internal management and administrative components of a program that affects the R&D is required via this mechanism. LOs have the flexibility to expand (but not reduce) the scope of the evaluation per their internal needs.

For purposes of this document, “Program evaluations” shall cover all major internal NOAA entities that conduct or fund scientific research and development: laboratories, science centers, program offices, matrix programs, etc.

Each LO will arrange for evaluations of its Programs on a regular and recurring basis (not less frequently than once every five years). The AA of each LO, or their delegate, is responsible for administering evaluations of each Program. The AA is responsible for appointing and charging the external peer review panel, receiving the review panel’s report, making final decisions on actions to be taken as a result of the report, and providing the results of evaluations to the Research Council. Within each LO, the AA may delegate authority for implementing Program evaluations per internal policies; however, authority for the evaluation should not be delegated to the individual responsible for (or residing under) the organization being evaluated.

LOs are strongly encouraged to share the findings and pending actions from Lab/Science Center/Program reviews with the Research Council (in an informational, not directional or decisional capacity) to inform corporate R&D planning, monitoring, evaluation, and reporting.

3. Ad Hoc R&D Evaluations

Ad Hoc evaluations are conducted on an as-needed basis in response to a particular need, mandate, or event. Jurisdiction for these reviews will vary per their unique terms of reference or mandate. Evaluations concerning or related to R&D activities should be considered in broader strategic planning initiatives as any other regularly scheduled evaluation would be (e.g., contributing to revisions of the AGM and strategic and R&D plans).

4. R&D Progress-to-Plan Evaluations

The Research Progress-to-Plan (P2P) evaluation is a component of the strategic planning and evaluation process that evaluates NOAA’s progress toward achieving NOAA R&D Plan objectives. The P2P evaluation is used to inform the SRGM, AGM, Implementation Plan revisions, and future NOAA R&D Plans. Every two years, the NOAA Research Council is responsible for leading an evaluation of progress toward the relevant research Implementation Plan. While the entire scope of the NOAA R&D Plan is subject to evaluation every two years, the RC may choose to evaluate specific components of the plan which address critical cross-LO priorities or emerging issues. Progress will be measured relative to the targets established in the NOAA R&D Plan.

5. NOAA R&D Portfolio Evaluations

Portfolio reviews will evaluate the strategic balance of NOAA’s R&D portfolio and progress toward achieving the objectives presented in NOAA R&D plans (e.g., a strategic R&D plan, SRGM, etc.). NOAA will conduct a Portfolio Review once approximately every four years, depending on the frequency of which the NOAA Research and Strategic plans are revised. Reviews should precede and inform the formulation of the next strategic plan and R&D plan. The Portfolio reviews will be conducted by NOAA, internally, but

will provide baseline assessments upon which the NOAA Science Advisory Board (SAB) make recommendations on the strategic direction and alignment of resources.

The Research Council Chair is responsible for administering a Portfolio review, and Research Council members representing each LO are responsible for contributing the data necessary for conducting the review. The RC's RDEC shall develop the procedures for conducting the Portfolio Review. The plan will include developing a final report that will inform current strategic planning and the next iteration of the R&D Plan. The Research Council chair shall deliver the final report to and brief NOAA senior leadership.

The core evaluation criteria will be established by the content in the NOAA R&D Plan. Key questions to consider include:

- a. Has NOAA made expected progress toward achieving its R&D Plan objectives? If not, why; and how can this be improved?
- b. Relevance: Is the current set of NOAA R&D portfolio priorities relevant to its mission, strategic plan, administrator priorities, and the state of science and technology? If not, how should priorities be realigned?
- c. Portfolio Balance: Is the balance of the R&D portfolio aligned to expectations in the a relevant NOAA strategic R&D plan?

G. External Partnership Program Evaluations

External partnership programs refer to those non-NOAA organizations that have a formalized institutional relationship with NOAA and receive NOAA funding to conduct research or administer grant programs. Examples include Cooperative Institutes¹², Cooperative Science Centers, and State Sea Grant programs.

Evaluations shall cover the quality and relevance of the scientific R&D and the performance of these non-NOAA organizations conducting that R&D. The primary benchmarks upon which to evaluate these criteria are the NOAA strategic and R&D plans, their associated derivatives, and other requirements for evaluation, as set forth in the charter and financial agreements between the program and NOAA. Evaluations shall be conducted per the schedule set forth in the partnership program agreement.

Responsibilities:

1. The Director of the office overseeing the partnership program (e.g., the Sea Grant Director) or the appropriately charged FACA committee (i.e., the convening authority) shall be responsible for administering evaluations, appointing review team members, receiving the final review team report, and approving the partnership program's response plan (if required).

¹² http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-107.html

2. The partnership program director (e.g., Maine Sea Grant Director) shall be responsible for organizing and conducting the evaluation and responding to and implementing recommendations.

Chapter 5: Reporting of the NOAA Research and Development Portfolio

A. Purpose

This chapter establishes procedures for reporting on the NOAA R&D Enterprise Portfolio. In conjunction with the Planning, Evaluation, and Monitoring chapters of the Handbook, implementation of this chapter is designed to provide a complete picture of NOAA's R&D Enterprise Portfolio for use in planning and budget development, as well as to provide information to external partners, stakeholders, and the interested public.

B. Policy Background

In accordance with NAO 216-115A, it is the NOAA policy to conduct standardized, representative reporting for its R&D enterprise to document the current state of the enterprise, highlight strategic R&D investment needs for the future, and communicate the return-on-investment and overall benefits to society derived from its current R&D portfolio.

C. Reporting Procedures

1. Scope

- a. At a minimum, NOAA will prepare, complete, and disseminate a Chief Scientist's Annual Report (CSAR) to describe the quality, relevance, and performance of the NOAA R&D Portfolio.
- b. The NOAA Research Council (Research Council) and/or the Office of the NOAA Chief Scientist may also request additional reports (e.g., AOP quarterly reporting and prior year R&D accomplishments for the NOAA Budget Blue Book) throughout the year to provide a more complete picture of the R&D Portfolio. Clear justification and cost/benefit analysis for additional reporting should be provided.

2. Schedule

- a. End-of-year reporting should be completed in time to inform both the budget cycle and the next planning cycle.
- b. Interim reporting will be completed in the timeframe requested by the Research Council or the Office of the Chief Scientist.

3. Responsibilities

- a. The Office of the Chief Scientist will be responsible for oversight of NOAA's R&D reporting activities.
- b. The Research Council will oversee and approve all R&D reporting products.

- c. The Research Council, in coordination with LO Communications staff, will be responsible for gathering and reporting annual research accomplishments to NOAA Budget for development of the Blue Book.
- d. LO Chief Financial Officers will be responsible for gathering and reporting R&D financial information for the development and defense of the NOAA budget.

D. The Chief Scientist's Annual Report (CSAR)

1. Scope

- a. The primary audience of the CSAR is very broad (NOAA leadership, the Department of Commerce, the Office of Management and Budget, the Office of Science and Technology Policy, Congress, NOAA partners and stakeholders, and the public), so the report should provide a high-level snapshot, written in clear, minimally-scientific language.
- b. The report will focus on a single fiscal year (FY) but also include limited coverage of other years, in order to adequately capture the long-term nature of R&D.
- c. The CSAR will provide selected scientific accomplishments to highlight specific priority areas outlined in the SRGM or AGM.
- d. The data gathered and presented in this report constitute the minimum level needed to provide a useful reporting of the adequacy of quality, relevance, and performance.

2. Schedule

The CSAR will be completed in time to inform the next planning cycle (Winter/Spring).

3. Responsibilities

The responsibilities for the CSAR are as follows:

- a. The Office of the Chief Scientist is accountable for completion and submittal to NOAA Leadership and partners. In the absence of a permanent Chief Scientist, the Acting Chief Scientist or the Research Council (as appropriate) will be accountable for requiring its completion and submittal to NOAA Leadership and partners.
- b. The Research Council may be asked to review and clear the document.
- c. The Office of the Chief Scientist will prepare the document and the supporting data and portfolio analysis.

- d. Representatives from NOAA's Line Offices and Staff Offices will provide necessary information to the Office of the Chief Scientist staff as requested.

4. Content

The content of the CSAR will include:

- a. Forward
 - i. Short message from the Chief Scientist
- b. Introduction: A snapshot of NOAA's R&D and engagement
 - i. A high-level overview of NOAA's R&D portfolio logic addressing questions such as why NOAA invests in research, what kind of research does NOAA support, and what principles guide NOAA R&D.
- c. Theme Chapters
 - i. Themed chapters based on the SRGM that highlight recent scientific accomplishments.
- d. Bibliometrics
 - i. NOAA-wide bibliometric data on peer-reviewed publications and citations.
- e. NOAA's Scientific Workforce
 - i. Scientific Awards and Achievements
 - ii. Scientific Integrity
 - iii. Laboratory and Program Science Reviews
- f. Conclusion

5. Distribution

The final CSAR will be made broadly available via:

- a. A briefing to NOAA Leadership by the Chief Scientist
- b. A briefing to the NOAA Science Advisory Board by the Chief Scientist
- c. Permanent posting to the NOAA Research Council website
- d. Email distribution of the CSAR link on the Research Council website to all of NOAA.

- e. Email distribution of the CSAR link on the Research Council website to key NOAA R&D partners and stakeholders.

Appendix 1.1: Glossary for NAO Procedural Handbook

Activity: Activities are the processes through which NOAA uses assets to generate outputs. NOAA's activities represent what NOAA needs to do in order to achieve its corporate strategic objectives.

Chief Scientist: A Presidential appointee serving as senior scientist for NOAA. The Chief Scientist drives policy and program direction for science and technology priorities (NAO 216-115A §4.01).

Conflict of Interest: Any financial or other interest which conflicts with the service of the individual on the review panel because it: (1) could significantly impair the individual's objectivity or (2) could create an unfair competitive advantage for any person or organization.

Core Evaluation Criterion: A major category by which the research program is judged (e.g., quality, relevance, performance).

Development: The systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes (Organization for Economic Cooperation and Development [OECD], 2015; NAO 216-115A §4.02).

Efficiency: Achieving the desired objective while minimizing the expenditure of resources, i.e., time, funding, labor, and materials/equipment.

Enterprise: A purposeful undertaking that generally requires the coordination of different organizations, types of expertise, and capital. Alternatively, the cross-cutting science, administrative, engagement, infrastructure, and management functions that support NOAA's distinctive capabilities (NOAA Business Operations Manual, 2011).

Evaluation: A study conducted periodically or on an ad hoc basis to assess how well a program is working against specified benchmarks or standards. Evaluation teams often include experts external to the program to ensure independence (NAO 216-115A §4.03).

External Research and Development (R&D): R&D conducted by any entity outside of NOAA (e.g., Cooperative Institute, academic institution, state or local government entity, other federal agency, etc.; NAO 216-115A §4.04).

Goal: Goals specify the components of NOAA's vision, translating the vision into a limited number of high-level results that NOAA will seek to achieve. NOAA's strategic goals are outcome-oriented—that is, they specify future social, economic, and environmental conditions that the agency is committed to achieving, and how society will benefit from NOAA's success. The timeframe for NOAA's strategic goals is multi-decadal.

Internal Research and Development (R&D): R&D conducted at NOAA facilities and/or by NOAA employees (NAO 216-115A §4.05).

Mission: NOAA’s mission summarizes the agency’s fundamental mandates and responsibilities. It is a succinct and distinctive statement of what NOAA does. The mission statement encapsulates the set of statutory requirements that drive NOAA’s functions, and is assumed to be stable over the planning period.

NOAA Invention: A new, useful process, machine, manufacture or composition of matter, or any new and useful improvement to a process, machine, manufacture or composition of matter, developed by NOAA (NAO 216-115A §4.06).

Objective: Objectives further describe strategic goals or enterprises by detailing the societal, environmental, or organizational benefits that NOAA seeks to achieve in the five year time frame. Objectives toward goals are outcomes for society and the environment, whereas objectives toward enterprises are outcomes for NOAA to achieve its goals. Objectives should be specific, measurable, attainable, realistic, and time-bound (SMART).

Peer Review: A widely used, time-honored practice in the scientific and engineering community of judging and potentially improving a scientific or technical plan, proposal, activity, program or work product through documented critical evaluation by individuals or groups with relevant expertise who had no involvement in developing the object under review (NRC, 2000; NAO 216-115A §4.07).

Performance: Assessing performance involves evaluating the effectiveness and efficiency with which tasks are executed, as well as the adequacy of the leadership, workforce, and infrastructure needed to achieve the designated goals. This evaluation criterion considers how research activities are progressing relative to milestones and benchmarks. Performance evaluation also includes all aspects of how research is conducted, including all components that feed into creating a high quality research enterprise (e.g., leadership, innovation, planning, monitoring, efficiency and effectiveness of processes, resource utilization, reporting).

Portfolio: A set of investments held by an organization (or an individual, program, lab, etc.) that yields benefits and has cost and associated risks. Through management of its R&D portfolio, NOAA can explicitly assess the tradeoffs among competing projects in terms of their benefits, costs, and risks.

Portfolio Balance: The proportion of research projects (or resources) in a portfolio that are allocated among categories (e.g., among strategic goals, topics, risk, research horizon, investment). Such an analysis is used to evaluate whether research priorities are being adequately addressed.

Program: Throughout this Procedural Handbook, the term “Program” is inclusive of laboratories, science centers, program offices (e.g., OAR’s Office of Weather and Air Quality), and matrix organizations (e.g., Coral Reef Conservation Program).

Project: Any undertaking of a temporary nature (e.g., research, assessment, prediction, acquisition, or stewardship efforts) designed to create a service, product, system, and/or system upgrade in support of a validated NOAA Mission Requirement. A NOAA project is intended to

address a shortfall within defined budget and schedule constraints and terminates when the service, product, or system achieves full operational capability (FOC), when the capability gap is resolved or, in coordination with other programs, when directed by the project manager or higher authority (NOAA, 2009).

Quality: This refers to the merit of R&D within the scientific community. Assessing the quality of scientific and technical work done involves the time honored tradition of peer review. Bibliometric data on peer-reviewed publications and citations, as well as awards and other professional recognitions, are critical to understanding the research quality of individuals and organizations, particularly for benchmarking against other organizations of similar size and scope. Quality is measured by the novelty, soundness, accuracy, and reproducibility of a specific body of research, as represented by the outputs (i.e., products) delivered by the project or program. This evaluation criterion establishes the relative merit and repeatability of the research or program relative to that of contemporaries in the community of practice, whether the scientific methodologies were appropriate, adhered to, and thoroughly documented.

Relevance: This refers to the value of R&D to users beyond the scientific community. Relevance includes not only hypothetical value, but actual impact. Assessing NOAA's relevance involves measuring the broader benefits of the work. It answers the question, "What would not have happened if R&D did not exist, and how much would society have missed?" The impact of R&D can be realized through the application of scientific knowledge to policy decisions, through the improvement of operational capabilities at NOAA's service lines, or by patenting and licensing of inventions for commercial use. Relevance is measured by how well a specific body of research supports NOAA's mission and the needs of users and the broader society. At a minimum, this evaluation criterion establishes how the research aligns with the strategic plan and priorities of the agency, as demonstrated by links to validated agency requirements, key legislative mandates, administration priorities and societal benefits. Relevance is more reliably established by evidence of actual impact and retrospective (or concurrent) analysis of how R&D causes measurable improvements in operational performance and social and economic value.

Research:

- a) **Basic Research:** Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. Basic research can be oriented or directed towards some broad fields of general interest, with the explicit goal of a range of future applications (OECD, 2015; NAO 216-115A §4.09).
- b) **Applied Research:** Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective. Applied research is undertaken either to determine possible uses for the findings of basic research or to determine new methods or ways of achieving specific and predetermined objectives (OECD, 2015; NAO 216-115A §4.09).

Strategic plan: A plan that identifies what NOAA should produce in the future (i.e., outputs), and why those are important (i.e., outcomes). Distinguishing between outcomes and outputs gives flexibility to change agency activities while staying true to its overall purpose.

Strategy: Explains what the agency intends to do and why it intends to do it. It relates a statement of output (e.g., mission, functions or activities) to a statement of outcome (e.g., vision, long-term strategic goals or objectives) to succinctly convey NOAA’s fundamental purpose, direction, and value to society.

Vision: An envisioned future state of society and the environment that, implicitly, cannot be achieved without NOAA. The vision describes long-term success in terms of the value that NOAA will generate for society—in effect, why the agency exists. The timeframe for NOAA’s vision is multi-decadal.

Appendix 1.2: References

Moore, Rosen, Rosenberg, Spinrad, Washington, & West (2004): *Review of the organization and management of research in NOAA: A report to the NOAA science advisory board by the research review team*. Silver Spring, MD: National Oceanic and Atmospheric Administration (NOAA) Science Advisory Board. Retrieved from www.sab.noaa.gov/Reports/RRT_Report-080604.pdf

National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce (2010): *NOAA's next generation strategic plan*. Silver Spring, MD. Retrieved from http://www.ppi.noaa.gov/wp-content/uploads/NOAA_NGSP.pdf

NOAA (2008): NOAA Administrative Order NAO 200-3: The NOAA Administrative Order Series. Retrieved from http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_200/200-3.html

NOAA (2016): NOAA Administrative Order 216-105B: Policy on Research and Development Transitions. Retrieved from http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-105B.html

NOAA Office of Oceanic and Atmospheric Research (OAR) (2010): Laboratory Science Review Implementation Plan.

NOAA Performance Measure Working Group (2005): Performance Measure Guidelines.

NOAA Research Council (2013): *Research and Development at NOAA: Environmental Understanding to Ensure America's Vital and Sustainable Future, A five year plan: Fiscal years 2013-2017*. Retrieved from <http://nrc.oarhq.noaa.gov/CouncilProducts/ResearchPlans/5YearRDPlan/NOAA5YRPHome.aspx>

NOAA Research Council (2008): NOAA 20 year research vision: Understanding global ecosystems to support informed decision-making. Retrieved from http://www.nrc.noaa.gov/plans_docs/new_noaa.pdf

OMB (2004): Final Information Quality Bulletin for Peer Review.

OMB (2009): Increased Emphasis on Program Evaluations, Memorandum for the Heads of Executive Departments and Agencies from Peter R. Orzag, Director of the Office of Management and Budget (M-10-01). Retrieved from http://www.whitehouse.gov/omb/assets/memoranda_2010/m10-01.pdf

Sandifer, & Dole (2010): *Strengthening NOAA science: Findings from the NOAA science workshop, April 20-22, 2010*. National Oceanic and Atmospheric Administration, US Department of Commerce. Retrieved from http://www.nrc.noaa.gov/plans_docs/2010/Science_Workshop_WP_FINAL.pdf

U.S. Government Accountability Office (GAO) (1999): Federal Research: Peer Review Practices at Federal Science Agencies Vary. Retrieved from <http://www.er.doe.gov/bes/rc99099.pdf>

Appendix 1.3: Abbreviations

AA	Assistant Administrator
AGM	Annual Guidance Memorandum
AOP	Annual Operating Plan
CIO	Chief Information Officer
CRADA	Cooperative Research and Development Agreement
CSAR	Chief Scientist's Annual Report
CS	NOAA Chief Scientist
DoC	Department of Commerce
FACA	Federal Advisory Committee Act
FY	Fiscal Year
IP	Implementation Plan
LO	Line Office
NAO	NOAA Administrative Order
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRDD	NOAA Research and Development Database
OAR	Office of Oceanic and Atmospheric Research
OMB	Office of Management and Budget
R&D	Research and Development
RC	NOAA Research Council
RDEC	Research and Development Enterprise Committee
SAB	NOAA Science Advisory Board
SBIR	Small Business Innovation Research

SO

Staff Office

Appendix 2.1: Evaluation Descriptions for Quality, Relevance, and Performance of NOAA Research Programs

The following criteria descriptions are guidelines for developing policies in LO-specific implementation plans. Standard criteria listed below are used to establish the assessment baseline "Meets Expectations." Standard criteria for meeting expectations can be augmented with additional base expectations as appropriate. Not all evaluation questions listed below will be appropriate for every review.

A. Quality

This refers to the merit of R&D within the scientific community. Assessing the quality of scientific and technical work done involves the time honored tradition of peer review. Bibliometric data on peer-reviewed publications and citations, as well as awards and other professional recognitions, are critical to understanding the research quality of individuals and organizations, particularly for benchmarking against other organizations of similar size and scope.

Quality is measured by the novelty, soundness, accuracy, and reproducibility of a specific body of research, as represented by the outputs (e.g., products) delivered by the project or program. This evaluation criterion establishes the relative merit and repeatability of the research or program relative to that of contemporaries in the community of practice and whether the scientific methodologies were appropriate, adhered to, and thoroughly documented.

Criteria for Meeting Expectations

- Program scientists and leadership are recognized for excellence through collaborations, research accomplishments, and national and international leadership positions.
- Programs have clear guidelines to ensure the quality of R&D products, including peer review, scientific integrity, data quality, and data management.
- Each Program may have additional criteria, as appropriate.

Evaluation Questions to Consider

- Does the Program conduct (or oversee/fund) preeminent research? Are the scientific products and/or services meritorious and significant contributions to the scientific community?
- How does the quality of the Program's R&D rank among programs in other U.S. Federal agencies? Other science agencies/institutions?
- Do Program researchers demonstrate scientific leadership and excellence in their respective fields (e.g., through collaborations, research accomplishments, externally funded grants, awards, societies)?
- (If applicable) What is the quality of outreach programming and products? How is the quality of communications and education programs maintained / improved?

The following Indicators of Preeminence may help assess these questions:

- Bibliometric representation of scientific literature output:
 - A Program's total number of refereed publications per unit time, per scientific Full Time Equivalent staff (FTE), and/or per dollar invested
 - The number of citations for scientific staff by individual or some aggregate
 - There are other bibliometric methods that may be more appropriate for program evaluation. Librarians from the NOAA Central Library in particular recommend percentile analysis though other methods found in the Chief Scientist's Annual Report may also be appropriate. The program should work directly with NOAA Library staff to tailor bibliometric analyses to their needs.
- Technologies transferred to operations/application (e.g. observing systems, information technologies, numerical modeling algorithms)
- Research products, information, and services delivered to and used by stakeholders
- Patents, Cooperative Research and Development Agreements (CRADAs), and other activities with industry
- Collaborations with national and international research groups, both inside and outside of NOAA, as well as reimbursable support from non-NOAA sponsors
- Contributions of data and expertise to national and international databases, programs, and state-of-science assessments
- Service of individuals to technical and scientific societies (e.g., journal editorships, boards or executive-level offices), U.S. interagency groups, international research-coordination organizations, international quality-control activities (to ensure accuracy, precision, inter-comparability, and accessibility of global data sets)
- Memberships or fellowships in prestigious science organizations (e.g., National Academies of Sciences or Engineering, American Meteorological Society, American Geophysical Union, or American Association for the Advancement of Science)
- Awards or other recognition received by groups and individuals for research, development, application, and/or service

B. Relevance

This refers to the value of R&D to users beyond the scientific community. Relevance includes not only hypothetical value, but actual impact. Assessing NOAA's relevance involves measuring the broader benefits of the work. It answers the question, "What would not have happened if R&D did not exist, and how much would society have missed?" The impact of R&D can be realized through the application of scientific knowledge to policy decisions, through the improvement of operational capabilities at NOAA's service lines, or by patenting and licensing of inventions for commercial use.

Relevance is measured by how well a specific body of research supports NOAA's mission and the needs of users and the broader society. At a minimum, this evaluation criterion establishes how the research aligns with the strategic plan and priorities of the agency, as demonstrated by links to validated agency requirements, key legislative mandates, administration priorities and societal benefits. Relevance is more reliably established by evidence of actual impact and retrospective (or concurrent) analysis of how R&D causes measurable improvements in operational performance and social and economic value.

Criteria for meeting expectations:

- The R&D enterprise of the Program is tied to NOAA’s mission, Strategic Plan, and R&D Plan, and is of value to the nation.
- The Program is effective and efficient in delivering products/outputs to applications, operations or users.
- Current, desired outcomes can be traced back to R&D that was instrumental in realizing those outcomes
Return on investment, where “return” can be performance improvement (activities and outputs) and value to stakeholders (outcomes)

Evaluation Questions to Consider:

- “What would not have happened if the R&D did not exist, and how much would society have missed?”
- How well do R&D activities address issues/areas identified in the NOAA strategic and research plans or other policy or guiding documents?
- Do the R&D activities address existing (or future) societally-relevant needs (national and/or international)? Are there R&D topics relevant to national needs that the Program should be pursuing, but is not? Are there R&D topics in NOAA, LO, or Program plans that the Program should be pursuing, but is not?
- Are users/customers engaged to ensure the relevance of the research?
- Do program assessments address the alignment of the R&D portfolio with the unit’s and NOAA’s mission?

C. Performance

This refers to how effectiveness and efficiency with which R&D activities are organized, directed, and executed. Assessing performance involves evaluating the effectiveness and efficiency with which tasks are executed, as well as the adequacy of the leadership, workforce, and infrastructure needed to achieve the designated goals. This necessarily involves understanding the quality of management, including interaction with stakeholders, clear articulation of strategic direction, as well as development and management of an R&D portfolio appropriately balanced across objectives, dimensions, and intended applications.

Performance is measured by both effectiveness (the ability to achieve useful results) and efficiency (the ability to achieve quality, relevance and effectiveness in a timely fashion and with little waste). This evaluation criterion considers how research activities are progressing relative to milestones and benchmarks as well as all aspects of how research is conducted, including all components that feed into creating a high quality research enterprise (e.g., leadership, innovation, planning, monitoring, efficiency and effectiveness of processes, resource utilization, reporting).

Criteria for Meeting Expectations:

- The Program has clearly documented scientific objectives and strategies through strategic and implementation plans (e.g., AOP) and a process for evaluating and prioritizing activities.

- The Program management functions as a true team and continuously strives to improve the operation of the Program.
- The Program demonstrates effectiveness in completing its established objectives, milestones, and products.
- The Program strives to increase efficiency (e.g., through leveraging partnerships).

Evaluation Questions to Consider:

Research Leadership and Planning

- Does the Program have clearly defined and documented scientific objectives, rationale, and methodologies for key projects and a selection process for new projects?
- Does the Program have an evaluation process for research projects: selecting / continuing those projects with consistently high marks for merit, application, and priority fit; ending projects; or transitioning projects?
- Does the Program have the leadership and flexibility to respond to unanticipated events or opportunities that require new research and outreach activities (i.e. time and resources)?
- Does the Program provide effective scientific leadership to and interaction with NOAA and the external community on issues within its purview?
- Does the Program management function as a team and strive to improve operations?
- Has the Program effectively responded to and/or implemented previous formal recommendations?
- Do program plans reflect a deliberate and appropriate balance across the spectrum of R&D dimensions (e.g., time horizon, risk level, degree of change, and driver of change)?
- Do program assessments address the unit's R&D portfolio balance with respect to: strategy, time horizon, risk level, degree of change, driver of change, uniqueness to NOAA, how conducted, output type, and engaging other disciplines?
- Who designs and manages the assessment? What are the criteria for ensuring the credibility and validity of the assessment?

Program Efficiency and Effectiveness

- Does the Program execute its research in an efficient and effective manner, given the Program's goals, resources, and constraints? Are R&D investments being made in the right places (effectiveness)? Are the most economical R&D investments being made (efficiency)?
- Are research projects on track and meeting appropriate milestones and targets? If not, why, and how can effectiveness be improved?
- How well integrated is the work with NOAA's planning, budgeting, execution, and evaluation processes?
- Is the overall level of support provided by NOAA sufficient for efficient and effective operations? Are there institutional, managerial, resource, or other barriers to the team working effectively?
- Is the Program leveraging relationships with internal and external collaborators and stakeholders to maximize research outputs? Leveraging internal and external funds?
- Are human resources adequate to meet current and future needs? Does the Program provide professional development opportunities to its staff?

- Is infrastructure sufficient to support high quality research outputs?

Transition of Research to Operations/Applications/Users

- Does the organization comply with NAO 216-105B on transition of R&D, as well as the associated Procedural Handbook and relevant LO policies supporting the NOAA policy?
- Does the organization have a process for identifying its stakeholders and customers?
- How well is the transition/dissemination of research to applications, operations and/or information services planned and executed?
- Does the Program's portfolio have an appropriate balance between transition and non-transition research?
- Has the Program defined who its stakeholders and end users are? Does it provide sufficient interactions/communication? Are end users of the R&D involved in the planning and delivery of applications and/or information services? Are they satisfied?

Appendix 2.2: Requirements for Peer Review Panel

A. General Guidance

If peer review panels are used (e.g., for evaluations), the responsible authority for the evaluation (e.g., Research Council Chair, AA, etc.) should ensure representation of distinguished and expert scientists, science administrators, and stakeholders who are qualified to evaluate the quality, relevance, and performance of the science covered. Each member of the review panel should be a highly reputable expert in the field that is the subject of his/her review; familiar with the applied nature of science that supports an agency's mission and review criteria for Federal R&D programs; experienced in working groups and review panels; and free from any conflict of interest (perceived or otherwise). If NOAA employees are considered for the review panel, they should be employed by a different LO or Financial Management Center (FMC) and have no vested interest in the work within the Program.

For those Programs with Federal Advisory Committee Act (FACA) committees, the AA should charge that committee with conducting the science evaluation using the guidelines established in this policy, unless elements of this policy fall outside the terms of reference for the committee. The committee should discharge its duties in compliance with FACA and other relevant statutes.

Reviewers should have no financial or professional conflict of interest with the Program being evaluated and must submit a conflict of interest disclosure form prior to participating.

The panel should be chaired by a Federal employee to comply with the FACA, and the individual should also be from outside NOAA to avoid conflicts of interest. Per these guidelines, the panel's final report should summarize panelists' individual findings, rather than seek consensus of the panel. Alternatively, a chair who is not a Federal employee can provide a summary report of review proceedings along with the individual review reports from each panelist.

B. Implementation

Materials presented at the review should allow review panelists to effectively evaluate the Program. Review panelists must be provided with summaries of Program scope and research activities, access to project information in the NOAA R&D Database¹³ (Chapter 3), any relevant research evaluations that have been completed in the period prior to the Program evaluation, access to indicators of preeminence and performance measures, and other appropriate documentation.

LOs should develop general procedures for organizing and conducting Program evaluations. Discretion for who will organize and plan an evaluation is left to the AA, though convening authority rests with the AA.

¹³ The project-level information available in the NRDD can be prepared by the program itself by using the NRDD to retrieve the data they need. For help with the NRDD, programs should contact the NRDD Director.

C. Reporting

1. Oral Report

Before the end of the evaluation, the panel must report on their preliminary findings and recommendations to Program, LO, or NOAA leadership (as appropriate).

2. Written Report

- a. Reviewers will provide individual evaluations of the topic they are assessing. Evaluations should address what is working well and what needs improvement, along with a prioritized list of recommendations. The Federal chairperson will combine individual reports into a summary report for submission to the AA. This report shall not be a consensus report, except where the committee is a FACA-compliant oversight group.
- b. The summary report should include at a minimum: an executive summary; an introduction; evaluations and recommendations on quality, relevance and performance by topic; a table or bulleted list of all recommendations; a conclusion highlighting the final assessments.
- c. Assessment: Each review panelist should provide a rating for each Program topic evaluated. These ratings should be noted in the final summary report. In the case of a FACA committee, the panel may develop consensus ratings.
 - i. Exceeds Highest Expectations – Program goes well beyond expectations and is outstanding in all areas.
 - ii. Exceeds Expectations – In general, Program goes beyond what would be required to simply meet expectations.
 - iii. Meets Expectations – In general, Program meets, but does not exceed expectations.
 - iv. Needs Improvement – In general, Program does not reach expectations. The reviewer will identify specific problem areas that need to be addressed.
- d. The review panel chairperson shall provide a final report within 60 days of the end of the review.

3. Program Response

The Program shall develop and submit to the AA or Research Council Chair a formal response to the Review Panel Final Report within 90 days of receiving it. The response should include further clarifying information where necessary and recommended actions to be implemented by the Program in response to the report. The AA or the Research Council Chair must approve the Review Panel Final Report, the Program response, and Program actions to be implemented.

4. Program Final Report

The Program shall report back to the AA or Research Council Chair as appropriate on completed actions from the response report. The report should include at a minimum: an introduction, the bulleted or tabular list of recommendations and completed actions, a written response to each recommendation including completed actions. The report shall be due no later than one year after approval of the Program Response actions.

Appendix 2.3: Potential Evaluation Questions for NOAA Portfolio Reviews

A. Progress to Plan

Has NOAA made expected progress toward achieving Research Plan objectives? If not, why; and how can this be improved?

B. Relevance

Is the current set of NOAA R&D portfolio priorities relevant to its mission, strategic plan, administrator priorities, and the state of science and technology? If not, how should priorities be realigned?

Are there gaps that NOAA should be pursuing, but is not?

C. Portfolio Balance

Is the balance of the R&D portfolio aligned to expectations in the NOAA Research Plan?

- Mission Balance: Does the relative balance of research among the strategic goals and objectives align with expectations? Among disciplines or topics? Are there portfolio gaps?
- Research Type: Does the relative balance of basic research, applied research and development activities align with expectations?
- Research Timeframe: Does the relative balance of short term vs. long term research align with expectations?
- Research Discipline: Does the relative balance of disciplinary vs. interdisciplinary align with expectations?
- Transition Balance: Is there an appropriate balance of transition research that addresses priority user needs in the portfolio? What is the relative balance of science for understanding vs. science for application in the portfolio?
- Resources: Does NOAA provide sufficient resources for mission-critical R&D activities (financial, ship/air time)? Are resources appropriately apportioned among competing priorities?
- Extramural Research: Does NOAA make appropriate use of extramural funding options (grants, contracts, cooperative agreements) to achieve mission objectives? Is intra vs. extramural research appropriately balanced; can greater efficiencies be achieved in research areas via external funding mechanisms?

Appendix 2.4: Further Reading

[Evaluating Federal Research Programs](#) (NRC, 1999) (PDF)

Logic Model Development (NOAA, 2004) (DOC)

Performance Measure Guidelines (NOAA) (DOC)

Performance Measure Training: Fundamentals of Performance Measures (Grant Thornton/NOAA, 2006) (PPT)

[Performance Plans: Selected Approaches for Verification and Validation of Agency Performance Information](#) (GAO, 1999) (PDF)

[Preparation and Submission of Strategic Plans, Annual Performance Plans, and Annual Program Performance Reports](#) (OMB Circular No. A-11, Part 6, 2010) (PDF)

[Thinking Strategically: The Appropriate Use of Metrics for the Climate Change Science program](#) (NRC, 2005) (PDF)

[Recommended Guidelines for testbeds and proving grounds](#) (NWS and OAR, May 19, 2001) (PDF)

[Performance and Success Measures for NOAA Testbeds and Operational Proving Grounds](#) (OAR) (PDF)

[National Sea Grant College Program Evaluation](#) (NOAA, 2009) (PDF)

[Proposal to Establish Systematic Processes for Regular Peer Review Of NCCOS' Intramural Research](#) (NOAA, 2006) (PDF)

NOAA Research Enterprise Evaluation Implementation Plan and Guide, 2017 (Currently in revision)