Charge to Reviewers
NOAA Global Monitoring Laboratory
5-Year Science Review
October 21-23, 2024

Purpose of the Review

The National Oceanic and Atmospheric Administration (NOAA)'s Office of Oceanic and Atmospheric Research (OAR) conducts independent peer reviews of each of its laboratories and programs every five years. The purpose of the reviews is:

- to evaluate the quality, relevance, and performance of the research conducted and sponsored by OAR laboratories and programs;
- to develop and implement recommendations to improve the quality, relevance and performance of OAR research;
- to strategically position the laboratory in its planning for future research and development.

The reviews comply with the requirements of NOAA Administrative Order 216-115B: Research and Development in NOAA and OAR Circular 216-3: OAR Laboratory and Program Science Evaluations.

Criteria

The criteria for the review are quality, relevance, and performance, as defined below, consistent with NOAA Administrative Order 216-115B.

Quality is a measure of the novelty, soundness, accuracy, and reproducibility of a specific body of research. Indicators include publications, technology development, data contributions, and awards.

Relevance is a measure of how well a specific body of research supports NOAA's mission and the needs of users and the broader society.

Performance is a measure of effectiveness and efficiency. It includes an assessment of the organization's leadership, management, organizational culture, diversity/equity/inclusion/access, strategic planning, progress towards performance targets and milestones, efficiency in resource utilization, and transition of research to operations.

Scope of the Review

The scope of the review covers the research and activities conducted or sponsored by the laboratory over the last five years. OAR laboratories typically conduct research and development while OAR programs typically sponsor research and development, and conduct outreach and engagement.

Based on the findings from the review, OAR asks reviewers to look forward and provide recommendations to assist with strategic planning for work in the present and anticipated future environments. OAR also asks reviewers to identify tradeoffs - when recommending expansion of one or more activities or programs, reviewers should identify what activities or programs should OAR consider scaling back.

The criteria cover the quality of the research, its relevance to NOAA's mission and societal needs, and how the research is performed (leadership, management, strategic planning, progress towards performance targets). As such, while the review is focused on science, it also includes the management of the science, as outlined in the performance criterion. However, reviewers should not stray into evaluating detailed operations such as accounting and day to day management or providing feedback on draft strategic plans, which are covered in separate, internal, annual Operations & Management Reviews and other processes.

The review agenda is structured around the review questions described later in this document.

Proposed Schedule and Time Commitment for Reviewers

The review will be held in-person, on October 21-25, 2024, in Boulder, Colorado. OAR will hold two teleconferences for the review panel in advance of the review to discuss the review process and answer any questions you may have. To ensure there is ample time for discussion during the review, many presentations will be pre-recorded and posted on the review website at least two weeks prior to the review. Panelists are expected to have reviewed these presentations ahead of the review to fully engage in the interactive panel discussions with staff and scientists during the review.

Each reviewer is asked to independently prepare their written evaluations and ensure their write-ups are particularly thorough for the review questions that they are assigned. Each review question must be assessed by at least two panel members. Reviewers will provide their evaluations to the review panel chair. The chair, a federal employee, will create a report summarizing the individual evaluations, due within 45 days of the review to OAR. The chair will not seek a consensus of the reviewers. OAR will send any technical comments within 14 days of receiving the draft report and the panel chair will send a final report no later than 30 days after that. The report will be posted on the lab/program website. A vice-chair will be appointed to fill in if the chair becomes unavailable.

Brief Background on Laboratory

The mission of the Global Monitoring Laboratory (GML) of the National Oceanic and Atmospheric Administration (NOAA) is to monitor the Earth atmosphere for climatic change; specifically, it is to acquire, evaluate, and make available accurate, long-term records of atmospheric trace gases, aerosol particles, clouds, and surface radiation in a manner that allows the causes and consequences of change to be understood. The laboratory was established in 1972 as part of the NOAA Environmental Research Laboratories.

The research in GML is focused on three major challenges, which include greenhouse gases and carbon cycle feedback, understanding trends in clouds, aerosols, and surface radiation, and guiding recovery of stratospheric ozone. Monitoring stratospheric ozone and the compounds that deplete it is a Congressional requirement for NOAA that is carried out by GML. The laboratory also operates under several global monitoring mandates, and has served over the decades as the core of the World Meteorological Organization (WMO) Global Atmosphere Watch (GAW) Programme.

Review Questions

Q1: *GML has been pursuing research under the three main research themes (Tracking Greenhouse Gases and Understanding Carbon Cycle Feedback, Guiding Recovery of Stratospheric Ozone, and Monitoring and Understanding Trends in Radiation, Clouds & Aerosols). Is the information provided by GML under these themes relevant and appropriate for diagnosing key aspects of Earth's climate system, for reducing uncertainties within it, and for addressing societal challenges associated with a changing climate?*

Q1 is focused entirely on scientific research conducted by GML under its three main research themes, and it seeks answers to the questions as to whether the information provided by GML is relevant and appropriate for diagnosing key aspects of change in Earth's climate system, for reducing attendant uncertainties, and for addressing societal challenges associated with a changing climate.

Q2: *Are the three supporting pillars within GML (Sustained Observations, Standards, Technological Innovation) well structured and resourced, allowing GML to continue making progress towards reaching its strategic objectives?*

The three supporting pillars of research in GML are: 1) sustained atmospheric observations, including observing/measurement networks and Atmospheric Baseline Observatories, 2) provision of standards and calibrations, and 3) technological innovation. Their robustness and health is essential for the laboratory to deliver on its mission and continue to make progress toward reaching its strategic objectives.

Q3: *Are GML's datasets easily findable, accessible, interoperable, and reusable, and its data products relevant for stakeholders? Are the data management activities optimally organized?*

While the scientific output and outcomes of GML's activities go well beyond data, its datasets and data products are an essential component of GML's output. The GML data underpins the in-house research and is also made broadly available to a wider research community and other stakeholders. The laboratory also has several data products such as the Annual Greenhouse Gas Index (AGGI) and the Ozone Depleting Index (ODI) whose values are updated and published on an annual basis, in addition to key data updates such as global greenhouse gas trends and the Antarctic ozone hole minimum.

Q4: *What are potential solutions and strategies that GML should explore as part of its efforts to enhance its current capabilities and create routine, reliable, and robust GHG monitoring and information systems in a sustainable manner to address national and international needs for GHGMMIS (GHG measurements, monitoring and information systems)?*

GML has been providing high-quality measurements of greenhouse gases (GHG) for over fifty years now, expanding the global coverage of its measurement network over time. In addition to the reference quality, the emphasis has always been placed also on the continuity of measurements that is necessary for building a long time series of data needed for diagnosing key aspects of change in Earth's climate system. While done entirely within a research environment, these measurements have been carried out in a routine manner. In addition, GML's in-house inverse modeling capabilities (CarbonTracker) form an integral part of the NOAA GHG monitoring system. Going forward, as NOAA looks at meeting the national and international needs for operational GHG measurement, monitoring and information systems, how can GML position itself as a potential contributor to meeting those needs?

Q5: *GML has made progress in recent years in improving the diversity of our workforce. What other actions are recommended to accelerate further progress in building a diverse workforce that is more representative of the U.S. workforce population? How could GML more effectively integrate participation from diverse communities and disciplines and enable our research to more directly benefit society in addressing challenges associated with climate change?*

Q5 focuses on diversity and integration of participation by diverse communities and disciplines in GML's activities. This includes diversity of the GML workforce but also integration of participation from different disciplines and diverse communities in making our research more directly beneficial to society in addressing challenges associated with climate change.

Recommendations

OAR requires reviewers to provide recommendations for how to improve the quality, relevance, and performance of the lab's science moving into the future. OAR encourages recommendations on research areas to pursue more earnestly and research areas in which to scale back. Additionally, OAR welcomes recommendations on scientific approaches, strategies for pursuing opportunities or managing risks, data management, outreach, etc. OAR requests future-looking recommendations that are specific, actionable, concise, and reasonable in number. The laboratory will develop a response plan with actions to respond to the recommendations and will track progress. Past experience shows 5 to 20 recommendations to be a manageable number that can be implemented and tracked, so the review panel is encouraged to consider providing no more than approximately 20 recommendations total. Regardless of the number of recommendations, OAR is not seeking consensus advice from the reviewers, so individual reviewers do not need to agree with all of the recommendations.