



SCIENCE ADVISORY BOARD

December 19, 2022

Dr. Richard W. Spinrad
Under Secretary of Commerce for Oceans and
Atmosphere & NOAA Administrator
Herbert C. Hoover Building, Room 6811
14th Street & Constitution Avenue, NW
Washington, DC 20230

Dear Dr. Spinrad:

Subject: Transmittal of the NOAA Science Advisory Board Ecosystem Sciences and Management Working Group (ESMWG) Report

On behalf of the NOAA Science Advisory Board (SAB), I am pleased to transmit to you the report developed by the ESMWG *Developing Resilience in the Face of Rapidly Changing Marine Environments*. This short report was developed at the request of NOAA to provide advice regarding how NOAA's practices need to evolve over the next decade to keep up with, and anticipate, possible future ocean states and the impact on ocean resources. While NOAA is not able to address every ecological forecasting need in marine and Great Lakes ecosystems, this report evaluates a subset of modeling issues that are largely under the control of NOAA.

The SAB believes addressing this topic is both critical and urgent. What has worked in the past for ecosystem models may not work for rapidly changing marine environments going forward. We strongly advise the time to act is now, so that the nation can be better prepared. We urge attention to this topic, evaluating how the linked tools of modeling, observations, data analysis, and engagement can provide insights and result in optimized tools for tomorrow.

In this report, the SAB identified three areas where NOAA's leadership can delve deeper and build additional action and capacity to understand, respond to, and plan for rapid change in marine environments:

- Understanding at scales relevant to biology: timescales and multi-stressor impacts;
- Promoting resilience by incorporating people in forecasting, risk assessment, and policy to respond to rapid change; and
- Encouraging collaborative science, co-design, and co-production in a rapidly changing marine environment.

A summary of recommendations is as follows:

- Rapid change we are now experiencing is not just historic change rates at a faster pace. Rapid change is likely to include threshold shifts, or system level perturbations, as different from a linear process.
- It is urgent to change how we anticipate and forecast concerns.
- Creating models that are fit for purpose will serve diverse needs.

- Collaboration is needed across many scales to establish goals and conduct necessary science: modeling/observations, social/earth science, and rightsholders/stakeholders/science/management.
- Strategic investments in social science must be made to advance forecasting and adaptive management.

System level changes will have deep and uncertain effects on people and social systems. The objective of developing resilience demands we study, understand, and evaluate overwhelming and socially disruptive consequences to communities. Resilience includes understanding the many ways people respond and adapt to such change.

The SAB greatly appreciates the opportunity to provide this advice to NOAA. We look forward to engagement with NOAA on this critical topic in coming years.

Very Respectfully,



John R. Kreider
SAB Chair

Cc: Sarah Kapnick
Karen Hyun
Michael Weiss
Janet Coit
Nicole LeBoeuf
Steve Thur
Cisco Werner
John Armor
Jonathan Pennock
Paul DiGiacomo

Jan Newton
Molly McCammon
Lisa Wainger
Jon Allan
Steve Weisberg
Cynthia Decker
Andrew Peck
Katherine Longmire
Viviane Silva

Attachment: NOAA Science Advisory Board ESMWG Report on Rapidly Changing Marine Environment