

2 December 2021

**To:** John Kreider, Chair, NOAA Science Advisory Board (SAB)

**CC:** SAB members Jason Hickey and Zhaoxia Pu, Liaisons to the Environmental Information Services Working Group (EISWG), and Cynthia Decker, NOAA SAB Executive Director

**SUBJECT:** Fourth NOAA SAB EISWG report to the US Congress, as required by the Weather Research and Forecasting Innovation Act of 2017 (P.L. 115-25, 18 April 2017), as amended (P.L. 115-423, 7 January 2019)

Dear Mr. Kreider:

We submit to you this fourth report to the United States Congress from the National Oceanic and Atmospheric Administration (NOAA) Science Advisory Board (SAB) Environmental Information Services Working Group (EISWG). It is made in accordance with Title IV, Sec. 401(c) of the Weather Research and Forecasting Innovation Act of 2017 (P.L. 115-25, signed 18 April 2017), and as amended (most recently by P.L. 115-423, 7 January 2019) (hereafter, the “Weather Act”), which assigns EISWG the following responsibility:

*“ANNUAL REPORT.—Not less frequently than once each year, the Working Group shall transmit to the Science Advisory Board for submission to the Under Secretary a report on progress made by National Oceanic and Atmospheric Administration in adopting the Working Group’s recommendations. ...”*

**Background and overview of process:** Over the past several years, EISWG efforts related to the Weather Act have generally been associated with either (1) individual NOAA reports mandated by the Weather Act; or (2) responses to current activities or concerns where important background information is sourced from more informal discussions or opportunities that can be identified, especially in collaboration with our NOAA liaisons. This second approach tends to be more timely than the former, which is slowed by a lengthy internal NOAA report-review process. As such, the EISWG plans to balance its future efforts between these two approaches. Ideally, this strategy will result in more timely findings and recommendations and maintain the EISWG’s commitment to the intent of the Weather Act’s review process. This maturing strategy is elaborated on in the future plans for 2022 section.

**Commonalities across submitted EISWG Reports:** In this 4th annual report, the EISWG feels it would be beneficial to identify and discuss commonalities across all reports submitted to the U.S. Congress to date. Through December 2020 EISWG has submitted four WRFIA-related reports:

- 1) Use of Observing System Simulation Experiments (OSSEs) at NOAA (April 2019)
- 2) Review and Recommendations to NOAA of the “Report to Congress - Tornado Warning Improvement and Extension Program (TWIEP) Plan” (July 2019)
- 3) Recommendations to the NOAA Science Advisory Board concerning the Earth Prediction Innovation Center (EPIC) (September 2019)
- 4) Recommendations to the NOAA Science Advisory Board concerning the Hurricane Forecast Improvement Program (HFIP) (October 2020)

A review of all four reports reveals several commonalities in the findings and recommendations, including:

- 1) The overarching need for significant increases in Federal investments to attain program goals. In many cases, program demands and expectations have grown to substantially exceed existing funding levels and must be remedied.
- 2) The growing importance of an Earth system science approach, including social and human behavioral sciences, to improve forecasts and the communication of warnings. This all-sciences approach is necessary to deliver on the need for significantly improved and expanded forecasts and information to meet future goals.
- 3) Broader collaborations, both internal (across line offices) and external (with the Weather Enterprise and other relevant Earth system enterprises), consistent with open science approaches, are required to leverage experience, avoid duplication and accelerate progress to achieve goals with constrained budgets.

### **EISWG Report completed in 2020:**

**Hurricane Forecast Improvement Program (HFIP):** The EISWG review of the NOAA HFIP (Sec. 104) report was approved by the SAB in October of 2020, submitted to NOAA Leadership, and posted on the SAB website (1) and attached for easy reference. Report highlights include:

*Urgent Need.* Cumulative tropical cyclone damages since 1980 have grown to over \$1 Trillion, more than all other billion-dollar weather and climate disasters combined (2). NOAA’s scientific review of over 90 peer-reviewed publications indicates that climate change likely continues to increase the intensity and impact of tropical cyclones (3). Weather and climate-related disasters, such as storms and storm surges, are broadly

recognized as disproportionately impacting disadvantaged communities. Given this, it is increasingly urgent that the United States improve the accuracy and extend the duration of hurricane and storm surge forecasts, as well as improve our ability to communicate to a broader community the hurricane risk factors and warnings, that save lives and property and build resilient communities.

*EISWG HFIP Review Summary.* The EISWG review contains five summary recommendations, each with expanded, detailed recommendations in separate sections. The first summary recommendation raises awareness of the overarching difficulty of delivering on an expanded HFIP scope with limited budgets. The subsequent three summary recommendations cover the specific topics raised by Congress in The Weather Act: (a) improved hurricane track and intensity forecasts, (b) improved forecasting of storm surge and communication of storm surge warnings, and (c) increased use of social science to improve the overall communication of forecasts and warnings. The final summary recommendation emphasizes the cross-cutting need to foster both internal and external partnerships to achieve success in a budget-constrained environment.

*Continuing Concerns.* A critical message of the report is that for NOAA to address the identified recommendations, the support of Congress is required to enable NOAA and its partners to expand critical research (in Earth system and social/behavioral sciences) and transitions to operations. A significant issue for the nation is that critical advances in the HFIP program (such as the rapid development of the Hurricane Analysis and Forecast System (HAFS)), and the expanded array of observations supporting hurricane science and forecasts, were accelerated by Congressional disaster relief supplemental appropriations, many of which are short term and end in 2021. Many of the NOAA research labs and external partners depend on the supplemental appropriations to support the activities that enable their contributions to the HFIP program. This is an inefficient funding model that prevents the long-term planning of needed research to be completed; ideally, extended funding can be identified and put in place.

**2021 Activities:** The EISWG has formed teams to review two recent NOAA reports, namely, *Improving Subseasonal to Seasonal Forecasting Innovation (Sec. 201)* and *Gaps in NEXRAD Radar Coverage and Recommendations (Sec. 414)*. The adopted process is to approach these two reports as we have past reports. Specifically, upon receipt (or selection) of a publicly released report, a small task group of EISWG members and outside experts is formed. A draft report is prepared by this task group. The report contains prioritized findings and recommendations; is reviewed by the

EISWG membership; and is then forwarded to the NOAA SAB for its approval and transmittal to NOAA leadership.

Additionally for the EISWG in 2021, the NOAA Science Advisory Board asked that the EISWG's co-leads also lead the decadal study of Priorities of Weather Research (PWR) report that originated in the Appropriations Act signed in December 2020. This very important effort is well aligned with the mission and goals of the Weather Act specifically, and the EISWG in general. The study consumed considerable EISWG time and resources (50% of the EISWG participated in the study), ultimately, slowing the overall review processes the EISWG is committed to completing.

EISWG also initiated the "Statement Concerning the Ongoing NWS Data Dissemination Challenges" and participated in the preparation of the "Advancing Earth System Predictions" White Paper (led by the Climate Working Group) Both reports are highly relevant to the EISWG's WRFIA activities. They were submitted to the NOAA SAB and leadership, and both will be reported on in the 2022 Report to Congress.

**2022 Planned Activities:** NOAA has made available a number of reports since the Weather Act was put into law. The EISWG has either completed, or will complete soon, reviews of five of these reports, and also submitted a separate report on OSSE's not specific to a NOAA-required report but highly relevant to the overall Act objectives. In addition, the working group concluded it did not have particularly valuable information to provide on several of the reports (for example, OAR-NWS Exchange Program (Sec. 403) and NWS Contract Positions (Sec. 410).

Nonetheless, for 2022, the EISWG plans to prioritize released NOAA reports for review to ensure that limited working group resources are committed to the topics and reports where the working group feels it can bring its greatest value. This prioritized list will be included in the annual Report to Congress starting in the spring of 2022.

In addition to prioritizing published reports for review, the EISWG is in the process of developing a more proactive process to facilitate the working group in reporting on topics it feels are most timely and relevant to the Weather Act. This process is also supported by Weather Act directives, which include "providing advice to NOAA on emerging science and technology from the academic and private sectors that have potential to improve predictions, as well as on partnerships, information services and communication." Toward this goal, the EISWG leadership identified five theme areas and solicited input from working group members, who suggested nearly twenty topic areas of potential significance to NOAA and its ability to provide the weather-water-climate-relevant information and services the nation requires. The themes were Earth System Prediction and Predictability, Technology Horizon, Workforce

and Partnerships, Information Services, Integrating Physical, Social and Behavioral Sciences. After several rounds of discussion, debate and consideration using different approaches, five candidate priority topic areas were identified:

- Information ecosystems trends (Information services)
- Next generation warning system (Integrating physical, social and behavioral sciences)
- Emerging technologies and techniques (Technology horizon)
- Precipitation, flooding and drought (Earth system predictions and predictability theme)
- Fire, smoke and air quality (Earth system predictions and predictability)

The five candidate priority topic areas were identified before half of the EISWG members joined the Priorities for Weather Research (PWR) Study. Portions of all of these topics have already been addressed in some way in the PWR Study. As such, in 2022, we will revisit the need for/ goals of / scope of these topic areas in light of the PWR report results.

For 2022, the EISWG plans to focus its efforts in these two areas, namely: (1) review of identified high priority NOAA reports, and (2) further development of identified, high-value candidate topic areas. The EISWG is currently organizing this new approach into a comprehensive plan that will be presented in the spring 2022 report to congress.

In summary, the EISWG is generally satisfied with NOAA's attention to, and progress toward, achieving the objectives of the Weather Act (and the NIDIS reauthorization) within their budgetary constraints, and in its response to our recommendations. We have found our access to NOAA experts and Leadership productive and collaborative.

On behalf of the members of the EISWG,

Scott Glenn, EISWG Co-Chair, and Board of Governors Distinguished Professor,  
Rutgers University

Brad Colman, EISWG Co-Chair, and Director of Weather Strategy, Bayer Crop Sciences

References & Links:

1 Link to HFIP report on SAB site -

[https://sab.noaa.gov/wp-content/uploads/2021/08/EISWG-HFIP-Review-Report\\_Oct-2020\\_Final-1.pdf](https://sab.noaa.gov/wp-content/uploads/2021/08/EISWG-HFIP-Review-Report_Oct-2020_Final-1.pdf)

2 <https://www.ncdc.noaa.gov/billions/summary-stats>

3

<https://www.climate.gov/news-features/understanding-climate/climate-change-probably-increasing-intensity-tropical-cyclones>