

**Meeting of the NOAA Science Advisory Board**  
**April 27-28, 2022**

Location: DoubleTree Silver Spring  
8777 Georgia Avenue  
Silver Spring, Maryland

Presentations for this meeting have been posted on the Science Advisory Board (SAB) website:  
<http://www.sab.noaa.gov/SABMeetings.aspx>

**SAB members in attendance:**

Mr. John Kreider, President, Kreider Consulting LLC (Chair); Mr. Jon Allan, Senior Advisor, Senior Academic and Research Program Officer, School for Environment and Sustainability, University of Michigan; Mr. Jesse Ausubel, Director, Program for the Human Environment, The Rockefeller University; Dr. Ilene Carpenter, Earth Sciences Segment Manager, Hewlett Packard Enterprise; Dr. Chelle Gentemann, Program Scientist, Transform to Open Science, National Aeronautics and Space Administration; Mr. David Grimes, President and CEO, Grimes Consulting; Dr. Robert Grossman, Frederick H. Rawson Distinguished Service Professor in Medicine and Computer Science and Jim and Karen Frank Director, Center for Translational Data Science, University of Chicago; Dr. Jason Hickey, Technical Staff, Google Research; Mr. W. Chris Lenhardt, Domain Scientist, Renaissance Computing Institute, University of North Carolina at Chapel Hill; Dr. Brooke Fisher Liu, Professor of Communication and Associate Dean for Academic Standards and Policies, The Graduate School, University of Maryland; Dr. Bonnie McCay, Distinguished Professor Emerita, Department of Human Ecology School of Environmental and Biological Sciences, Rutgers University; Dr. Zhaoxia Pu, Professor, Department of Atmospheric Sciences, University of Utah; Dr. Denise Reed, Professor Gratis, Pontchartrain Institute for Environmental Sciences, University of New Orleans; Dr. Martin Storksdieck, Director, STEM Research Center and Professor, College of Education and School of Public Policy, Oregon State University; Dr. Elizabeth Weatherhead, Senior Scientist, U.S. Geological Survey; Dr. Steve Weisberg, Executive Director, Southern California Coastal Water Research Project; Dr. Anthony Wu, Executive Director, AeroMarine LLC; Dr. Donald Wuebbles, The Harry E. Preble Professor of Atmospheric Sciences, University of Illinois.

**NOAA senior management and Line Office representatives in attendance:**

Dr. Rick Spinrad, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator; Dr. Cisco Werner, Acting NOAA Chief Scientist and Acting OAR Assistant Administrator; Ms. Janet Coit, Assistant Administrator, National Marine Fisheries Service and Acting Deputy NOAA Administrator; Ms. Nicole LeBoeuf, Assistant Administrator, National Ocean Service; Dr. Steve Volz, Assistant Administrator, National Environmental Satellite Data and Information Service; Ms. Mary Erickson, Acting Assistant Administrator and Director, National Weather Service; Dr. Gary Matlock, Deputy Assistant Administrator for Science, Oceanic and Atmospheric Research; National Marine Fisheries Service; Mr. A.J. Reiss, Acting Deputy Director, National Weather Service

**Staff for the Science Advisory Board in attendance:**

Dr. Cynthia Decker, Executive Director and Designated Federal Officer; Ms. Courtney Edwards; Andrew Peck.

### **Opening Statement of the Chair**

John Kreider, Kreider Consulting and Chair, NOAA SAB

John Kreider welcomed the attendees to the meeting and reviewed the agenda. He recognized two SAB members whose terms recently expired, Eugenia Kalnay and Everette Joseph.

### **SAB Consent Calendar**

John Kreider, Kreider Consulting and Chair, NOAA SAB

- December 2021 SAB Meeting Minutes
- Working Group status reports

Denise Reed made a motion to accept the consent calendar. The motion was seconded by Elizabeth Weatherhead and was passed unanimously.

### **NOAA Response to SAB Data Archiving and Access Requirements Working Group Report: Recommendations Concerning the NOAA Data Strategy Implementation Plan**

Tony LaVoi, NOAA Chief Data Officer (CDO), Office of the Chief Information Officer

Of DAARWG's eight recommendations to NOAA on their Data Strategy Implementation Plan, seven were accepted and incorporated into the final strategic action plan. The only recommendation that was not accepted concerned the source of the budget for the CDO, which was considered out of scope for the document. Detailed responses were made available along with the meeting materials. NOAA's response also considered DAARWG's recommendations in their Preparing for a Cloudy Future report from 2019. The SAB's prioritizing of open science/open data (OSOD) presents an excellent opportunity for collaboration on NOAA's efforts in this area and the agency would like to explore more agile ways to engage with the Board. Mr. LaVoi reviewed some of the data activities that NOAA and the larger federal enterprise have been engaged in over the last four years, including the Evidence Act, NOAA's Strategic Plan, and data strategies for the agency, the Department of Commerce, and the federal government writ large. NOAA's Data Strategic Action Plan lays out the organizational priorities for the next five years. These include data governance, data policy framework, data workforce, and open data. Each of these priorities include specific actions NOAA seeks to carry out, including 12 that they intend to complete in FY22-23. Data governance is the foundation for all the efforts across the agency. NOAA has recently received approval to start a new Data Governance Committee (DGC) which broadens the scope of the Environmental Data Management Committee to include all NOAA data. NOAA will create an Assistant Chief Data Officer role within each of the line offices and these individuals will comprise DGC along with the NOAA CDO. As CDO, Mr. LaVoi was tasked with developing a Data Dissemination report addressing how NOAA can provide better access to data and information to users. NOAA has hundreds of webpages and systems through which they disseminate data, but users have difficulty finding it. NOAA is compiling recommendations on how to improve this, which is an area the DAARWG could provide helpful input. NOAA's Big Data Program has evolved from an experiment to an operational enterprise, now known as NOAA Open Data Dissemination (NODD). Through this effort, NOAA is leveraging its relationships with cloud service providers to bring exposure to

NOAA's open data. To address interoperability challenges, NODD is providing a centralized location for NOAA's data and documentation. They are now working to address data conversion, moving from legacy formats to more cloud-optimized formats. NOAA's data broker at North Carolina State University has developed a dashboard to display metrics for accessions, interactions, and uploads. NOAA has been playing a lead role in developing an AI-ready data standard and is working with the National Aeronautics and Space Administration (NASA) and the U.S. Geological Survey (USGS) to develop AI-ready standards for particular subsets of data. They expect to have an AI-ready data standard in the next 2-3 years and there are many areas here for contributions from the SAB or its working groups.

### Discussion

Jesse Ausubel said that NOAA's strength has been with oceanographic and atmospheric data, but biological data has always been a vexing issue. He asked what Mr. LaVoi thought the challenges were with regard to biological data. Mr. LaVoi said that NOAA is actively working to provide better access to Fisheries data within the constraints of the Magnuson-Stevens Act. Some of the challenges inherent in the 'omics community include the substantial data volumes and computational requirements. The 'omics team is developing a strategy for how to handle their data loads. Nancy Majower said Fisheries is working on a vision for making much more of their data available.

Bob Grossman congratulated NOAA on all they have done with OSOD over the last couple years and the leadership they have demonstrated among federal agencies. He asked how NOAA approaches balancing between leveraging cloud-specific vendor services and what they need to do to derive cloud-agnostic data. Mr. LaVoi said that the vast majority of NOAA data moved from on-premise systems to cloud systems has had very little data conversion, primarily due to resource availability. Much of the work they are doing within the AI-ready data standard is to inform NOAA on their best options, balancing true openness and platform-specific technologies.

Elizabeth Weatherhead asked how NOAA is coordinating and prioritizing what data they make available in order to optimize their resources while also serving the end users. Mr. LaVoi said those decisions are primarily made within the mission line offices based on long-standing requirements as well as future opportunities. Dr. Volz added that NOAA is working with NASA and USGS to ensure their data is compatible as they all transition to a common cloud.

Jason Hickey said that AI is an evolving technology and asked how NOAA is developing standards so that their data will be available and accessible over the coming decades. Mr. LaVoi said the need for developing an AI-ready standard is recognized by many members of the data community. While they have put a lot of work into this area already, NOAA is open to better solutions to the problem and will stay mindful of developments elsewhere, including internationally.

David Grimes said he was trying to understand the roles of the line offices versus the role of the enterprise in this effort, recognizing the various interdependencies that the line offices have. He also noted that much of the world does not have the bandwidth available to work from the cloud and asked how NOAA intended to address this. On international collaboration, he asked how much NOAA has collaborated with European agencies that have experience in this area and could offer best practices and lessons learned. Mr. LaVoi said that the line offices are responsible

for the mission and the particular data while the enterprise level NOAA effort and the CDO look for opportunities across line offices around standards, best practices, deployment of systems, et cetera. Each of the line offices has a different culture based around the mission when it comes to data governance and management. He was not in a position to comment on international engagement.

Jon Allan asked if the turnaround time from sensor to use has shortened. He commented on the need for more investments in all aspects of data, recognizing the economic and utility value of decisions being made with NOAA data. Measurements on how having access to this information impacts the nature of local decision making and political will would be helpful. Another interesting exercise for the challenge team may be to assess the ability of users to find and use data that NOAA knows it has. This could help identify where the difficulties are in accessing NOAA data and may lead to meaningful solutions.

Chelle Gentemann asked if NOAA will be making their data metrics public. Mr. LaVoi said they will be sharing them on a dashboard. Dr. Gentemann also said that, as NOAA is developing new AI-ready datasets and cloud-optimized datasets, they still have the older formats out there as well. People are struggling to find the data they need because it stored on so many websites. Moving to the cloud and creating multiple versions of the same datasets in different formats seems likely to amplify this issue. NOAA needs to focus on how to make data more accessible and simplify the user experience. Mr. LaVoi said it is important to remember that there is an entire ecosystem of users that are comfortable with the current formats and not everybody has the resources to keep up with these changes. NOAA needs to stay mindful not to leave behind users that are reliant on its data.

### **Review of the Draft 2022 Report to the United States Congress from the Environmental Information Services Working Group**

Brad Colman, Climate Corporation and Co-Chair, EISWG

Scott Glenn, Rutgers University and Co-Chair, EISWG

Brad Colman presented the report outline. The core of the report speaks to the NOAA Data Dissemination Statement and the Hurricane Forecast Improvement Program (HFIP) Review. NOAA's response to the Data Dissemination Report was timely and thorough, specifically addressing multiple concerns. NOAA was able to reduce the throttling in response to concerns. Resourcing issues in the face of surging demand for NOAA data was a major challenge when the report was drafted. The report includes several call-outs of unfunded items that the EISWG has emphasized as priorities. EISWG encourages NOAA to continue its current path, but also to prioritize this issue resource-wise. Based on the HFIP Five-Year Strategic Plan, EISWG developed five recommendations and 21 sub-recommendations relating to the three Congressional focus areas of track and intensity forecasts, storm surge forecasts, and communication. In addition to these, there were two cross-cuts on the scope and funding for the plan itself and the value of partnerships. NOAA's response was thorough and EISWG commended the agency's sustained progress on HFIP while acknowledging there is much left to do. EISWG urges NOAA to implement the five-year strategic plan and highlighted the funding is about \$12M short annually of what NOAA requested. The urgency of hurricane forecast improvements was a critical takeaway from the report, as was the need for additional resources for long-term efforts. HFIP is increasingly part of a broader NOAA system, which needs to be taken into consideration in order to achieve the goals of the Weather Act. The rest of the report

provides an overview of what EISWG is currently working on and what will be included in the 2023 report, as well as how all of this ties in to the Priorities for Weather Research (PWR) Report that was submitted in 2021.

### Discussion

Jason Hickey commended the EISWG's work over the last year. He asked how they envision EISWG's role in the unifying efforts for the related areas of data dissemination, open science, and data governance. Dr. Glenn said that some of these topics are being addressed by the SAB, so EISWG primarily brings its perspective to Open Science Working Group sessions and would also be willing to start engaging with the NODD efforts. Dr. Hickey asked if the EISWG sees a need to bring together data governance and data dissemination over time. Dr. Colman said they need to be coordinated and NOAA's response indicates their intention to bring NODD into this effort. The SAB may be able to provide guidance on what they think EISWG's role should be.

Denise Reed asked about how best to communicate the needs and potential consequences identified in the report to Congress. Having too many priorities may lead to each being viewed as less urgent. She also noted that no one from NOAA was present in the room that could address the disconnect the report points out relative to the progress on data dissemination. As a report to Congress, the document needs to be able to stand alone, as opposed to leaning on other reports, which it currently does. Dr. Colman said the EISWG has a vast and complicated portfolio and they only bring the most critical items before to SAB. The true value of this process is in the dialogue between all the various parties. They could add more explicit language about the criticality of getting out watches and warnings and the need to have reliable data and the resources necessary to support a vast weather industry. Mary Erickson said that NWS has shared their Integrated Dissemination Program (IDP) plans. NOAA received \$12 million for NWS dissemination in the FY22 President's budget and have requested further funding in FY23 to resource that plan.

John Kreider said it is important to have plans, but it is a problem if the work does not go beyond planning. He asked if the EISWG felt NOAA is really making progress implementing their plans and what key performance indicators would indicate they are meeting their objectives. Dr. Glenn said that if NOAA implemented the plan they would make a lot of progress on addressing the challenges it cites. Funding constraints will determine progress in many of these areas.

Jon Allan commented that the SAB seemed to be in a "do loop" with NOAA, in which the Board keeps saying what they would like to see and the agency responds with the same answers on why they are not doing it. The SAB may need to consider new approaches moving forward. He also stressed the importance of coupling the human behavioral dimension with an empirical/predictive basis. Faster models may not prompt the public to respond to warnings any more than the current ones. Dr. Glenn said they recognized that this problem goes beyond HFIP, but HFIP is an important use case for demonstrating the need. Dr. Colman said the entire enterprise is asking itself how to optimize social-behavioral science. These are complicated issues and the entire enterprise needs to recognize their importance.

Members decided to table the item and vote on it later in the meeting after having direct interaction with NWS representatives.

## **NOAA Response to SAB Data Archiving and Access Requirements Working Group Report: Recommendations Concerning the NOAA Cloud Strategic Plan Actions**

Nancy Majower, Assistant Chief Information Officer, National Marine Fisheries Service

The NOAA Cloud Action Plan has gone through several iterations and its latest version incorporates many suggestions from the DAARWG's and the NOAA Science Council, who approved it in February of 2022. The plan's objectives include promoting innovation, facilitating migration, recognizing enterprise opportunities, providing governance, and developing a cloud-ready workforce. In order to build upon innovative actions across the agency since DAARWG's 2021 review, NOAA has been establishing exploratory environments, addressing greater agility, emphasizing training for diverse constituents, leveraging unique cloud benefits beyond infrastructure, collaborating on data co-location, and has more innovative opportunities on the horizon. NOAA has several actions underway to establish an exploratory environment, including NODD utilizing cloud service provider credits for scientists/partners to develop innovative solutions and format transitions, as well as Fisheries, the National Environmental Satellite, Data, and Information Service (NESDIS), and the Integrated Ocean Observing System (IOOS) launching cloud sandboxes on various platforms. DAARWG recommended incorporating more agility in the plan and NOAA recognizes the need to be able to rapidly adapt its products and services to current events and customer needs. It is critical that the mission programs understand what the capabilities might be in order to optimally leverage the cloud. It is important to have training so that a diverse group of end users can use programs within the cloud environment NOAA sets up. NOAA has actions underway that will leverage unique cloud benefits beyond infrastructure, including NODD working with a variety of partners to optimize formats, provide data tutorials, educational seminars, and launch AI/ML efforts. The Cloud PMO Center of Excellence is also working with the Department of Commerce to provide data to solve specific challenges for underserved communities.

### Discussion

Robert Grossman asked about changes NOAA has made in how it preserves their data, the role of the NOAA Data Center, and how they conceptualize their approach. Ms. Majower said they have worked through a lot of cases where the cloud might not be reliable enough for their needs and are figuring out best practices for determining where it is appropriate. There is a lot of work to be done in this area and they need to be agile. Mr. LaVoi added that the NOAA Cloud Archive Project is looking into this for both the technology and policy implications. They have gotten clear guidance from the National Archives and Records Administration on how to go about archiving and what the appetite is for risk acceptance in the cloud.

Chris Lenhardt asked for more information on coordination with the National Centers for Environmental Information (NCEI) on the cloud. Ms. Majower said they work very closely with NCEI and there is a NOAA Cloud Committee made up of all line offices.

Jesse Ausubel asked how much control or influence NOAA leadership has over NOAA-supported activities given the regional approach of much of the agency's offices. Ms. Majower said they are making considerable progress in this area. Their influence comes from highlighting case studies. Mr. LaVoi said the approach they often take within the data community is to speak to the value of partnering and complying with best practices. In many instances, NOAA is not a hierarchical organization but there is still a need to enforce compliance at times.

Jason Hickey asked what role public-private partnerships play in addressing this as a joint design effort. Ms. Majower said they are partnering in many cases and have been able to utilize the providers and their expertise while also bringing in mission staff to come up with solutions.

David Grimes said it is unclear how the exploratory environments will benefit NOAA. He suggested emphasizing how interaction and collaboration need to take place to help people learn based on their different levels of capabilities.

### **Tsunami Science and Technology Advisory Panel (TSTAP) Post-Tsunami Review Report to the SAB**

Rocky Lopes, Co-Chair, TSTAP

Rick Wilson, California Geological Survey and Co-Chair, TSTAP

The TSTAP's review report was not meant to be an after-action review of the January 15 tsunami advisory along the west coast stemming from the Tonga volcano eruption. However the timing of the event aligned with when the original TSTAP report was submitted to NOAA and so the panel presented its observations and findings from the event correlated with the recommendations included in their report. Together they demonstrate why addressing these issues is so urgent. The Tonga eruption was a non-seismic event and these were cited in the report as an area where significant improvements were needed. The first alert went out from the National Tsunami Warning Center (NTWC) saying they were analyzing the event to determine the level of danger. A Tsunami Advisory was issued nine hours later. The tsunami was projected to arrive at high tide and tides are not currently integrated into the Tsunami Forecast System. The tsunami impacted the entire ocean for 28 hours and a pressure wave generated from the eruption also produced tsunami effects as far away as the Mediterranean Sea and the Caribbean. The Tsunami Advisory lasted for 19.5 hours for some locations. Damage assessment estimates to ports and harbors in California was ~\$10 million. Dr. Lopes discussed each of the TSTAP's 13 observations and findings from the Tonga eruption and how they aligned with the recommendations included in their report.

#### Discussion

Robert Grossman asked how many of these findings would have been present in the case of a seismic event. He also asked how many tabletop exercises the TWC does in a given year. Dr. Lopes said the last exercise was a hybrid tabletop in 2018. The TSTAP did not do an analysis of what would have occurred if this had been a seismic event. Of the 22 recommendations in the TSTAP report, 15 were further emphasized or refined by this event.

Denise Reed said the review report does a good job of providing more support for the existing recommendations. She asked what happens to it if the SAB approves it. Dr. Decker said that if it is approved, SAB staff will put a cover letter on it and forward it to NOAA leadership as a supplement to the original TSTAP report. Dr. Lopes clarified these are not new recommendations and will not require an additional response from NOAA.

Jon Allan made a motion to accept the report as written. The motion was seconded by Denise Reed and passed unanimously.

## **NOAA Response to SAB Climate Working Group Report: Opportunity for COVID-19-related Earth System monitoring and prediction efforts as a result of worldwide shelter in place/stay at home policies**

Craig Frost, Supervisory Research Chemist, NOAA OAR Chemical Sciences Laboratory  
Shobha Kondragunta, Research Physical Scientist, NESDIS

In April of 2020, the Climate Working Group (CWG) recommended that NOAA take advantage of the opportunity for COVID 19-related earth system modeling and prediction efforts as a result of the worldwide shelter in place/stay at home policies. They provided some general objectives for the agency, including: observe and quantify atmospheric composition and radiation responses to the pandemic's economic downturn, model the earth system impacts of these changes, and collaborate with public health agencies to assess prediction capability for vector-borne diseases. Dr. Frost presented NOAA's response summarizing some of their activities addressing each of these three objectives. The results of this research are either in preparation or have been published in numerous papers in scientific journals. This work brought together NOAA's Oceanic and Atmospheric Research (OAR) laboratories, NOAA line offices, university partners and partners in other federal agencies. Some of the work Dr. Frost highlighted included COVID-AQS, which is NOAA's ground-based field study of air quality during the pandemic that they then compared to an air quality baseline from two years earlier and found a profound decrease in emissions in the spring of 2020 followed by a gradual increase as people went back to work. Comparing Environmental Protection Agency (EPA) datasets on air pollutants, NOAA found corresponding changes in decreases in primary and secondary pollutants. Carbon monoxide and carbon dioxide emissions in the study areas decreased by about a third during this period. Methane emissions did not change much during the pandemic because the primary source of methane in the study area is from landfills and natural gas transmission networks. He highlighted a collaboration between NESDIS and OAR looking at satellite measurement of atmospheric compositions, for example nitrogen dioxide. A team from the National Institutes of Health (NIH) and Princeton University funded through NOAA cooperative agreements used a climate-dependent epidemic model to simulate the COVID-19 pandemic, probing different scenarios based on what is known about the role of seasonal variations has on the occurrence of coronavirus and similar viruses. Without a vaccine or other control measures, COVID-19 will likely only be responsive to seasonal changes after the supply of unexposed hosts is reduced. A simulation that accounted for the impact of control measures, such as social distancing, suggested that the longer these measures are in place and slow the transmission of COVID-19, the more sensitive the virus becomes to warmer weather. This effort increased and strengthened the partnerships NOAA has not only within the agency, but also with federal and academic partners. It has also led to new research efforts and changes in the way NOAA conducts field work. It has even informed planning for the Next Generation NOAA satellite missions, which will now include monitors for air pollutants on geostationary satellites. Innovative applications and improved forecasting tools developed during this effort will lead to better information going to NOAA stakeholders and improved preparation for the next pandemic event.

### Discussion

Joellen Russell said the CWG was very pleased with the NOAA response to the COVID-19 challenge. It was an incredibly nimble and comprehensive response under profoundly difficult working conditions.



Elizabeth Weatherhead asked if it is correct to interpret all of the atmospheric changes as being due to shifts in the transportation system. Dr. Frost said it is fair to say that the majority of the changes were due to this, but there were also some changes in the industrial sector. Dr. Weatherhead said that these studies could provide key insights into the benefits of electrifying the transportation sector. This is policy-relevant and right in line with what the SAB looks to NOAA to be doing. Dr. Weatherhead also asked if these findings are being picked up by NOAA or others and carried forward to study the human health and environmental impacts. Dr. Frost said that typically NOAA does not do the calculations around human health benefits if air pollution improves, but others use the information NOAA produces to do this work. A number of NOAA scientists contribute to studies such as the Global Burden of Disease and these partners are picking up these studies.

Jesse Ausubel said NOAA missed many opportunities during this period, particularly on the ocean side, which have led to significant data gaps in the time series. Of the agencies collaborating on this effort, the only one prepared for natural experiments was the National Science Foundation (NSF), who had ways to do RFPs and quick contracting that NOAA and the Navy did not have. There is a lot that NOAA and the Navy could learn from NSF to capitalize on natural experiments in the future. It is also important to remember that the pandemic was not the only contributing event that happened in those months. Negative prices for oil led to drastically reduced shipping and a stoppage of seismic testing on the sea floor. These impacts were comparable to the pandemic in terms of sound in the ocean. Dr. Frost noted that the CWG's charge focused on atmospheric side and that is what led their efforts. He was not able to speak to what the agency did or did not do on the ocean side. There were a number of NOAA laboratories doing in situ observations on the ground or with aircraft, mobilizing even though they were unsure of how safe it was. It is the synergy of the satellite and in situ measurements that give value to the information.

Cisco Werner said NOAA is taking the totality of the report and the future directions into consideration as they prepare for what to do next. On the ocean side, the findings raise several questions about what to do next in regards to uncrewed systems so that these measurements can continue in the event of a future disruption.

Jon Allan asked if the SAB should revisit the issue of rapid response preparations for certain contexts, particularly the operational issues that emerged during this study. Mr. Kreider said that the SAB's focus should be on science, but the operational aspects that could enable better science would be worth commenting on.

### **NOAA Update**

Rick Spinrad, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator

Rick Spinrad reminded the SAB of his top three priorities for the agency: establishing NOAA as the primary authoritative federal source for climate products and services that can be applied to a diverse range of missions, advancing NOAA's complementary work on environmental stewardship and economic development with a particular focus on the New Blue Economy, and exhibiting equity in how NOAA builds and provides services. NOAA is focused on diversification of the workforce. In addition to thinking about the socio-economic side of equity, they are also addressing challenges for communities that speak languages other than English by

increasing their translation efforts. NOAA currently has extraordinary support from the Department of Commerce for balancing the economic development portion of their portfolio balanced with their environmental stewardship mission. NOAA fully recognizes the potential for taking their raw data and translating it into real economic value. NOAA has been meeting with the Economic Development Administration to discuss their role in supporting a New Blue Economy and the concept is starting to materialize, especially in the climate services arena. There is a desire to focus on climate adaptation and resilience, rather than just mitigation. Dr. Spinrad briefly discussed NOAA's efforts to develop Climate-Ready Nation (CRN), NOAA's efforts to secure a permanent Chief Scientist with a strong climate and financial technology background, and the standing up and implementation of the NOAA Climate Council. NOAA has met with several federal agencies at the senior level to discuss what they need to realize a Climate-Ready Nation. There will be significant consequences for many sectors of the economy and society resulting from climate change, but if this is done right, there will also be opportunities to benefit from sophisticated climate services while providing a stimulant for economic development. Dr. Spinrad challenged the SAB to come up with ways in which they offer help on this initiative. He would like to see the SAB bringing cutting edge disruptive technologies to NOAA's attention to vet how they might be applied in their work. He would also like to hear guidance from the SAB on potential partnerships. He would like the SAB meetings to be more forward-leaning and entice more NOAA people to attend.

### Discussion

David Grimes said that in his recent work with the financial sector he has found that they are very vulnerable to climate issues and that they are an enabler as well. Traditionally, the focus on industry partners has been on sectors that are directly related to NOAA's work, but there is a lot of potential benefit in looking to those vulnerable sectors for whom regulatory changes will need to be made in order to keep their industry sound. Dr. Spinrad said the Chief Scientist they are trying to bring onboard would bring a lot of this expertise and it is a major driver in NOAA's work with the Treasury Department and other agencies.

Chair Kreider said the SAB has heard repeatedly that they need to be more agile and they should modify their timeline to be more rapidly responsive. In order to be more helpful, the SAB would benefit by seeing more feedback from NOAA on results. If NOAA wants to be more agile and incorporate disruptive technologies, it requires a culture and a willingness to take risks that may not work but offer valuable learning opportunities. Dr. Spinrad said he would like to see the PWR report used as a case study for developing key performance indicators and priorities for programs. Risk tolerance starts at the top and program managers need to know they are encouraged and supported to take risks. He has been very vocal internally about a tolerance for failure, especially where there is a high potential benefit.

Jon Allan said that the notion of a Climate-Ready Nation is going to be facilitated heavily through the financial sector. Capital deployments under the UN-supported Principles for Responsible Investment are going to change everything in every sector of the economy. There is a huge movement of wealth from higher carbon consequence to lower carbon consequence investments and NOAA could have a profound impact by informing those decisions.

Chelle Gentemann asked if there are specific things about the interaction between NOAA and the SAB that Dr. Spinrad would like to see changed. Dr. Spinrad said he wanted to hear the SAB's thoughts first and then figure out the mechanics of making it happen. Some of the responsibilities for reviewing reports can probably be done differently and they have made improvements in working remotely over the last two years. He would like to see a room full of people from NOAA in the room listening to the SAB discuss cutting edge topics and get the benefit of the back and forth directly.

Robert Grossman commented on NOAA's engagement over the last couple years with the social sciences community and how that has benefited NOAA's mission work. It might be helpful to consider an engagement at a deeper level with the not-for-profit community, in particular the economic sciences. Getting a better understanding of the economic value of data at a deep and scientific level would present opportunities to broaden the way that NOAA is engaging with the New Blue Economy. Dr. Spinrad said that, while they have learned a lot, this is not NOAA's area of expertise. He would like to get the Director of NSF, Sethuraman Panchanathan, to speak with the SAB on this subject and where there might be opportunities to collaborate.

Denise Reed cautioned that they should consider societal value and not just focus on the monetary side. Equity and the blue economy should go together. She also said that the SAB and NOAA have gotten into the habit of just swapping reports and the meeting format is not especially conducive to dialogue. The formal advice that they need to provide works better if the SAB has enough engagement to really understand what NOAA is telling them and generate ideas collectively. Dr. Spinrad said that he may have overemphasized the economic value because it is something that has been underemphasized in the past, but it is not at the expense of the other performance measures. He asked the SAB to consider if there are things that other advisory boards do well that the SAB might benefit from employing,

Jesse Ausubel said that he was not aware of a vision of what the U.S. Exclusive Economic Zone or continental shelves might look like in 2050 or after. Developing a widely shared vision of what the New Blue Economy might look like on American shelves in 2050 might be worthwhile. Dr. Spinrad said he has asked the National Ocean Service's (NOS) Assistant Administrator to draft something that defines what the New Blue Economy is and how it will be implemented. This would be a great topic for discussion at the next SAB meeting.

Martin Storksdieck said there is a large community of social scientists trying to figure out how to get communities climate ready at a number of levels. In order to provide useful advice, it is essential that the SAB understand the extent of NOAA's knowledge around these topics. Dr. Spinrad said one of the aspects they have been discussing is how to ensure NOAA's products and services are being delivered to a literate user group that understands what is being delivered and how to use it. Dr. Storksdieck said it goes even deeper, to the structure of communities and said he would be happy to provide further insights in this area.

### **Climate-Ready Nation Briefing**

Ko Barrett, NOAA Senior Advisor for Climate

NOAA's vision for a Climate-Ready Nation is a thriving nation whose prosperity, health, security, and continued growth benefit from and depend upon a shared understanding of, and collective action to reduce, the impacts of climate change. Dr. Barrett is leading this initiative as part of her role as Senior Advisor and she is committed to bringing together the climate-related capabilities in place across every NOAA mission area and supporting a more coordinated service delivery approach. The idea is to target service delivery to states, communities, and tribes across the U.S., to support federal agencies to climate-proof their investments, and to work with academia and the private sector to enable a robust public-private service delivery enterprise. A piece of this will include enhancing efforts to foster a climate-literate public empowered to take action in their own lives and spheres of influence, particularly in underserved communities. NOAA is uniquely positioned to execute this vision and through partnership and co-development of knowledge they hope to transform the way people receive, understand, and act on climate information. The next decade will be critical in addressing the climate challenge. Transformational change must be enacted at the national level, but NOAA must also harness the ambition and call for action at every level of society. Two key hallmarks of what a Climate-Ready Nation would look like include: (1) decision makers and citizens have equitable access to the climate information, products, and services they need and a clear understanding of what this information means for their communities, economies, natural resources, and the built environment; and (2) decision makers and citizens are empowered to take a range of adaptation and mitigation actions that can prevent or reduce the negative impacts of climate change by utilizing socioeconomic, ecological, and other relevant information to build resilience, including by considering tradeoffs of different pathways. Interagency working groups are meeting to bring the capacities of federal agencies together to work on the problem. They hope to extend this reach to all segments of society and provide them with the information and tools needed to advance their priorities in a way that thrives in the face of climate change. They have aligned CRN with the 211-d report that identified risk and focus areas (drought, wild fire, flood, coastal resilience, and extreme heat) as key areas in which to coordinate their efforts. They have added to this list two other areas of marine resources and greenhouse gas mitigation. This initiative is a scalable effort and can grow as much as demand grows. NOAA cannot accomplish this vision without extending their capacity through use of partnerships. They are currently focusing on serving climate needs within the Department of Commerce, where they have strong support to work collectively on climate change. Dr. Barrett discussed the spectrum of expertise and said that, as they implement the CRN, they are looking for simultaneous consideration of NOAA's value chain to ensure alignment with NOAA's existing portfolio of climate products. She discussed an example of a CRN project, a collaboration with the U.S. Department of Transportation providing climate information and assistance to transportation planners and stakeholders to enhance safety, effectiveness, equity, and sustainability of the nation's transportation infrastructure. In the near term, the CRN team will be working to integrate CRN into existing NOAA offices and programs to support a cross-cutting structure, as well as continue to engage across NOAA and with partners to share, improve, and advance the CRN concept.

## Discussion

Don Wuebbles asked for examples of new research or capabilities that will be developed from CRN and what NOAA will be doing differently to address local issues in order to solve what

may be much bigger issues. Dr. Barrett said they will be addressing their response to priorities at the local or state level and ensuring they are providing support to the local/states' priorities. They are just starting to build teams of experts that work in risk areas to identify where opportunities are for making the greatest impact. In many cases, people just need to know what information is available and how to access it. They will hear from people in working in local communities to get their priorities and then feed those back to NOAA and other federal agencies.

David Grimes said that one dimension that seems to be missing is the focus on systems reengineering, because societal systems were not designed to address this kind of pressure. Thinking about it in this way introduces a different kind of scale, rather than just being about creating access to information and then empowering processes. On the CRN initial risk and focus areas, just speaking about broad hazards and not addressing the vulnerability dimension may not communicate the focus and fail to engender a need within the community to do something about it. He commented that the concept of scale may need more visibility in the plan, because it is essential that the products be aligned with what the scale demands.

Jon Allan said the Great Lakes communities have come to the conclusion that there is very little they can do to influence treaties and international agreements on carbon policy, but they want more information on what they can do in their own lives. NOAA should continue to think about the suite of services, as well as organizations/institutions, that can help communities make decisions and make them in a way that they are politically tenable.

Denise Reed commented on the phrase "climate proofing investments," which may sound to some as though they can insulate themselves from climate change. She asked about the scale of the level of ambition of the pilots with USDOT and encouraged NOAA to reach for something big with this effort. Dr. Barrett said they have just begun the conversation with USDOT and will take up scoping soon.

Martin Storksdieck asked if NOAA's role in creating climate-ready communities goes beyond providing technical assistance to organizations that provide informational tools. It is well established that information does not necessarily lead to action, so he asked if NOAA feels it is part of their responsibility to help communities respond. Dr. Barrett said NOAA wants to go further than just providing information but the question is how far they can go and actually make a difference.

Elizabeth Weatherhead said the scientific community wants NOAA to play a role in the community and she feels her company Jupiter Intelligence, which relies on NOAA's observations and models, has not been engaged by NOAA in the way other agencies and even international groups have included them. If more of the emphasis could be on leveraging the existing expertise within the broader community, NOAA would have a winning path forward. Dr. Spinrad said he was surprised to hear this sentiment. He is open to suggestions on how to do this better but partnerships are a critical part of the concept of operations for NOAA.

John Kreider said it was unclear from the vision statement where exactly NOAA wants to be. He suggested summarizing what they hope to achieve in the next eight years and then look at the steps they need to start on now in order to achieve those goals.

## **NOAA Science Update**

Cisco Werner, Acting NOAA Chief Scientist and Acting OAR Assistant Administrator

Dr. Werner discussed recent science activities as they relate to NOAA's three research and development vision areas for 2020-2026: (1) reducing societal impacts from hazardous weather and other environmental phenomena; (2) sustainable use and stewardship of ocean and coastal resources; and (3) a robust and effective research, development, and transition enterprise. NESDIS and NCEI released the new 1991-2020 temperature-, precipitation-, and snow-related climate normals which provide a new baseline for considering relative climate changes. Other activities related to the first vision area included NOAA's first integrated ocean observations tool to coordinate the use of different in situ ocean observing platforms called OceanView, the launch of the first ever national rip current forecast model, and the development of the Weather and Society Dashboard that will enable forecasters to better understand public perception, response, and readiness to severe tornadic events. On the second vision area, NOAA researchers have developed global seasonal forecasts that can provide up to a year of advance warning for marine heatwaves that could help fishing fleets, ocean managers, and coastal communities anticipate these events. Other activities related to sustainable use and stewardship of ocean and coastal resources include the ongoing development of a nationally integrated coastal/ocean and biological modeling system, a study pairing herbivorous fish behavior and demographic data in a coral reef ecosystem to explore the effects of changing human activities, and the agency's continued reliance on community partners to assist with fishery sampling and survey efforts. On the third vision area, Dr. Werner discussed some of the advancements the Office of Coast Survey and their partners have made in machine learning, autonomous surface vessels, and uncrewed aircraft systems, particularly in terms of being able to use the data in a timely way.

Steve Volz discussed the economic assessment of future GeoXO Series Satellites that are scheduled to begin operations in the early 2030s. NOAA's geostationary satellites are a \$20 billion investment over a 30 year period, and therefore require a very strong economic justification. Over 150 societal benefits have been identified and a cost-benefit comparison analysis makes a strong economic case for GeoXO as a whole even though it only covers a small fraction of the beneficial use cases. They are trying to develop an economic standardization for these analyses, as one currently doesn't exist. GeoXO will be up for a Department of Commerce confirmation at the end of this year.

Dr. Werner concluded by discussing the U.S.'s first official Marine Economy Satellite Account (MESA), a joint effort by NOAA and the Bureau of Economic Analysis (BEA), which will provide a deeper in-depth analysis into the economic value of the marine economy. Just as it is important to understand where climate baselines are, this is an important and evolving look at what the economic valuation of the marine sector is.

## Discussion

Jon Allan asked if the economic assessment included the Great Lakes. One of their assessments looking at the current movements of ore found that if the Soo Locks went down, Central North

America would be looking at unemployment rates of around 20%. Dr. Werner said he would check to see if the Great Lakes were included in MESA.

Jesse Ausubel commented on the effects of inflation and the outlook for reduced buying power from flat budgets. While thinking about long-term growth and confidence, NOAA also needs to think near-term about cost-saving strategies that can sustain their assets and activities. Dr. Werner said the hard part of this is how to maintain what NOAA is currently doing while developing new capabilities which require an initial investment. Dr. Spinrad added that another component of this is how NOAA is optimizing the comingling of philanthropy in what the agency is doing, which has always been a challenge. Engaging the philanthropic sector is something NOAA needs to do better than they have in the past. Dr. Ausubel recommended acting fast because philanthropies have to spend on the basis of the prior three years; 2022 is a bad year and could get worse, so 2023/24 funding will be smaller for many organizations.

Robert Grossman asked if MESA will be an ongoing effort between NOAA and BEA to keep the information up to date and where the expertise came from during the process of developing these figures. Dr. Werner said it is ongoing and this is the first output of a four-year effort. The economists involved were a comingling of NOAA and BEA economists.

Jon Allan asked what NOAA hopes to accomplish that was not included in the presentation. Dr. Werner said they hope to move towards a more integrated approach to addressing climate, ecosystems, economy, and community.

## **Presentation and Discussion of SAB 2022 Work Plan Topics**

### *Diversity, Equity, and Inclusion (DEI)*

Christopher Lenhardt presented the DEI small group discussions. Discussions on DEI began during the previous administration and, while things are very different now under the new leadership, much remains to be done. The group has spent a considerable amount of time coming to a common understanding of what the issues are or might be, considering the topic in two ways: inward-facing DEI issues within NOAA and outward-facing engagement with relevant stakeholder groups and incorporating DEI issues into NOAA's operational work. This was also an opportunity for self-reflection by the SAB. After a series of meetings, they identified a number of representatives to talk with, starting with those from the NOAA Employee Resource Group and affinity groups. The team envisions producing a report that identifies gaps or areas that may need additional focus. Dr. Storksdieck thanked the NOAA staff for their support and input into these discussions.

Ilene Carpenter asked if the group has spoken with any NOAA staff that is doing similar work. Mr. Lenhardt said the employees they have spoken with are the ones leading the Employee Resource Groups, so they have a leadership role on this. Dr. Spinrad said they are trying to schedule Ben Friedman to speak with the group and NOAA does have a history of doing workforce surveys and statistical analyses of these issues.

John Kreider said the topic of DEI is important, but it can quickly devolve into myriad other issues. He urged the group to maintain the boundaries and keep a focus on science, since that is the SAB's role. Dr. Spinrad also suggested considering anything in particular that is unique to the environmental sciences that intersects with DEI challenges. Mr. Allan said that it is very difficult to tease out the science questions from the culture, engagement, and community questions. All the pieces within the DEI world are important to consider.

### *Open Data/Open Science*

Robert Grossman said the working group seeks to survey open data and open science (OSOD) efforts within NOAA and draft a report that highlights accomplishments, identifies potential gaps, and possibly make recommendations or suggest an engagement strategy between NOAA and the SAB around OSOD. They have laid out their intention in a scoping document and are conducting a survey addressing some of the questions the group is grappling with. Next they will be inviting speakers to present to the working group. The working group's report will cover some aspects of OSOD and their applications related to NOAA, with a focus on some of the challenges, trade-offs, barriers, and resource needs. The target technology is rapidly changing and the working group wants to explore how the programs conceive of OSOD and how that might be different from other NOAA programs and external researchers. The group meets every other week and will begin drafting their report in August.

David Grimes asked who the target of this survey will be and if they would benefit by getting more of an external perspective on how NOAA is doing. Dr. Hickey said they have invited many speakers from NOAA in order to understand what exists and what needs to be addressed. Future steps include getting input from a variety of private sector, academic, and open source experts. The group was open to recommendations of specific speakers that might offer insights.

Rick Spinrad said he was trying to figure out the utility of the product being proposed. The challenge NOAA is facing is with data buys in commercial data. Dr. Grossman said that they won't know the utility until they go through the exercise. Part of the reason for taking this on was that SAB members were trying to figure out how to be as effective as possible on the topic. Their goal is not to opine on the end state of OSOD, but see if there are any potential recommendations on how the SAB could more effectively engage with NOAA on the subject. Dr. Spinrad encouraged the group to develop recommendations that will help NOAA justify budget requests and policy priorities.

Jon Allan said he was still looking for the underlying hypothesis for this effort and a framing element of why open data would be better than what is currently being done. Chair Kreider suggested further refining the statement of objective and asked the group to meet with key NOAA staff to figure out what they are looking to do.

### *Public-Private Partnerships*

Steve Weisberg described the team's work in framing a specific set of charges around the very large topic of public-private partnerships. The group has held seven meetings with topical experts, as well as hearing from people leading public-private partnerships within NOAA and the



U.S. Army Corps of Engineers. The group decided not to take on the traditional approach to public-private partnerships as there is an entire industry focusing on this. Instead, they want to explore more innovative approaches. They identified six classes of "non-monetary" public-private partnership areas they want to analyze: shared technology development, transition of technologies, collaborative data collection, clarifying NOAA's role, engagement in public decision making, and workforce/talent development. They intend to produce a 10-12 page report that describes each of these models, identifies potential opportunities where NOAA could expand within these mechanisms, and what issues they need to be aware of when considering each. Dr. Weisberg further discussed their process for acquiring more information and drafting the report.

Martin Storksdieck asked if the group plans to have a comparison table between the various partnership models, laying out the pros, cons, and applicability of each. Dr. Weisberg said this might be a good way to do the executive summary. He added that they could include specific organizations that NOAA might seek out for each model type.

Elizabeth Weatherhead said there is a large group of people who want to partner with NOAA and by creating this summary, they may be offering more tools and opportunities for NOAA to reach out. It could be circulated throughout NOAA to expose more people to possible ways to partner.

Gary Matlock asked why Cooperative Institutes were not included. Dr. Weisberg said they left out the Cooperative Institute model because it is a one-way flow of money and they wanted to avoid primarily monetary relationships.

Rick Spinrad appreciated the team's willingness to think outside the box. There are a number of partnerships that are outside NOAA and the federal government that should be considered. He noted examples of Navy partnerships, such as university affiliated research centers, that he found as extraordinarily valuable. Another consideration that may be helpful to include in the report would be constraints, such as the illegality of comingling resources.

Steve Volz said the most helpful thing to get the team's perspective on would be how to choose the right model for a particular scenario. He added that there are operational and contract constraints in using some of these mechanisms that are very onerous and unappealing to the commercial sector.

Courtney Edwards will provide the group additional comments received through the webinar.

### *NOAA International Activities*

Jesse Ausubel began by noting that the team's recommendation was to defer a decision on approving the working group's work plan. The group has had three meetings with NOAA staff on the agency's international activities. They have not yet met with the Director of NOAA's Office of International Affairs, Elizabeth McLanahan. The four reasons they recommended deferring on a decision were: (1) they haven't finished their information gathering; (2) it's not clear there is a market for the advice; (3) it may not make sense to advise NOAA on these questions in the absence of the State Department, Navy, NASA, and NSF; and (4) the current

context is not very favorable. The future of the UN Decade of Ocean Science is an open question as there have been no serious financial commitments to it yet. It is very difficult to find out what NOAA is spending on international activities or to get a sense of what NOAA's international science portfolio includes, so the team was not sure they could make meaningful recommendations. International priorities and alignments may be very different after the Russo-Ukrainian War, making it difficult to know where organizations and programs created in the 1980s through the 2000s will stand. The group also felt this is not an area where there is much room for report writing and they would be most useful as a sounding board before international engagements where strategy might be necessary. The group is willing to revisit the question of whether this topic is one that a subgroup of SAB could offer assistance on.

Rick Spinrad disagreed with the conclusion. He agreed that the kind of study that the SAB provides is not what is needed on the international side and that a long, drawn out exercise would not be useful. He identified NOAA's need to have a more formalized common statement of their principles for engaging in international activity as one area in which the group could offer guidance and he recommended meeting with NOAA representatives that attend international conferences to get their feedback. Dr. Ausubel said the working group will meet again to discuss this further. Dr. Volz said that explaining how the observations and information NOAA provides has a global application and impact could help justify the need for NOAA to be in a position of leadership in providing that content in international settings. Dr. Werner said the uncertain state of global affairs may be a driver for considering scenarios and offering guiding principles for how to hold on to some of the international initiatives. Dr. Ausubel asked that Steve Volz and Nicole LeBoeuf join the next working group call.

David Grimes said he would be willing to join this working group.

Jon Allan recommended looking at the Great Lakes Water Quality Agreement as an example of how international governance can tend value.

Chair Kreider suggested delaying the decision on each of the topics so the working groups have an opportunity to refine their proposals.

### **Public Comment**

Rocky Lopes commented on where some international relationships may be formally recognized in legislation. The Weather Act recognizes the International Tsunami Information Center, which is greatly involved in technology transfer and training. They do a very good job with tsunami exercising and training internationally for the Pacific Ocean and the Atlantic Basin, particularly in the Caribbean.

### **Conclusion**

Following on from Dr. Spinrad's charge to the SAB earlier in the meeting regarding disruptive technology, Mr. Kreider assigned homework to all members. He asked that members identify the objective of the charge, summarize what they heard Dr. Spinrad request, and add additional thoughts. Ms. Edwards will compile and distribute all responses by the start of tomorrow's meeting.

## **NOAA Response to SAB Ecosystem Science and Management Working Group Report: Decision Making Under Deep Uncertainty**

Douglas Lipton, Senior Scientist for Economics, NMFS Office of Science and Technology

Mr. Lipton presented NOAA response to the ESMWG's recommendations in their Decision Making Under Deep Uncertainty (DMDU) report and suggested next steps. NOAA was very appreciative of the level of effort that went into the report and that it was formatted in a way that made it easy to see how DMDU could be applicable to the agency's work. The report included ten recommendations and eight suggested next steps centered around key four themes: (1) build DMDU concepts into similar activities NOAA is already doing; (2) look for new applications and opportunities to advance DMDU concepts; (3) raise awareness of DMDU among NOAA personnel; and (4) work with partners to advance DMDU. NOAA responded positively to each of these and will consider incorporating DMDU approaches and concepts into ongoing efforts, including management strategy evaluations (MSEs), integrated ecosystem assessments, the Climate Ecosystem and Fisheries Initiative, coastal planning, and observation system simulation experiments. NOAA will also explore the applicability of DMDU to other areas and use DMDU concepts to inform data collection and observation priorities. NOAA will use a variety of approaches, such as OneNOAA Seminars, to educate staff about DMDU concepts and applications. In following these recommendations, NOAA seeks to build awareness resulting in greater application of DMDU techniques in their on-going activities where appropriate.

### Discussion

Denise Reed said that if they want to test the value of this approach, it may be best to apply it to a new case where they can develop the tools deliberately to feed this particular application rather than trying to adapt a current analytical process. In her experience, the process takes a long time to get everyone on board so it would be best to select a project that does not require immediate buy-in.

Chair Kreider asked if NOAA had any specific test cases where they were considering applying DMDU. Mr. Lipton said the East Coast Climate Scenario Development process is doing a lot of what a DMDU approach would require, even though it may not fully adopt the DMDU approach. The investment from NOAA to create an MSE position at every Fisheries Science Center and form an MSE working group may provide a model to follow for DMDU. They are just ramping this up and spreading awareness of it over the next couple of months. Chair Kreider said that NOAA needs takes a group of people that know how to do this and test it out on a particular topic. Leaving it for people to become more aware of and apply elements of it may not lead to a real test of its value.

Jon Allan discussed his own experience in applying these kinds of approaches to projects he was involved in. DMDU will not increase the ability to see the future, but can knock down the fallacy of misplaced certainties, made teams look into new areas of what was driving uncertainty in their topic area. The only way for NOAA to gain any experience with it is just to try it out. Dr. Reed said the prime opportunity for applying DMDU is where something is broken and everybody agrees a new approach is needed.

## **SAB Report on Leadership in Coastal Resilience**

Denise Reed, University of New Orleans and SAB Member

Dr. Reed described the extensive effort to gather ideas from across NOAA line offices that fed into the drafting of the report on NOAA leadership in coastal resilience. NOAA is primed to be the leader in this space and has a host of mandates that address coastal resilience from many different angles. They must partner with others and marshal the resources of the federal government towards addressing one of the most important threats the nation is facing. The report not only outlines what NOAA needs to do, but emphasizes why it must be done. The report encourages NOAA to take on all of its mandates in an integrated way and to think about a research and development agenda that NOAA can pursue over the next ten years to make real differences in the nation's coastal resilience. The report also emphasizes NOAA's important role as a convener, not just at the federal level, but states and the local level participants as well. The report's nine recommendations fall under three categories: (1) continued discovery (nature-based approaches to risk reduction, supporting adaptation of important coastal species, socio-economic inquiry); (2) networks of knowledge discovery (enhance observing systems, integrated coastal resilience modeling, predicting human natural system feedbacks); and (3) making a difference on the ground (from stakeholder engagement to co-production and co-design, facilitating social learning, support for implementation). Dr. Reed discussed each of these and the justifications for included them.

### Discussion

Rick Spinrad thanked the group for the report and appreciated the timing. About \$1.2 billion coming to NOAA as part of the Infrastructure Investment and Jobs Act has been allocated to coastal resilience projects. Once the spend plan is released, the SAB will see how much of the report's thinking NOAA has incorporated into it. The process this group underwent has been very helpful in this immediate execution phase.

Steve Weisberg expressed concern about the amount of funding about to be spent on coastal resilience projects that have almost no requirements for monitoring or assessment. He would like to see the recommendation on observing systems be tweaked to say that the investments being made are being reviewed to determine whether or not they effective. Dr. Reed felt that they could work that in. This report is deliberately high level and NOAA can work through the tactics.

Cisco Werner asked if there are any areas in coastal resilience where NOAA needs to step up and help the international community. Dr. Reed said NOAA should be partnering with the World Bank and associated groups that fund coastal work. The quick solution is not necessarily the best solution. The U.S. and its territories could be test cases for the challenges of low lying coasts in deltas and on island states where this kind of integrated thinking would serve everyone better

Steve Thur recognized that the primary audience for this report is the Administrator, but there may be secondary audiences that would benefit from it. In this regard, he offered three friendly amendments: (1) adding "nature-based" into the body of the first recommendation; (2) coupling biophysical observations with the continued monitoring of the human interaction of the

ecosystem in order to do recommendation 6; and (3) recommending that what NOAA needs to be a leader through policy development support. Dr. Reed said that, in focusing specifically on the science, they avoided the last one, but they can work in the other suggestions.

Robert Grossman made a motion to accept the report with the minor modifications mentioned. David Grimes seconded the motion and it passed unanimously.

## **Updates from SAB Working Groups**

### *Climate Working Group*

New SAB liaisons, Don Wuebbles and Chelle Gentemann, have provided excellent support to the CWG, along with the several new members that have joined. They have begun discussing potential new work topics, including emerging hazards and vulnerabilities, climate and air quality prediction, and organizing operational ocean forecasting. The CWG will continue collaborating with EISWG and other working groups, participating both on SAB topics and reviews. The focus of the CWG's current effort is on three white papers they plan to share with the SAB in the fall.

Rick Spinrad said he would like to ensure there is explicit coordination efforts between the CWG and the Climate-Ready Nation initiative.

### *Data Archive and Access Requirements Working Group*

After recent recruitment efforts, DAARWG has identified six new candidates who are now going through the approval process. DAARWG looks forward to working with the new Data Governance Committee and their working groups. Since the last SAB meeting, the DAARWG has had briefings on NODD and NESDIS' Cloud Archive Project, which are both very important and relevant to DAARWG's work. They plan to provide comments on what they heard. DAARWG would be happy to work with other groups at NOAA on a broad range of topics, for example what will happen with the Earth Prediction Innovation Center (EPIC) data and the challenges with Fisheries data.

Rick Spinrad commented that NOAA is putting a lot of emphasis on their Office of Space Commerce, which will rely heavily on space situational awareness and space traffic management. This is a relatively new area for NOAA and presents some interesting data challenges. He would like to arrange a briefing on this for the DAARWG and get their insights.

### *Environmental Information Services Working Group*

EISWG now has two SAB liaisons that have been participating in the working group activities, bringing valuable expertise in data and machine learning to EISWG's work. In May, they will begin to start filling the vacancies they anticipate at the end of the year. Among EISWG's current efforts, the social science subpanel has been organized to bring their expertise to bear on all EISWG reviews. Communication activities around the PWR report are becoming more important and they are getting requests for more information sharing activities. Space weather is a new focus area for future EISWG work and they have begun their information gathering. HFIP has now gone through the full five-year review-response cycle. EISWG is looking into how they can have a greater impact from the reports that they create.

Rick Spinrad said the PWR report exemplifies how NOAA can codify requirements development and validation within the organization. They have been looking into how to do PWRs for oceans, ecosystems, and other fields. The teams working on those will want to reach out to the EISWG for guidance on how to proceed.

Mary Erickson commented on the upcoming reauthorization of the Weather Act. There is an understanding that the number of reports is burdensome and any input the EISWG has on how to focus them and make it a more effective process would be valuable.

Chair Kreider discussed sending a letter to PWR team on behalf of the SAB thanking them for their efforts. The SAB was agreeable to this and Chair Kreider will work with the EISWG Co-Chairs to begin drafting.

#### *Ecosystem Sciences and Management Working Group*

Dr. Wainger thanked NOAA and the SAB for their response and discussion on their DMDU report. ESMWG's current efforts include a white paper on forecasting under rapidly changing marine environments. The working group is looking at what investments are needed now to manage marine systems under a rapidly changing climate. The themes for this effort include: (1) integrated human-ecosystem modeling; (2) co-design and co-production of approaches and services; and (3) multi-stressor impacts and how fisheries models can be more responsive to climate change. They plan to develop recommendations for the SAB's consideration at a future meeting.

#### **Open Discussion**

The SAB circled back to a discussion from the previous day regarding approval of the EISWG Report to Congress. Ms. Erickson, Acting Assistant Administrator from the NWS, is present as requested to speak on the topic. Ms. Erickson said since the report was written, NOAA has received its FY22 appropriation and \$12 million has been allocated to moving forward on the final phases of the IDP. They have worked through two of the four phases in the Integrated Dissemination Plan. The FY23 President's Budget has been released and if NWS receives what it asked for, it would provide the funding necessary to resource the remainder of the report. Acknowledging the progress made and the opportunities to move forward could be included in the transmittal letter.

Elizabeth Weatherhead made a motion to accept the report as written with any further issues addressed in the transmittal letter. Chelle Gentemann seconded the motion and it passed unanimously. Chair Kreider will work with the EISWG chairs and Jason Hickey to draft the transmittal letter.

Chair Kreider had previously asked the SAB members to send in their understanding of what the problem is they are trying to solve in relation to what Dr. Spinrad asked of them around accelerated applicability, new ways of thinking, and consideration of disruptive technologies. Dr. Spinrad wanted to hear from the SAB on areas where they can be most impactful in terms of recommendation to NOAA. Chair Kreider briefly summarized some of the responses he had received. Dr. Weisberg said the SAB could make a list of possible classes of ideas that would help transform NOAA, then NOAA could weed through those to determine which have the

greatest chance of success. Dr. Weatherhead said they are here to help NOAA identify challenges and opportunities for moving forward and do some minor level scoping on how those could proceed. Dr. Grossman said getting some clarity on the timeframe could help determine what actions the SAB should look to take.

Rick Spinrad said NOAA is looking for change in its culture and concept of operations, as well as in the community with whom they are partnering. If there are areas that NOAA does not currently have authority for but the SAB thinks it should, he is willing to bring that to Congress and the White House Office of Science and Technology Policy to propose changes.

Jon Allan said NOAA should change their approach to tribal engagement from being paternalistic to working cooperatively. He also commented on the erosion of public trust in science. If the public does not have confidence in the legitimacy of NOAA's science, no amount of funding can fix that.

David Grimes said SAB's role is to empower, to aid, to inform, and to advise. Whatever they do should be aligned to NOAA's mission, its priorities, and to its ambitions. Dr. Carpenter said the inform part of this is especially valuable because technologies are changing rapidly relative to the duration of procurement cycles.

Jason Hickey said the SAB's work falls into three categories: (1) to bring to NOAA's attention potentially valuable things that they are not currently doing, (2) to bring to NOAA's attention what they are doing that need to be upgraded, and (3) independently assessing things that NOAA would like to do but is unable to for whatever reason. The SAB should recognize that they have power in giving recommendations that can assist NOAA in its operations.

Martin Storksdieck said the SAB should help move NOAA from being a technocratic agency to one that uses a community-based research approach to share expertise. The SAB should help NOAA rethink how far to go when working towards fulfilling its mission.

Rick Spinrad said he would like to meet with the Director of NSF to discuss how they can take advantage of their respective science boards to make sure they are addressing some of these issues of empowering, aiding, informing, advising, and envisioning in the most effective manner. NSF has extraordinary social, behavioral, and economic capabilities that NOAA lacks.

Chelle Gentemann emphasized the need for NOAA to be a leader addressing today's scientific and climate challenges, but also to work with other agencies to enable society to address these pressing issues. David Grimes said that the SAB deliberately avoids talking about the how, but sometimes the means is an important dimension. The SAB should explore where it can play a role in characterizing the value proposition that is being lost when NOAA is not enabled to do the things it needs to.

Jon Allan suggested bringing together advisory boards across agencies to coalesce around shared ideas. Recommendations coming in collectively from multiple directions is much harder to ignore.

Robert Grossman said the SAB can advise NOAA in order to help them envision its future, change its culture, and recommend ways to manage disruptive changes. Dr. Spinrad confirmed this is in line with what he was looking for from the SAB, which would be in addition to the SAB's current work.

Dr. Weatherhead asked how the SAB can be helpful in terms of NOAA's culture. Dr. Spinrad said prodding the agency on the risk tolerance within their research portfolio is helpful. The SAB's independent and transdisciplinary perspectives on moving towards an earth system approach would be valuable. Chair Kreider suggested assembling a small group of people that could work on putting together this statement and then going into the means, and circulating that to the board for approval at the next meeting. Dr. Spinrad asked for NOAA leadership to be involved in this process as much as is allowable.

Returning to the four work plan topics, it was decided to proceed with the topics, taking the responses they have received into account for determining next steps. The OSOD group will meet with Tony LaVoi and Nancy Majower to refine their scope of work.

Jon Allan made a motion to move ahead on the four topics. Steve Weisberg seconded the motion and it passed unanimously.

### **Plans for Next Meeting**

Cynthia Decker, Executive Director, SAB and Designated Federal Official

If possible, Dr. Spinrad strongly supported holding a future meeting at a NOAA facility away from the Washington, D.C. area. SAB staff will explore possible locations. Currently, they are looking at dates in late August. Chair Kreider requested setting dates as far in advance as possible.

### **Review of Actions**

Cynthia Decker, Executive Director, SAB and Designated Federal Official

Dr. Decker reviewed the actions from the meeting, including:

- Approval of the consent calendar.
- The SAB accepted the EISWG report to Congress with a transmittal letter covering some of the issues raised by members.
- The SAB accepted the TSTAP statement, which will be supported as an addendum to the earlier TSTAP report.
- The SAB accepted the Report on Leadership in Coastal Resilience and will transmit it to NOAA leadership.
- SAB staff will work with NOS representatives to get a briefing on its vision of coast in 2050.
- SAB staff will explore the possibility of inviting the Director of NSF for a conversation with the SAB at a future meeting.
- Recommendation that the CWG align its efforts more explicitly with the Climate-Ready Nation initiative.



- SAB staff will summarize the discussion on how the SAB can evolve in preparation of moving forward on it.
- The SAB approved moving forward on the proposed work plan topics.
- SAB staff will consider possible NOAA facilities at which to hold the next SAB meeting outside of the Washington, D.C. area.

### **Adjourn**

The meeting was adjourned at 12:33 p.m.