

**49th Meeting of the NOAA Science Advisory Board
Silver Spring, MD
15-16 April, 2014**

Presentations for this meeting have been posted on the Science Advisory Board (SAB) website:
http://www.sab.noaa.gov/Meetings/2014/april/april_15_2014.html.

SAB members in attendance: Mr. Raymond Ban (Chair), Consultant, Ban and Associates Consulting LLC; Dr. Eric Barron, President, Pennsylvania State University; Dr. Heidi Cullen (by phone), Vice President for Communications, Climate Central; Dr. Michael Donahue, Vice President, Water Resources and Environmental Services, URS Corporation; Dr. Robert L. Hicks, Professor, University of Notre Dame; Dr. Jeremy Jackson, Senior Scientist Emeritus, Smithsonian Institution; Dr. Peter Kareiva, Chief Scientist and Director of Science, The Nature Conservancy; Dr. Jennifer A. Logan, Professor, Harvard University; Dr. Molly K. Macauley, Vice President for Research and Senior Fellow, Resources for the Future; Dr. Jean May- Brett, STEM Partnership Coordinator, Louisiana Department of Education; Ms. P. Lynn Scarlett, Managing Director for Public Policy; The Nature Conservancy; Dr. Jerry Schubel, President and CEO, Aquarium of the Pacific; Dr. Marshall Shepherd, Professor, University of Georgia; Mr. Robert S. Winokur, Retired (NOAA, Navy); and Dr. Dawn Wright, Chief Scientist, Environmental Systems Research Institute (by phone).

NOAA senior management and Line Office representatives in attendance: Dr. Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere; VADM Michael S. Devany, Deputy Under Secretary of Commerce for Operations; Dr. Louis Uccellini, Assistant Administrator, National Weather Service; Ms. Mary Kicza, Assistant Administrator, National Environmental Satellite, Data, and Information Service; Dr. Holly Bamford, Assistant Administrator, National Ocean Service; Dr. Richard Merrick, Chief Science Advisor, National Marine Fisheries Service; Dr. Patricia Montanio, Assistant Administrator, Program, Planning and Integration; Dr. Robert Detrick, Assistant Administrator, Oceanic and Atmospheric Research; and RADM David Score, Director, Office of Marine and Aircraft Operations.

Staff for the Science Advisory Board in attendance: Dr. Cynthia J. Decker, Executive Director; Anna Hermes; and Mary Anne Whitcomb.

Tuesday, 15 April

Opening Statement of the Chair and Self-Introductions by Science Advisory Board (SAB) Members

Ray Ban, Ban and Associates and Chair, NOAA SAB

Ray Ban welcomed the SAB members and other attendees, and everyone introduced themselves.

NOAA Update

Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere

Summary

Dr. Kathy Sullivan thanked everyone for attending, and especially thanked Ray Ban for his service to the Science Advisory Board (SAB). This is Ban's last in-person meeting during his SAB appointment.

Ban has been a member of the SAB since 2007, and has served as Chair since 2010. During his tenure as SAB Chair, Ban presided over 13 full meetings of the SAB and 11 teleconferences, transmitted 11 reports to the Under Secretary from 9 different working groups, and throughout, provided excellent leadership to the Board. Dr. Sullivan announced that Lynn Scarlett (Managing Director for Public Policy, The Nature Conservancy) will serve as the next SAB Chair.

Dr. Sullivan highlighted recent and upcoming changes in NOAA leadership. Dr. Sullivan was confirmed as Under Secretary of Commerce for Oceans and Atmosphere on March 6, 2014. Vice Admiral Michael Devany is the new Deputy Under Secretary for Operations. He has served as a NOAA Corps officer since 1990, and is entrusted with a critical priority of the Under Secretary – organizational excellence. Eileen Sobeck is the new Assistant Administrator (AA) for NOAA National Marine Fisheries Service (NMFS). She has experience with the NOAA Office of General Counsel (1979-1984), the Department of Justice Environment and Natural Resources Division (1984-2009), and has been the Acting Deputy Assistant Secretary for Fish and Wildlife and Parks at the Department of the Interior since 2009. Dr. Sullivan thanked Sam Rauch for excellent leadership as Acting AA of NOAA NMFS. The new Chief Scientist will be announced in the near future. There is an opening for the Assistant Secretary for Environmental Observations and Prediction (AS-EOP) position (Dr. Sullivan's previous position). NOAA National Environmental Satellite, Data, and Information Services (NESDIS) AA Mary Kicza is retiring from federal service in July. Mark Paese (NESDIS Deputy AA) will serve as the Acting AA. NOAA Office of Oceanic and Atmospheric Research (OAR) AA Bob Detrick is leaving NOAA to be the President of Incorporated Research Institutions for Seismology. Dr. Sullivan thanked him for his service as AA and more recently as Acting Chief Scientist. Craig McLean (OAR Deputy AA) will be Acting AA.

The Department of Commerce 2014-2018 (5-year) Strategic Plan was released last month. Its five priority areas are: trade and investment, innovation, data, environment, and operational excellence. NOAA has named objectives in four of five of these areas. NOAA is using this Strategic Plan as a management tool for development of NOAA's objectives. Secretary Pritzker's budget hearings acknowledged NOAA activities in all areas, not just Environment.

Dr. Sullivan recently announced four areas she will prioritize while serving as Under Secretary.

1. NOAA will invest in observational infrastructure. NOAA's global observing systems are the foundation of the environmental intelligence it provides. Investing in key observational platforms sustains the vital environmental intelligence citizens and businesses rely upon.
2. NOAA will provide information and services to make communities more resilient. Communities across the country are sensitive to severe events. NOAA provides the information, products, services, and tools communities need to ensure preparedness and resilience.
3. NOAA will evolve the Weather Service. The demand for National Weather Service (NWS) products is increasing, and NOAA is committed to building a weather-ready nation. NOAA and the NWS are serious about being accountable for forecast accuracy, and ensuring the public knows how to react to forecast information. NOAA and the NWS are enabling and encouraging change and innovation to move the NWS into the 21st century.
4. NOAA will strive for organizational excellence, which underpins all of the work that NOAA accomplishes. NOAA endeavors to be "brilliant at the basics" by striving to recruit, retain, reward, and develop the best talent possible, ensuring that NOAA's internal and external customers receive the best service possible. NOAA will live by, "Mission First, People Always."

The FY15 budget will help NOAA provide products and services to help build resilient communities and economies in this changing world. The budget invests in mission critical infrastructure to help evolve the Weather Service, and observations and tools to strengthen NOAA's environmental intelligence. The FY15 budget makes smart investments to better position NOAA for the future by continuing efforts to strength the Agency's coastal and oceanic programs, and its internal and extramural programs, all while maintaining fiscal discipline. A well-attended stakeholder budget briefing highlighted that NOAA's work cannot be done alone and stakeholder feedback at this briefing was positive overall. NOAA's partners are critical to accomplishing NOAA's mission and goals.

The White House and NOAA continue to prioritize climate initiatives. The President's Climate Action Plan is moving forward. NOAA is engaged in many aspects of this, especially efforts led by the Climate Preparedness and Resilience Council, a White House-chaired interagency council. The White House Climate Data Initiative rolled out on March 19, 2014 and builds on Administration commitments to strengthen America's resilience to climate change, and to make government-held data more accessible to the public, entrepreneurs, researchers, and others as fuel for innovation and economic growth. NOAA launched the website climate.data.gov, which makes federal data more accessible and usable. NOAA and the National Aeronautics and Space Administration (NASA) announced an innovation challenge to encourage development of data-driven visualizations and simulations that help people understand their exposure to coastal vulnerabilities. NOAA's Big Data Request for Information closed in March and NOAA is currently reviewing contributions. Climate tools are evolving with the Climate Toolkit and OpenClimateGIS.

Several assessments have been released, including the 5th IPCC Assessment (March 2014, which has contributions from 19 NOAA scientists) and NOAA's Arctic Report Card (December 2013). The 3rd National Climate Assessment will be released in early May 2014 and has contributions from 14 NOAA scientists. The First World Ocean Assessment (WOA) will be delivered this year. This assessment is a UN process for global reporting and assessment of the state of the marine environment, including socioeconomic reports. NOAA is working with the State Department, the National Ocean Council Office, and National Ocean Policy interagency subcommittees to carry out the U.S. government review of the first WOA. NOAA and its partners on the Interagency Ocean Acidification Working Group (National Science Foundation, NASA, Bureau of Ocean Energy Management, United States Department of Agriculture, State Department, Environmental Protection Agency, Fish and Wildlife Service, United States Geological Survey, and United States Navy) released the first federal Ocean Acidification Strategic Research Plan on March 26, 2014.

Dr. Sullivan attended NOAA's 2nd Recreational Fishing Summit at the beginning of April. Positive progress in relationship building has been made amongst the Recreational Fishing community since the last meeting four years ago. NOAA has committed to establishing a National Recreational Fishing Policy, which will guide future actions and better integrate recreational fishing into the NOAA Fisheries mission.

NOAA continues to prioritize and improve its observational infrastructure. NOAA remains committed to maintaining Tropical Atmosphere Ocean (TAO) array buoys and exploring options for a second generation TAO. The Geostationary Operational Environmental Satellite R-Series (GOES-R) and Joint Polar Satellite System (JPSS) instruments have been tested and continue to make progress toward their launches.

NOAA continues to advance its research enterprises. For the Earth System Prediction Capability, NOAA and the U.S. Navy are teaming up with academic and other government scientists to design the next generation of powerful supercomputer models to predict weather, ocean conditions and regional climate change. Four teams are working to rewrite computer models that will create faster, lower-cost, and better integrated models. The Advanced Weather Information Processing System (AWIPS-II) was implemented at an additional 8 Weather Forecast Offices (WFO). AWIPS-II is now operational at National Centers for Environmental Prediction, River Forecast Centers, and 16 WFOs. This improved software architecture lays the foundation for implementing science and technology improvements within NWS operational sites. AWIPSII activation at WFOs will continue through FY15-Q4.

Organizational Excellence is a priority across the enterprise and includes improved Line Office collaboration. NMFS and OAR had a recent bilateral meeting and the National Ocean Service (NOS) and OAR will have a similar meeting soon.

NOAA researchers have contributed to several groundbreaking scientific achievements. Scientists from the Northwest Fisheries Science Center, in conjunction with academic partners, published two studies on the toxicity of oil on fish related to the *Deepwater Horizon* oil spill, which have important implications for NOAA's natural resource damage assessment for the *Deepwater Horizon* oil spill. Additionally, researchers found that ecosystem functioning is changing in New England and is affecting Atlantic cod stocks. NOAA scientists and industry representatives definitively connected wintertime high ozone levels in the Utah basin to the high atmospheric concentrations of volatile organic compounds (VOCs) associated with extensive oil and gas development activities in the basin. The NOAA Ship *Okeanos Explorer* is collecting baseline environmental intelligence in the deep Gulf of Mexico until May 1. Newly funded research includes a National Science Foundation grant to NOAA National Severe Storms Laboratory (NSSL) researchers to improve convective-scale (1km) weather predictions.

Following the main recommendation of the NOAA Social Science Needs Assessment, NOAA is currently in the process of establishing a NOAA Social Science Committee to address critical gaps in decision-making, operations, and research related to the social sciences. This Committee will guide the implementation of these recommendations. However, work on the most critical gaps has already begun.

NOAA and its partners received several awards recently. Three NOAA scientists (Adam Clark, OAR-NSSL; Alan Haynie, NMFS-Alaska Fisheries Science Center; and Scott Weaver, NWS-National Center for Environmental Prediction) were granted Presidential Early Career Award for Science and Engineering (PECASE) awards. NOAA won two 2013 Partners in Conservation Awards from the Department of Interior, and three Department of Commerce Gold Metals (NOS, NMFS, NWS). Stellwagen Bank National Marine Sanctuary scientists received a 2013 Next Gov BOLD Award for the development of Whale Alert. NOAA's climate.gov website was nominated for Webby Awards in Green and Government categories. Additionally, many NOAA employees were recognized by professional awards from organizations such as the American Meteorological Society, the American Geophysical Union, the National Weather Association, and the European Association of Geochemistry.

Ecosystem Sciences and Management Working Group (ESMWG): Ecosystem-Based Fisheries Management Recommendations

David Fluharty, University of Washington and Co-Chair, ESMWG (by phone)

Summary

The ESMWG was charged with exploring the progress made in the implementation of Ecosystem-Based Fisheries Management (EBFM) in US fisheries during the period 1999-2014. Principal lines of inquiry in this effort included: assessment of fishery management Council regions taking actions to implement EBFM; determination of the availability and adequacy of ecosystem science in the management of marine fisheries in the US; and examination of the use of ecosystem science in support of regional fishery management council actions.

To complete the assessment, the ESMWG received presentations from and had discussions with scientists from NMFS regional science centers and international experts. It also received presentations from and had discussions with lead staff on EBFM from regional Fishery Management Councils. The group examined peer-reviewed literature and reviewed Fishery Science Center and Council regional reports and websites. In the discussions, presentations, reports and websites the ESMWG looked for evidence in a number of areas that relate to EBFM including:

- Cessation of overfishing and development of rebuilding plans for overfished species; delineation of the extent of ecosystem interactions;
- Development of a conceptual model of the foodweb;
- Description of habitat needs of different life history stages of animals and plants in the “significant foodweb;” and develop conservation measures

The report has one principal recommendation and five ancillary recommendations.

Principal Recommendation: NOAA Fisheries should perform a prioritized needs assessment of what ecosystem inputs will contribute to the improving the performance of Councils.

Ancillary Recommendations:

1. Continue and expand support to Council processes for ecosystem science
2. Invest more in development of science to understand fishery management as a coupled socio-ecological System
3. Headquarters can facilitate cross-region and Council interactions on EBFM science and management
4. Invest in tools for assessing trade-offs [spatial and temporal] of alternative management decisions
5. Assess and implement best practices for integrating ecosystem science across NOAA and with partners

Finally Dr. Fluharty presented grand challenge questions for EBFM:

- How can we demonstrate the results of EBFM are making a difference in fisheries and protection of marine diversity? Can these be compared across ecosystems?
- Can/should we actively manage for different ecosystem states and maximum economic yield as opposed to maximum sustainable yield?
- To what extent is climate change/ocean acidification an ecosystem game changer for fisheries?

- How can historic ecosystem state be used to inform fishery management by Council regions?

Discussion

Michael Castellini, an ESMWG member, said Alaska is concerned about EBFM and recommended the entire report to the SAB particularly ancillary recommendation two because the people of Alaska are already living with the impacts of climate change and ocean acidification.

Mike Donahue said the presentation was excellent and asked if the four grand challenge questions will be done in the future or addressed as part of the recommendations. Dr. Fluharty said the report was constrained to focus on the mandate for the study and left the grand challenge questions for future discussion. Alternatively, these issues could be identified by the needs assessment. Either way, these challenges will continue as ongoing concerns for EBFM.

Peter Kareiva noted there is a co-mingling in the report of single species and ecosystem-based management. Could stock success stories simply be due to good single species management? Dr. Fluharty responded that there is not a mandate for Fishery Management Councils (FMCs) and Science Centers (SCs) to develop plans for EBFM. Dealing with overfishing is a big step towards addressing EBFM and it requires elements of single species management

Peter Kareiva asked whether the needs assessment should happen before pursuit of the science recommendations. David agreed and said this is why the group identified the needs assessment as the major recommendation and the other as ancillary. Should NOAA choose not to do a needs assessment, the ESMWG didn't want to lose opportunity to make science recommendations?

Peter Kareiva noted that there was no discussion in the report on the Comparative Analysis of Marine Ecosystem Organization (CAMEO), a program sponsored both by the National Science Foundation and NOAA that was providing information for science management before it was discontinued. Dr. Fluharty answered that while CAMEO was a program admired by the working group, the program was cancelled so it was not included in the report.

Ray Ban asked about the value of a needs assessment versus science plan. Dr. Fluharty responded they are both good recommendations; however there is a diminished value of science plan without a needs assessment first.

David Lodge noted that when he reads the executive summary it is different in form from both the body of the report and the presentation. Dr. Lodge suggested that the Executive Summary be revised to better reflect the language of the key recommendations in the body of the report. David Fluharty agreed and will make these revisions.

Lynn Scarlett said most of the recommendations are focused on the intersection of science and its use in management rather than the science itself. Ms. Scarlett wondered what might be the implications of this for NOAA in terms of the human resources capacities. David Fluharty said when the group considered the cultures of Council regions and found that they vary in terms of the ability to use and understand results delivered from the Science Centers. Success in getting research results from Science Centers into the Councils varies a lot by region. The group noted that some of that variation was due to interpersonal communication skills.

Rob Hicks noted that there may be issues with core data needs. Dr. Fluharty answered that in 2009 NMFS did an assessment of the adequacy of science to support fishery management so the group did not address that issue. The ESMWG may strengthen the wording of the discussion of the 2009 report to address this.

Ray Ban said the ESMWG may want to take time to discuss points raised in these comments—prioritization of the needs assessment versus the science recommendations, revising the executive summary to match the wording of the recommendations, and strengthening wording on the discussion in the report about data assessment. David said the ESMWG will review the comments, make revisions and send the revised report to the SAB.

Jeremy Jackson said he would like to see specific examples of specific fisheries and how management attitude has evolved on EBFM. The assessment of whether EBFM is working involves improvement in the management of the fisheries and the specific metrics on improvement. Dr. Jackson did not understand these metrics from the report and would like to see examples of half a dozen fisheries and how well they are doing. The report needs more focus on effect and action, and at the moment is only a good start.

Dr. Fluharty said the group shared that concern but the providing such information would require a separate study. Some of that information can be found in appendices. The only quantitative assessment available is the number of stocks overfished in 1999 and those that are not being overfished now, and changes to the degree of overfishing. Dr. Fluharty said if the SAB wants to ask the ESMWG to do a follow-on on the lines Dr. Jackson is suggesting, that could be done.

Ray Ban suggested that the ESMWG address the areas brought up and the SAB will schedule a teleconference meeting to discuss the revised report. He thanked the ESMWG for its work.

Review Report on the Cooperative Institute for Marine Ecosystems and Climate (CIMEC)
Dawn Wright, ESRI, Member, SAB and Chair, CIMEC Review Committee (by phone)

Summary

An external review of the research, education, and outreach programs of the Cooperative Institute for Marine Ecosystems and Climate (CIMEC) at the Scripps Institution of Oceanography (SIO) was conducted on 6-7 February 2014 in La Jolla, CA. CIMEC grew out of the Joint Institute for Marine Observations (JIMO) in 2010 to expand reach beyond SIO and to take advantage of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program (supported by the NOAA Southwest Fisheries Science Center and California Fish and Wildlife) and the Argo global drifter program (supported by NOAA, other government agencies and other countries). CIMEC is a seven-member consortium, including: SIO (lead), University of California (UC) – Santa Cruz, UC – Davis, Humboldt State University, UC – Los Angeles (UCLA, unfunded), UC – Santa Barbara (UCSB, unfunded), and California State University – Los Angeles (unfunded).

CIMEC has four scientific themes that address three of NOAA's Next Generation Strategic Plan long term goals:

1. Climate and Coastal Observations: Analysis and Prediction - Argo, gliders, drifters, radar, ocean acidification, and CalCOFI

2. Climate Research and Impacts - California current ecosystem, meridional overturning circulation, and atmospheric CO₂ measurements
3. Marine Ecosystems - fisheries ecology, marine mammals and noise, graduate education programs
4. Ecosystem-Based Management - graduate education programs and the NOAA Southwest Fisheries Science Center (this theme still emerging)

Findings and Recommendations:

The Review Panel issued recommendations for CIMEC in four categories: Strategic Planning, Science, Education and Outreach, and Management. Five recommendations were issued for NOAA. The Review Panel awarded the CI an overall rating of “Outstanding.”

The Review Panel had four recommendations for CIMEC related to its Strategic Planning:

1. The Review Panel was most concerned by the fact that CIMEC does not have a strategic plan. CIMEC has strong scientists with successful, strong, and continuing research projects that could all contribute to useful discussions of the pros and cons of a strategic plan. The Review Panel recommends that CIMEC develops a strategic plan merging in “vertical integration” (e.g. ecosystem-based management) and “horizontal integration” (e.g. across all project themes).
2. The Review Panel also noted that the CIMEC Executive Board and Council of Fellows do not have substantial strategic influence on the research conducted. The Review Panel recommends that CIMEC engage the Council of Fellows.
3. The Review Panel suggested the CIMEC Director and Co-Director should be included in meetings of the NOAA Western Regional Collaboration Team to enhance communication.
4. The Review Panel commended CIMEC on its eight major goals stated in its mission statement; however, the goals are not strongly linked to metrics. It was recommended that CIMEC build metrics for these goals and report on them annually.

The Review Panel had three recommendations for CIMEC’s Science:

5. The Review Panel found that the CI sponsors (the NOAA Office of Oceanic and Atmospheric Research and the NOAA National Marine Fisheries Service), expressed a high level of appreciation for CIMEC scientific accomplishments and capabilities. The Review Panel encourages more collaboration involving the full breadth of CIMECs capabilities. For example, the CalCOFI ecosystem study could bring in researchers from UCLA and UCSB.
6. A lot of the development of observing systems is conducted in house, which is very cost effective and ensures greater data quality and a focus on science needs. The Review Panel recommends this work is recognized and continued.
7. Lastly, the Review Panel found that CIMEC should better integrate social sciences in their research, especially for ecosystem based science. The Review Panel suggested that UCSB would be a valuable contributor for integrating social science.

In terms of Education and Outreach, the primary concern was related to the lack of Task 1 funds for education, which is currently funded through Task 2 and 3. The Review Panel had four recommendations for CIMEC related to education and outreach:

8. CIMEC has an impressive record of training students. All students expressed positive experiences and receiving financial and mentoring support and were very appreciative of their opportunities. The Review Panel recommends that CIMEC should develop a new plan for using and distributing education and outreach through task 1B funding once available.

9. The Center for Stock Assessment Research (CTAR) and the Center for Advancement of Population Assessment Methodologies (CAPAM) are excellent examples of education programs helping NOAA meet its needs. These programs support integrating education and outreach with ongoing research. CAPAM is developing innovative online courses with other institutions. The Review Panel suggests that CIMEC should support the expansion of the CAPAM project.
10. The UCSC students and postdocs that are funded by CIMEC are effective, but are a large burden on a single junior faculty member. The Review Panel suggests that lead PI duties should not be put in the hands of a junior faculty member.
11. CIMEC should partner with any new cooperative science center in California (if developed) to bolster education, improve diversity, and provide a funding avenue for non-funded CI partners.

The review panel had three additional findings related to CIMEC's science management:

12. The CI and CI director have few resources to support innovation. The Review Panel thought this was an important finding; this CI is in good financial health but they do not have any discretionary funds for important innovation projects. The UC system should consider providing a portion of returned overhead to the CI for seed funds.
13. A large problem is that there is lack of participation of major partner institutes, especially partners receiving less funding. Less funding provides no incentive for participation. CIMEC should sponsor forums that would allow new PIs to share ideas and inform NOAA of their capabilities.
14. CIMEC should explore ways to better function as a catalyst for integration of science between NOAA and the universities, and between multiple research areas. Key mechanisms for this success include development of a strategic plan and continuing to conduct workshops. CIMEC has hosted a lot of interesting and useful workshops: two on tropical research and one on climate impacts on California ecosystems. These workshops are good opportunities to develop new collaborations/partnerships, etc.

Overall, the Review Panel cited excellent accomplishments in ocean observing, working with stakeholders, and educating the next generation scientists. During the Review, there was open acknowledgment of CIMEC's challenges, including strategic planning, constrained budgets, and the lack of funds for all seven partners. However, CIMEC is seeking new opportunities for networking and collaboration. The Review Panel awarded CIMEC with an overall rating of, "Outstanding." They found that CIMEC is an extremely valuable member of the CI community and they see the opportunity for CIMEC to reach a transformative status.

Additionally, the Review Panel had several NOAA-specific recommendations:

1. NOAA should use CIMEC and other CIs to systematically identify cutting edge science, develop new integrative approaches, sponsor pilot projects, and support leadership in outreach and education.
2. CIMEC brings in new partners to address NOAA's workforce and research needs, but they are unfunded. NOAA must develop approaches that align the RFPs with the actual financial resources available.
3. NOAA should support actions and strategies that encourage participation and networking of CIMEC unfunded and/or young PIs with NOAA programs, scientists, and research networks (e.g. visits to NOAA headquarters).
4. NOAA must work with the collaborating California universities to encourage their partnership.

5. NOAA's western regional collaboration team should include the CIMEC co/director in their meetings.

Discussion

David Checkley, CIMEC Director, thanked Dr. Wright and the Review Committee for a thorough review and said that CIMEC will take their recommendations to heart. He stated that some of the problems are not CIMEC-specific, such as issues with the Task 1 funding and unfunded partners; he will be participating in a meeting in the near future with other west coast CIs and NOAA leadership to discuss these issues. CIMEC is making progress, but there are certainly some challenges ahead. Dr. Wright thanked Dr. Checkley for his comments and for mentioning the Climate Impacts on California Ecosystems Workshop occurring at Scripps in the following weeks. This will be a significant meeting as it includes participants from academia, management, and government (three CI's, two NOAA Fisheries Centers, etc.).

Eric Barron asked whether the "Outstanding" ranking was warranted because the Review Panel had more recommendations than he has seen for CI reviews. Although it is apparent that the science is outstanding, it almost seems as though CIMEC is not a CI: there is no strategic plan; there are partners without funding or support; there is not empowerment of the board; and there are minimal opportunities for leadership from the Directors. Dr. Barron's interpretation is that there is outstanding science but this is not functioning as a Cooperative Institute. Dr. Wright replied that these are fair comments. The "Outstanding" ranking was chosen because CIMEC is in its first five years; coordinating among all seven partners is challenging. The Review Panel found that the science, education and outreach, and potential are outstanding given the challenges CIMEC does face. The Review Panel found it helpful to include a lot of recommendations given the potential they see; the recommendations provide ways for CIMEC to continue to grow and be more cohesive moving forward. The Review Panel did not want to see CIMEC's funding challenged or put in jeopardy; instead, they wanted to let the CI grow and develop for the next five years.

Dr. Checkley said that much of what has been recommended regarding integration depends on resources; CIMEC was given one-third of what was requested and advertised in the Federal Funding Opportunity (FFO). CIMEC does not have the resources to do what they would like to do to acknowledge these recommendations. Additionally, it takes time to know the players in the institute. He believes the upcoming workshop will allow players on West Coast to discuss collaborations going forward to address NOAA needs. Dr. Checkley thinks CIMEC is a strong institute, but funding from NOAA is mostly through individual Principle Investigators. There are two sides to the issue of what a Cooperative Institute is and how a CI moves forward collectively. The funding issue is a big concern.

Bob Winokur complimented the Review Panel on the report. He had same reaction to the "Outstanding" rating as Dr. Barron. Many of the recommendations are process-oriented; maybe a way to move forward is to have a categorization of recommendations to differentiate between process and science recommendations. He found the most troubling finding to be the unfunded partner institutions. If the CI only receives one-third of the money that it expects, it may need to reset its expectations for those institutions.

Dr. Wright said that the Review Panel did not know how to separate the recommendations in terms of the four categories they were charged with reviewing. To help the review panel, it would be instructive to have a different ranking arrangement for CIs. The Review Panel tried to separate the

recommendations for NOAA specifically, which was a diplomatic way of asking NOAA to assist with difficult issues such as the lack of funding.

Dr. Checkley said that the discrepancy between the funding amount advertised in the FFO and actually awarded, along with the amount of Task 1 funds the CI receives as a portion of the total award, makes it difficult for the CIs to address organizational and/or strategic planning actions that are needed.

Dr. Wright noted that the Review Panel did hear from all seven partners and understood their constraints, yet given the four categories upon which to assess the CI, the Review Panel came to an “Outstanding” rating unanimously. Susan Avery said that there is an issue of managing expectations for CIs, especially for regional CIs. Furthermore, managing of expectations is critical in terms of performance metrics, but the CI will fail if the budget is limited. Dr. Avery recommended that NOAA should take a hard look at its expectations for regional centers in order to deliver what is needed.

Secondly, Dr. Avery asked whether the Review Panel was suggesting that there is a need for more fundamental social science within the CI, or whether there needs to be more interfacing with the social science capabilities among the CI members. Dr. Wright replied that the Review Panel would like CIMEC to integrate with existing specialists and experts already members of CIMEC (*i.e.*, UCSB), and interface with other organizations such as the Leopold Leadership Program, the National Center for Education Statistics, etc. The recommendation should be worded as interfacing with social science activities that are already ongoing. In terms of managing expectations, the Review Panel implied its concerns in the recommendations to NOAA. As first time reviewers, the Review Panel did not know how to say that the expectations of regional CIs should be managed according to funding. This was implied by their recommendation for the CI leadership to be included in the NOAA Western regional team.

Ray Ban said that the Review Panel put forth an excellent report that is concise and complete, with straightforward recommendations. The significant disconnect is the “Outstanding” rating when it is looked at in the light of the four topics of the review. The strategic plan is completely absent although there may be a good reason for this. For approval, the SAB does need to come to a comfort zone with the rating, given that the recommendations are not necessarily in line with the findings. For better or worse, CI reviews have all been based on this rating system and it would not be fair to CIMEC or other CI reviews to change the criteria for the ratings on the fly. To focus the discussion, the group should discuss the discrepancy between the findings and the actual rating.

Michael Donahue said that he is new to the CI review process, but the process is reminiscent of the Sea Grant review process. He wondered if the “Outstanding” rating is a matter of great inflation or the result of an unclear rating system. Five of thirteen findings point out weaknesses in CIMEC; is this appropriate for an “Outstanding” rating? Perhaps the SAB should review the Review criteria and come up with some sort of numerical scale. Jeremy Jackson agreed that there seems to be a problem with grade inflation and the SAB has been derelict in the grades they have provided. Dr. Jackson reminded the group that Jerry Schubel presented a review of a CI that was in perilous condition, in no way comparable to the CI of discussion; a “Satisfactory” rating seemed to be inflated in that case. In that context, it does not seem fair to award an institute facing great challenges a rating comparable to an institute that is arguably unsatisfactory.

Lynn Scarlett suggested that a number of important recommendations were about integration and substantive science issues. In respect to the reviewers and CIMEC, she suggested NOAA may want a different funding model to achieve more integrative research.

David Lodge said that there is a question about whether the CI is being judged against its original proposal (which was not funded completely), or its revised scope of work from its actual received funding level. This may represent a “process” problem between the CIs and NOAA. Dr. Wright replied that the Review Panel was only given the original proposal and there was not a revised scope of work; CIMEC provided information on what they were actually doing. The Review Panel had to consider what the CI was able to do given the reduced funding, but the Review Panel also did not want to reward “business as usual” by individual PIs. The partner institutions should be expected to connect the science to management. Much of the science was excellent and the reviewers saw the potential links with other themes in the CI. However, the CI is not well connected at this time.

Eric Barron recommended that the review panel should not change its recommendations and rating. The recommendations were very honest. The “Outstanding” rating says what the reviewers saw has to continue in order to be funded. The CI should not be at risk when the Review Panel identifies a high quality of science and relevance to NOAA. One interpretation of this is that, in a low-budget environment, CIs have been created for NOAA to disburse funds for certain topics but it is not acceptable to impose metrics on collaborations or elements of a CI that are not funded. He recommends the SAB accept this report and rating but provide a qualifier on why the Review Panel gave the “Outstanding” rating. If the “Outstanding” rating is awarded to facilitate funding, the SAB should clarify that. If NOAA wants more from a CI, or has other expectations for a CI, the CI needs greater funding and those expectations must be stated.

Dr. Schubel said that the other CI that received a “Satisfactory” rating had a number of factors that were not satisfactory, but NOAA needed a Great Lakes CI. The present rating system is a rather blunt instrument, and forces the Review Panels into things they might not want to do.

Mr. Ban wanted to know if a “Satisfactory” rating puts future funding for the CI in jeopardy. Philip Hoffman replied that in the particular case of the Great Lakes CI, the rating did put funding in jeopardy. A lot of positive changes have been initiated for that CI based on that rating.

The review system is based on 10-year old recommendations from the SAB; it may be time to revisit the process with a decade of data. NOAA instituted a recompetition schedule and has closed two institutes in the past year. In the next year, NOAA will be looking at what it wants to do with CIs in the future. If the SAB has strong recommendations about the review process, they should be addressed to NOAA. This focus is essential to the success of the CIs.

Kathryn Sullivan said issues like this will be considered by the Chief Scientist. She appreciates the work of the Review Panel, the realities of the CI review process, and of making CIs successful in the current funding climate. In these budget times NOAA may not be able to support all the CIs and so must be cautious and clear-minded in the renewal and recompetition process.

Mr. Ban asked for a motion to direct NOAA, in cooperation with the CI Office and the SAB, to open up reviews of ratings of CIs. A motion was made by Dr. Jackson and was seconded by Jean May-Brett, and passed unanimously.

Mr. Ban then asked for a motion to accept the CIMEC review panel report as written. Dr. Barron motioned to accept, but with an amendment that clarifications be added to the transmittal letter that the rating given was based on the science. Mr. Ban agreed the “Outstanding” rating is being given based on good science being performed and the Review Panel’s desire for the science to continue, despite some of the findings and recommendations. This should be captured in the transmittal letter. Dr. Jackson seconded the motion. Mr. Ban suggested that the Review Panel could provide some language in the transmittal letter consistent with the discussion. Dr. Wright agreed to supply the language for the transmittal letter. The motion passed unanimously.

Additional Discussion April 16

The SAB members held additional discussion of the CIMEC review on April 16. Upon discussion of the action items for the April 2014 SAB Meeting, Michael Donahue mentioned that the SAB could address the CI review issue with a subcommittee, and that this deliberation would be separate from the CIMEC review submission. After discussion of this suggestion, the SAB agreed that Philip Hoffman should present the current CI review process and its problems at the summer meeting. At that time, the SAB will further discuss the CI review process and whether the SAB has recommendations to make changes to it.

Furthermore, some concern was expressed as to the seriousness of CIMEC’s lack of a strategic plan. Dr. Barron thought that perhaps there should be a time frame set for the strategic plan to be completed. This comment will be discussed at a teleconference meeting in June, with Dr. Wright leading the discussion. Dr. Donahue suggested that perhaps the SAB should approve CI’s strategic plans. Dr. Sullivan reminded the SAB that there is no formal requirement that CIs must submit strategic plans for approval. Dr. Avery mentioned that there are other planning documents that are required, and the five-year proposal is the backbone of the strategic plan. Every year an annual work plan is established. Cynthia Decker said she would work with Philip Hoffman to set up this discussion at the teleconference meeting, Mr. Ban said that this action item would be put on temporary hold until the discussion during the teleconference.

NOAA Observing System Integrated Analysis Capability II (NOSIA II)

John Murphy, Director, Office of Science and Technology, NOAA National Weather Service

Summary

The NOAA Observing System Council (NOSC) advises NOAA leadership on NOAA’s observation systems. Observations comprise approximately half of NOAA’s budget, so evaluating their value is significant. The NOSC was charged with creating a tool for assessing all of NOAA’s observing systems in the context of the agency goals, in order to link observed data to the value it provides. The purpose of this presentation was to provide an informational briefing on the NOSC’s observing system assessment tools, analysis capabilities, and portfolio management activities.

To collect information for the tool, NOSC conducted 72 on-site or virtual visits, interviewed approximately 500 subject matter experts, surveyed 894 products, and identified 600 foundational data sources used for NOAA’s mission. This analysis was much more extensive than the NOSIA-I and Earth Observation Assessment I (EOA-I) efforts done in the past. NOSIA-II uses a value chain model, linking individual observations to a key objective, product, or service, and ultimately to NOAA Mission Service Areas (MSA). NOAA MSAs were derived from the NOAA Next-Generation Strategic

Plan, implementation plans, corporate goals and annual operating plans, NOAA Line Office procedural and policy directives, and other information sources. Observing system performance was translated into a numerical value; the NOSC considered a value of “80” to be considered “good.”

The NOSIA-II tool greatly added to NOAA’s ability to provide valuations of observing systems. For example, NOSIA-II was the first tool to identify 25 NOAA MSAs mapped to NOAA Next Generation Strategic Plan Objectives. NOSIA-II provided the first NOAA-wide comprehensive identification and listing of NOAA Key Products and Services (KPS), and performed the first assessment of the performance of each KPS. Also, numeric evaluation of the each KPS and each data source for a KPS had not been done before. As a starting point, the contribution of an observing system was equally valued for NOAA Goals, MSAs, and Key Products and Services (KPS); however, this, and other baseline assumptions, can be easily changed in the NOSIA-II model.

Murphy then demonstrated the NOSIA-II executable software tool, *Palma*, which collects and integrates the hierarchical value chain information from an individual observing system to NOAA MSAs, KPS, etc. The demonstration showed that *Palma* can be used to examine the cost of an observing system as both dependent and independent variables. The tool can assist in identifying areas for budget cuts, or where to place additional resources for maximum impact.

Dr. Sullivan added that tool’s methodology allows for the determination of the best mix of observational data for a given budget.

The user can look at all of NOAA, NOAA’s goals, Line Offices, and other categories to see how they are performing. The tool also allows users to test the impact of a data product or observing system by removing it from the value chain and seeing its direct impact on the various categories (program, Line Office, NOAA Goal, KPS, or MSA). Cost can be included in the analysis, so that the user can determine what the optimum value is for the data product. The observing system data can also be parsed into cost and impact quadrants (high-cost, high-impact; high-cost, low-impact; low-cost, high-impact; low-cost, low-impact), which help inform decisions on how to prioritize systems. The tool will also help determine what the needs are to achieve certain goals.

Discussion

Dr. Sullivan said that the purpose of NOSIA-II was to provide information for justifying observing systems, and for a clear inventory of the observing systems and individual parameters measured. This analysis is a step forward for the agency to look at the entire portfolio of NOAA’s observing systems that have grown out of individual projects. It also demonstrates the scale of the observing systems and provides a record of the physical and biological parameters measured. NOSIA-II informs decisions about what data are needed, why the data are needed, and how to use observing platforms more efficiently. It is also the first step toward looking at NOAA’s research portfolio more analytically to determine how NOAA’s aim and mission are being accomplished. Portfolio management tools being developed will help determine how cost structures are balanced. Broadly, this tool also allows NOAA to communicate its capabilities to other groups and the White House so that the capability of the country’s observing systems as a whole can be evaluated.

Molly Macaulay was impressed by the tool, and asked whether NOAA has made substantive decisions based on the tool. She also asked whether people had begun to “game” the use of the tool to throw off the significance or value of their data product. Murphy replied that the tool has been used to look at some possible decisions, especially in the high impact, low cost quadrant; however, no specific budget

decisions have been made using the tool. Dr. Sullivan added that NOAA does not want to use one tool exclusively to inform decisions, which then would be vulnerable to human manipulation. This tool is for broad targeting and for queuing up needs.

NOAA Science Talk: Improving Prediction of Extreme Weather Events using Multi-Model Ensembles

David Novak, Acting Deputy Director, NOAA National Weather Service Weather Prediction Center

Summary

Dr. Novak provided an informational briefing on NOAA's use of multi-model ensembles in improving prediction of extreme weather events.

Given the impact of extreme weather events on our society, decisions are now made on actions to be taken with longer lead times; these decisions require more accurate and consistent weather predictions. A 2006 National Research Council report, "Completing the Forecast" cited "...compelling reasons for the Enterprise to transition to a new paradigm...in which uncertainty is an integral and essential component of all forecasts."

Ensemble models provide a variety of possible solutions, each with slightly different initial conditions and physics representations. NOAA has a suite of operational ensemble systems with a variety of forecast lead times from minutes to years. Dr. Novak provided examples of improved predictions and lead time using multi-model ensembles. Dr. Novak did highlight community debate as to whether single, unified system approaches are most efficient to pursue versus multi-model approaches. These remain open questions. Regardless, forecasters and users are expanding ensemble use. The Weather Enterprise is moving towards decisions informed by NOAA's probabilistic intelligence. In summary, multi-model ensembles provide accurate and consistent guidance and enable forecasters to communicate uncertainty and societal impacts

Discussion

Ray Ban said it is interesting to see how the probabilistic information associated with predictions is becoming a known quantity.

Louis Uccellini said the group should keep in mind that the National Academy report, "A Vision of the National Weather Service: Roadmap for the Future," completed in 1999, led the way for ensemble systems though none were operating then. The NWS now has ensembles being used across the spectrum of forecasts; ensemble models are the second revolution in forecasting prediction.

Public Comment Period

There were no public comments.

Wednesday, 16 April

NOAA Response to the SAB Portfolio Review Task Force Report

Robert Detrick, Assistant Administrator, NOAA Office of Oceanic and Atmospheric Research

Summary

Robert Detrick began by thanking the members of the Portfolio Review Task Force (PRTF). The PRTF did an outstanding job on the review given that they were charged with the expansive task of examining NOAA's entire research portfolio and the organization to address the research portfolio, all within a one-year timeframe. NOAA's response to the PRTF recommendations was developed by a cross-NOAA senior level working group with support from the NOAA Research Council and discussion with Administrator Dr. Kathryn Sullivan. The scope of the review was intended to address two questions: what Research and Development portfolio does NOAA need, and how should that portfolio be organized and managed? The PRTF Report had ten recommendations for NOAA. NOAA agrees with most, but not all of the recommendations. Highlights of the complete Response Report were presented.

NOAA agreed with the first recommendation to increase its socioeconomic and ecosystem science capacities. NOAA has executed several actions related to this recommendation already. Namely, NOAA has developed a social science "tiger team," created new senior-level social scientist positions, and partnered with the National Science Foundation Social Behavior Economics Division. NOAA will continue to address the social science recommendation with a NOAA Social Science Committee, which will develop a Social Science Vision and Strategy. NOAA has also implemented Ecosystem-Based Fishery Management Plans, an Integrated Ecosystem Assessment Program in five regions, and established a committee to implement an integration framework for ecosystem sciences.

The second recommendation for NOAA to support the seamless integration of research and operations has been named one of Dr. Sullivan's high priorities. The NOAA Research Council updated the NOAA Administrative Order on the policy for transitioning NOAA research to operations. The new version adopts Technical Readiness Levels, which are used widely by other government agencies. NOAA also established a NOAA-wide committee to plan, monitor, evaluate, and improve effectiveness of NOAA research transitions. NOAA is conducting a pilot study examining the transition of a sampling of projects and will add "science and technology transfer" as core criteria for NOAA lab, center, and program reviews.

NOAA did not agree with the third recommendation that the SAB should form a special task force to address identified observation and data sharing issues. NOAA felt that this should be a NOAA management responsibility, and NOAA is working to develop a more quantitative framework to evaluate observing systems (e.g. the NOAA Observing System Integrated Analysis II; NOSIA-II). NOAA has also committed resources to the development of a Quantitative Observing System Assessment Program for observing system portfolio changes (e.g. Observing System Simulation Experiments; OSSEs). NOAA will continue to consult the SAB moving forward, but this work is too large in scope for the SAB or a SAB Working Group alone.

NOAA also did not agree with the fourth recommendation that the role of the Chief Scientist should be enhanced to include budget authority. This enhancement would require Executive and Congressional approval. However, NOAA does agree with the importance of having a full-time Chief Scientist, and

will charge the Chief Scientist with balancing and strengthening NOAA's Research and Development portfolio and participation in NOAA leadership forums.

NOAA agreed with the remaining recommendations from the PRTF. The fifth recommendation was that NOAA should maintain a strong and productive internal scientific staff. Among other things, NOAA is working to implement the Science Career Track, which will allow non-competitive promotion for high-performing scientists without additional managerial responsibilities. NOAA will continue to encourage the development of lab and center staffing plans, develop researchers through fellowships and other education programs, and will explore opportunities to increase the use of interagency personnel assignments.

NOAA also agreed with the sixth recommendation that NOAA should ensure that Cooperative Institutes (CIs) have sufficient support and are aligned with NOAA's priorities. NOAA has consulted with CI directors for their concerns and has agreed to a new model for funding administrative activities. Two CIs were terminated in 2013 and NOAA will continue to involve the SAB in CI reviews.

The seventh recommendation was to critically examine the alignment of funds and staff with the NOAA Next Generation Strategic Plan (NGSP). NOAA produced a new 5-Year Research and Development Plan and completed human resources needs assessments and plans to establish and maintain a Project Portfolio Management System and produce annual State of NOAA Research Reports to track alignment with the NGSP.

NOAA has involved the external community for Science Challenge Workshops and Research and Development planning, and will continue to engage partners in planning, needs assessment, and research. These activities support the eighth recommendation to capitalize on extramural research community support and skills.

To address the ninth recommendation to accelerate the development of existing NOAA talents, NOAA has established the Science Career Track and broadened the applicant pool and increased the stipend for Presidential Early Career Awards in Science and Engineering (PECASE).

Lastly, in response to the tenth recommendation, NOAA will work with the Department of Commerce and the Office of Management and Budget to create ways to manage funds flexibly and efficiently and to implement research priorities over several years.

Discussion

Susan Avery expressed disappointment in the observing recommendation because the Task Force tried to look at the science needs for observing. Dr. Avery does not think that NOSIA-II really addresses questions posed in the PRTF Review Report. The Report emphasized improvements gained from information from observations, not from technology, as well as the need to share data and costs with private sector and university partners. Dr. Detrick said that NOAA is not relying on NOSIA-II to assess new technology. Observing System Evaluations (OSEs) and OSSEs are other mechanisms for that assessment; however, assessing technology for observations is a challenging issue because of the number of observing systems and complexities of the evaluation process. While NOAA does not want to charge the SAB with this task, it will continue to consult the SAB as they make changes in observing systems.

Dr. Sullivan said that the point raised by the PRTF is valid, and NOSIA and the Palma tool (a decision-assistance model tool) are a response to this, driven by the NOAA Observing Systems Council (NOSC) and a need to understand the support of observations for science. NOAA has made considerable progress to equip the Agency with tools to evaluate and analyze technologies, and would like to continue to have the SAB weigh in on this process over time, but the process itself is too large to constitute a standing committee of the SAB.

Dr. Avery agreed that there does not need to be a SAB working group for this process, but cautioned that external evaluation is important to help identify other opportunities and possibilities for evaluation. Dr. Sullivan said that NOAA leadership does look elsewhere for ideas. Dr. Detrick added an example: Scripps Institution of Oceanography hosted a workshop to identify next-generation technology for the Tropical Atmosphere Ocean (TAO) array.

Molly Macauley found that the NOSIA-II four-quadrant diagram allows NOAA to assess how products for communities are impacted by the removal of an observation system, which describes that observation's community value. This is especially relevant to the NOAA Community Resilience priority.

Jerry Schubel commented on the fourth recommendation. He said the PRTF understood that the NOAA Chief Scientist would probably not be given budget authority, but the PRTF thought that NOAA should have greater flexibility in how it uses its research funds; having someone at a high level in the agency to oversee and act as an advocate for this this would help.

Peter Kareiva asked whether the scope of research increases as a scientist advances in the Science Career Track. Dr. Detrick said that the individual may increase responsibility with advancement, but his or her responsibilities would be limited to research-related activities. Jeremy Jackson asked whether there was a maximum level a NOAA scientist could achieve; for example, the Smithsonian awards "supergrades" above a Level 15. This is a good way to retain the best scientific research staff. Dr. Detrick said that the NOAA Science Career Track is limited to fit within the government structure. Dr. Jackson added that the "supergrade" researchers go through an academic review to reach that level. Dr. Detrick said that NOAA has senior Scientific and Professional (ST) and Senior Level (SL) positions, which may be similar.

Ray Ban concluded the discussion by thanking Dr. Detrick and expressing hopes that the dialogue will continue.

NOAA Response to the SAB External Review of the Ocean Exploration Program

John McDonough, Acting Director, NOAA Office of Ocean Exploration and Research

Summary

John McDonough thanked the external review panel and the Ocean Exploration Advisory Working Group of the SAB (OEAWG) for their time and efforts; their advice and input to the Ocean Exploration Program (OEP) was critical. The review expanded dialogue with the external community, and was the first independent review of the program since its inception in 2005.

The Review Panel was asked to consider the quality, relevance, and performance of the program, and to provide guidance for the future of the OEP. The thirteen Review Panel members were selected with

the SAB OEAWG, and began the review process in August 2011. The Review Panel established a foundation for how to evolve the OEP over time, especially by developing partnerships in a stagnant or decreasing funding situation. Dr. McDonough stated that his presentation would provide a summary of NOAA's response to the ten recommendations from the Review Panel, submitted May 2012.

The first recommendation was for the OEP to set strategic goals and priorities. NOAA will complete a draft strategic plan by April 2014, which will be provided to the SAB OEAWG for advice and consultation. The second recommendation was that OEP should engage NOAA leadership. OEP has been working with NOAA line office leadership, has conducted expeditions that support the NOAA Habitat Blueprint and Atlantic Canyons Mapping, and has engaged internal and external partners using telepresence-enabled expeditions.

The third recommendation was that the OEP should conduct a national forum on Ocean Exploration. *Ocean exploration 2020: A National Forum* was held 19-21 July 2013 and was co-hosted by the NOAA OEP and the Aquarium of the Pacific. Another National Forum will be held in 2015, and these events will continue to be held in the future.

For their fourth recommendation, the Review Panel suggested that the OEP should consider radically new management models. The OEP will consider new management models, as it has since its inception.

The Review Panel recommended that the OEP should restore its extramural grants program using diverted funds from the *Okeanos* program (recommendations 5 and 6). The OEP engaged NOAA Cooperative Institutes and reinstated a competitive grants program for FY-14. However, the *Okeanos Explorer* will continue to operate as a dedicated ship of exploration, and its funds will not be diverted for the grants program.

The seventh recommendation was that the OEP should stay abreast of new technologies. The Task Force on Ocean Exploration and Undersea Research Technology and Infrastructure, an interagency group, was developed and will continue to address this recommendation.

The eighth recommendation was that the OEP should complete Extended Continental Shelf Mapping efforts. This effort should be complete in the next three years, and the data will be important for the United Nations Law of the Sea and other policies.

The Review Panel recommended that the OEP needs to cultivate champions and icons for ocean exploration. The exploration ships have been excellent icons of ocean exploration, and the OEP is interested in determining the next generation of icons for public engagement. The OEP will work to engage students to grow future champions.

The tenth recommendation from the Review Panel was considered the most fundamental, and called for the development of an Ocean Exploration Advisory Board (OEAB). The OEP has taken steps to establish the OEAB, and the OEAB will be initiated by Summer 2014.

Discussion

VADM Paul Gaffney, co-Chair of the Review Panel, said that he was happy to hear Dr. McDonough reaffirm the "undiminished motivation of OE," and said he was pleased that NOAA's response

embraces many of the recommendations from the Review. VADM Gaffney provided comments on the individual NOAA responses as follows:

Response 1: VADM Gaffney congratulated Jerry Schubel for enabling the first National Forum on Ocean Exploration, and for empowering the NOAA community. He hopes that subsequent forums will inform adjustments to the Strategic Plan.

Response 2: While it is necessary for OEP to make stronger bonds within NOAA, the response does not sufficiently address the recommendation, which needs NOAA front office public policy statements in support of National and NOAA ocean exploration programs. Further, in dealing with Congress and other agencies, top leadership involvement is necessary. NOAA's new leadership has an opportunity to use this review and NOAA's response to inform public policy support for ocean exploration.

Response 5: VADM Gaffney was pleased that the targeted competitive grants have been reinitiated. The Review envisioned a goal of \$10M per year. VADM Gaffney thanked McDonough for clarifying that \$5M in the program in FY-14 is for the competitive grants.

Response 6: The Review did not have the benefit of the *Okeanos Explorer* cost analysis that the Response Report presented. However, the OEAB should scrutinize this information, especially as the Response highlights the value of the *Okeanos Explorer*, but the FY-15 NOAA Budget Blue Book singles out the *Okeanos Explorer* for cuts. This suggests there is internal inconsistency in the valuation of the *Okeanos Explorer*. The Review Panel noted that a \$6-10M annual investment in a "figurehead" national image ship, like the *Okeanos Explorer*, is logical when the program was envisioned at \$75M per year. Perhaps the scale needs to be reviewed now that the OE program has only \$20-30M per year.

Response 8: The Review was very strong in recommending that the Extended Continental Shelf (ECS) mapping be completed within three years. The Response certifies that the ECS work will be completed in three years, but the FY-15 Blue Book singles out this work for a funding cut.

Additional discussion from the SAB continued with a comment from Jim Kendall, Bureau of Ocean Energy Management and a member of the Review Panel. He said that NOAA's response was well prepared, and he was glad to see external funding increased from \$3M to \$5M in 2014.

Susan Avery offered a suggestion on cultivating or identifying future "champions" for ocean exploration. She said that although it is true that there is a need to identify future champions, OE will need future spokespeople also. Spokespeople are mid-career researchers active in OE, and this group needs to have more input. Members of the OEAB would be strong candidates as spokespeople. Dr. Avery added that the FY-15 budget includes a \$7M decrease from the FY-14 appropriation and she would like to understand that.

Dr. McDonough said the reason there were two announcements for recruiting members of the OEAB was to ensure they had a well-balanced panel. Regarding the FY-15 budget, he is looking at how to distribute the reduction across the program, but the reduction also leaves open opportunities to leverage funds from other partners so as not to lose parts of the program completely.

VADM Gaffney said that it is very important to hear some policy statement on the OE program from the NOAA Administrator, even though the program is small.

Jim Kendall said that the community at the Ocean Exploration Forum discussed that they must be careful and cognizant that someone's exploration can be called something else by someone else. Dr. McDonough has led an important movement to bring in people not traditionally seen as explorers; there is a need to revitalize the spirit of exploration. There are very good reasons to explore (e.g. the Arctic), but research does not always have to be called "exploration" for success.

Bob Ballard pointed out the difficulty the program has had in securing funding. He believes there is a need for a National Ocean Exploration program. Those committed to the program should try to improve it. The University of Rhode Island has committed \$40M for the Nautilus and Inner Space Center as well as securing private funds. The Exploration Trust does not charge overhead on funds received from NOAA. Additionally, people need to go to Congress for support of the program. Dr. Ballard heard that explorers have not recently spoken to Congressmen in support the program. Those that have gone to the Hill in the past have been successful in advocating for an increase in the House and Senate budget proposals.

Dr. Schubel said NOAA is mandated to lead in the development of a national program in concert with other agencies and public-private partnerships. There need to be strong statements from the leadership of NOAA that this program is important to the agency. Dr. Schubel also noted that the *Okeanos Explorer* is providing excellent photos and videos of its ongoing expedition, and NOAA needs to do a better job of communicating those findings.

Cynthia Decker said that the SAB OEAWG will be disestablished when the OEAB is established this summer.

Working Group Updates

Climate Working Group (CWG)

Holly Hartmann, University of Arizona and Chair of the CWG, reported that the one of the key topics the group will look at this year is the climate goal alignment with societal challenges. The next meeting, May 16, will be a virtual meeting. Between meetings the working group is using an action tracker developed by Wayne Higgins to have informal discussions and to address specific questions. NOAA staff, such as Jennifer Faught, also keep work going between meetings by addressing CWG questions and keeping in touch with members. The CWG had a program update with the climate observations division; there were productive conversations during this, including a discussion on climate observation challenges. A new task is to respond to what the working group heard in those discussions; earlier discussions were more focused on process but are now focused on program specifics. Rather than providing more formal reports, the working group will have more engaged discussions using the action tracker. The CWG may use a report on those discussions as their report to the SAB. Ray Ban responded that at the SAB meeting the previous day there were discussions on ways working groups can provide advice in a timely way for issues NOAA is facing. The idea is to provide advice in a way that may not be as polished but may be more helpful than formal reports. This may be one of those reports from the CWG.

Ray Ban asked Dr. Hartmann about the Climate Partnerships Task Force recommendations on engaging with the private sector on climate services; it is his understanding that NOAA is working on this effort. He wondered if the CWG was working with NOAA on engaging the private sector on

climate services, Holly Hartmann said this discussion has not yet happened but the topic is likely to come up at the May CWG meeting.

Data Archiving and Access Requirements Working Group (DAARWG)

Chris Lenhardt, Renaissance Computing Institute and Chair of DAARWG reported that the March 2014 meeting was the first face-to-face meeting in some time and all members were in attendance. Topics discussed at the meeting included: data management planning, an update on the Comprehensive Large Array-Data Storage System (CLASS), GOES-R Level 0 data archiving, the Environmental Data Management Committee (EDMC) archive procedure, and climate model record archive requirements.

Preliminary thoughts by the DAARWG from the meeting include: continuing to encourage the use of permanent identifiers for NOAA archival data sets; encouraging consistency in the development of data management plans; encouraging automation where possible on tracking metrics for EDMC activities, and encouraging thinking about including science software (e.g., models) as part of “data”.

DAARWG is still looking at the CLASS and GOES-R archiving requirements.

Next steps for the WG include planning some virtual briefings in May on the archive funding model and archiving costs for individual data providers and an informational briefing on the National Environmental Information Office (NEIO), and strengthening NESDIS initiatives. The next DAARWG face-to-face meeting will be in August 2014.

Discussion

Louis Uccellini said on the issue of recommendations from the joint DAARWG-CWG Climate Partnership Task Force, the National Weather Service is working to provide public access to 5-6 of the climate models as well as reforecasts and reanalysis. The private sector wants that information in real time; however there is an issue of getting this all of this information out to a continually-growing group. This real-time access has become the problem; NOAA needs to consider the effort involved in providing all of the model-related data sets and not just the models. NOAA would like some sense from the working group on whether NOAA is handling this process correctly.

Ray Ban added that, on Big Data return on investment and the climate sector, DAARWG is going to be central to SAB for figuring out what this all means.

Environmental Information Services Working Group (EISWG)

Ray Ban, SAB liaison to the EISWG, reported that the next EISWG meeting will be in Silver Spring, April 28-29. Bob Winokur added that there is a draft agenda and the group is meeting on the NOAA College Park campus. Ray said as his term on the SAB comes to a close in June, Bob Winokur will take over the EISWG liaison role.

At a meeting of American Meteorological Society (AMS) committee on weather and climate enterprise it was noted EISWG has effectively connected with the private sector. EISWG has also been effective in reaching out to the community to gain input to inform the decisions of the working group. This is a good accomplishment and credit for these actions goes to Co-Chairs Walt Dabbert and Nancy Colleton.

Gulf Coast Ecosystem RESTORE Science Program Advisory Working Group (RSPA WG)

Jean May-Brett, SAB liaison to the RSPA WG, highlighted the RSPA WG Terms of Reference and advice to be provided to the SAB. The working group includes members from three groups:

- Subject matter experts;
- Representatives of science organizations in the Gulf of Mexico, of which there are currently two individuals, however, NOAA is waiting for the five state Centers of Excellence to be named before representatives will be requested; and
- Representatives from RESTORE Act funding organizations.

A Chair has been identified and NOAA staff is identifying dates for the first in-person meeting to be held on the Gulf coast.

Mike Donahue, also a SAB liaison to the RSPA WG, said a small committee looked at the members on the group and offered the position of Chair to Dwayne Porter of the University of South Carolina who enthusiastically agreed to serve.

Ecosystem Sciences and Management Working Group (ESMWG)

Richard Merrick, NOAA sponsor for the ESMWG, reported that the ESMWG had a two-day meeting April 1-2, at the NOAA Southwest Fisheries Science Center in La Jolla, California. On the first day of the meeting there were presentations from PPI, NMFS and NOS on Ecosystem Services Valuation as part of the group's data collection efforts on the topic. On the second day the ESMWG members discussed the charge received from the SAB on Arctic research and will be working on a Terms of Reference for that effort. The expectation is that between now and next meeting in October, the ESMWG will define the Arctic research terms of reference so the group can begin to work on that effort.

Ecosystem Sciences and Management Working Group: Coastal Habitat Restoration Recommendations

Mike Beck, The Nature Conservancy and Member, ESMWG (by phone)

Summary

The purpose of the review was to understand where and how restoration is supported within NOAA; the restoration benefits that are assessed and how NOAA uses its role in guiding restoration efforts. The report discussed key questions asked about restoration projects: both projects NOAA funds (direct) as well as those projects funded by other agencies but on which NOAA provides advice (indirect).

NOAA Direct Projects:

Findings

- Many of NOAA's Request for Proposals (RFPs) and funding criteria focus on multiple benefits (i.e., ecosystem services), but it appears that there is little focus on measuring these benefits
- NOAA does try to measure fisheries benefits
- At the scale of most restoration projects, the benefits to fisheries productivity are likely to be low and difficult to measure

- NOAAs projects are likely to deliver many additional benefits (e.g., job creation, shoreline access, recreation, hazard mitigation at the current scale) and many projects are chosen for these benefits

Recommendations

1. NOAA should track and make available information regarding its existing measures in the Restoration Atlas or the National Estuaries Restoration Inventory (NERI) database ensuring consistency and accuracy in the data.
2. NOAA should more clearly recognize that its restoration mandates extend well beyond fisheries
3. NOAA should undertake a Return on Investment (ROI) analysis on a small subsample of projects that cover multiple objectives
4. NOAA should scale its restoration projects to more clearly fit the desired objectives.
5. There should be center(s) of excellence in restoration at NOAA that focus on fisheries and non-fisheries benefits
6. NOAA restoration efforts should more clearly measure additional benefits beyond fisheries
7. More of the (NERI & NOAA Restoration Atlas' data should be made public

NOAA Indirect Projects:

Findings

- NOAA is a key advisor for hundreds of millions of dollars of habitat restoration investments by other federal and state agencies
- NOAA has an opportunity to guide these investments towards good projects and specific restoration benefits
- NOAA does not appear to account clearly for its largest opportunities to guide restoration funding
- NOAA may not greatly value its role as a key advisor on restoration in its strategic priorities

Recommendations

8. NOAA's strategic plan and implementation plans need to have a greater focus leveraging the restoration funds of others to achieve multiple benefits
9. NOAA should formally recognize that its expertise in restoration can provide value-added to coastal habitats by advising and directing non-appropriated money
10. NOAA should highlight the role it plays in working with its agency partners on projects, showing the separate skill sets that its staff and those of other agencies bring to the table to ensure complex restoration projects succeed.

Discussion

Jeremy Jackson asked about how NOAA defines restoration—one of the things that interests him is whether restoration addresses the drivers of damage or just tries to fix the damage. Is restoration a Band-Aid or an attempt to address the original causes of the problem?

Mike Beck responded that this is a challenge of restoration. Some restoration efforts have just fixed damage but larger efforts to address the causes need to be addressed. When restoration works on the causes of problems, programs have delivered benefits. One example is salt marshes in the Northeast that show substantial increase in acreage when culverts are opened up. Changing the flow of water can have a substantial effect. Jeremy Jackson wondered how NOAA could track these issues. Mike Beck said NOAA could address these questions about whether the projects are fixing the damage or the underlying cause of the problem.

Lynn Scarlett asked about how the first recommendation about tracking and making information available links to the eighth recommendation on leveraging funds of others. These are important recommendations to have consistent ways to track restoration projects across the government. Mike Beck agreed that there are efforts in recommendation one that point to Restoration Atlas that NOAA oversees and directs and is the place where more headway can be made. The SAB could add emphasis on its importance and the need to put these data into an online database so decision-makers can see the benefits.

Rob Hicks asked why the only benefits being measured relate to fisheries. Is this a problem that NOAA can't characterize other benefits? Mike said that is only one problem, but that some of the measures of ecosystem benefits and services are newer than measuring fisheries production. Another issue is that NOAA is responsible for implementing the Magnuson Stevens Act and its requirements and has a lot of things to deliver based on that Act. The Restoration Center is based in NMFS and so has those mandates and is experienced in measuring fisheries benefits. . However NOAA could make other measures.

Michael Donahue made a motion to accept the report; Lynn Scarlett seconded the motion which passed unanimously.

Meeting Adjourned

This meeting was adjourned at 12:25 PM EDT.

List of Meeting Actions

Action 1: The Ecosystem Sciences and Management Working Group (ESMWG) will revise the report on Ecosystem-Based Fisheries Management (EBFM) per comments from the Science Advisory Board (SAB), including revisions of the Executive Summary to include all recommendations in the report and consideration of other suggested changes.

Action 2: The SAB will consider the revised ESMWG EBFM report at a teleconference meeting within the next two months, before the July 2014 in-person meeting.

Action 3: The SAB will include in the transmittal letter of the CIMEC report a strong recommendation that the Cooperative Institute (CI) complete a strategic plan within a limited amount of time. The SAB will discuss the specific language at its teleconference meeting in June 2014.

Action 4: The SAB will consider the criteria for future CI reviews in context of current funding situation. This discussion will be held after an update on the current CI program at the July 2014 meeting.

8-20-14 FINAL

Action 5: The SAB approved the ESMWG report on Coastal Habitat Restoration and will transmit to NOAA.