

U.S. IOOS Advisory Committee

In-Person/Virtual/Hybrid Public Meeting

Meeting Minutes

Nov. 30–Dec. 1 and Dec. 6–7, 2022

Notification and Availability of Meeting Materials

The Integrated Ocean Observing System Advisory Committee (IOOS AC) was announced to the public by [Federal Register Notification](#) and on the [IOOS Advisory Committee Website](#). Meeting presentations and background material are posted on the IOOS website. On November 30 - December 1, all attendees participated virtually by Google Meet. On December 6-7, attendees attended both in person and virtually.

IOOS Advisory Committee Members Present:

Scott Rayder, Leidos (Chair)
Sara Graves, Ph.D., University of Alabama in Huntsville (Co-Chair)
Jason Biggs, Ph.D., Guam Department of Agriculture
Daniel Costa, Ph.D., Institute of Marine Sciences, University of California Santa Cruz
Catherine Edwards, Ph.D., Skidaway Institute of Oceanography, University of Georgia
Eoin Howlett, Trinnex
Molly McCammon, Alaska Ocean Observing System (AOOS)
Julio Morell, Caribbean Coastal Ocean Observing System (CARICOOS)
Ruth Perry, Ph.D., Shell Renewables & Energy Solutions
Jennifer Read, Ph.D., Univ of Michigan Water Center Graham Sustainability Institute
Daniel Rudnick, Ph.D., Scripps Institution of Oceanography, University of California San Diego
Oscar Schofield, Ph.D., Rutgers University Center for Ocean Observing Leadership
Jyotika Virmani, Ph.D., Schmidt Ocean Institute
Richard “Dick” West, ADM (ret.), Independent Consultant
Robert “Bob” Winokur, Independent Consultant

Susan Yee, U.S. Environmental Protection Agency (ex officio)
Laura Lorenzoni, NASA (ex officio)
Carrie Schmaus, DOE (ex officio)
Josie Quintrell, IOOS Association (ex officio)
Kristin Yarincik, IOOS Association

IOOS Leadership and Staff in Attendance:

Carl Gouldman, Director, IOOS Office
Krisa Arzayus (DFO), IOOS Office
Becca Derex, IOOS Office
Laura Gewain, IOOS Office
Schuyler Nardelli, IOOS Office
Courtney Edwards, IOOS Office

Invited Participants (non-FAC members)

Gabrielle Canonico, IOOS Office
Mitchell Tartt, ONMS
Roger Griffis, NMFS
Clarissa Anderson, SCCOOS
Derrick Snowden, IOOS Office
Gerhard Kuska, MARACOOS
Jeff Payne, OCM
Brian Zelenke, IOOS Office
Jake Kritzer, NERACOOS
Alan Leonardi, NOAA NOPP Office
Jeremy Weirich, NOAA Office of Exploration
Aria Raimondi, NOAA/NOS/FPD
Marian Westley, CO-OPS
Matt Stout, ONMS

Public Observers:

Nick Rome, COL/UCAR
Masha Edmondson, COL/UCAR
Matthew Hodanbosi, Sea Grant Fellow
Tiffany Vance, IOOS Office
Brent Ache, CO-OPS
Ross Timmerman, SCCOOS
Ashley Peiffer, IOOS Association
Hassan Moustahfid, IOOS Office
Nicholas Dawson, IOOS Office
Christine Hayes, NOAA/NOS
Becky Baltes, IOOS Office
David Legler, IOOC Co-Chair/GOMO
Amanda Vieillard, DOE AAAS Fellow
Michael Lalime, IOOS Office
Mathew Biddle, IOOS Office
Katie Fillingham, COL/UCAR
Mary Brinkman, General Public
Riley Pohlman, General Public
Tobey Curtis, ATN/IOOS Office
Alex Harper, CeNCOOS
Henry Ruhl, CeNCOOS
Debra Esty, IOOS Office
Carolyn Wilson, SURA
Gus Norrbom, Intern, U.S. House Committee on Science, Space, and Technology
Joseph Fillingham, NOAA
Jack Conroy, NOAA
Chris Beaverson, NOAA/NOS
Frank Cantelas, NOAA/OER

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Meeting welcome

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Aria Remondi - NOS Culture of Evaluation

Marian Westley - External Review at CO-OPS

Matt Stout - External Review at ONMS

Carl Gouldman - Upcoming External Review for IOOS

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FAC Business and Planning

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Public Meeting Adjourned

DAY 1 - November 30, 2022 (Virtual)

Meeting Welcome and Administrative Updates

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office

K. Arzayus welcomed everyone to the November 30 U.S. Integrated Ocean Observing System (IOOS) Advisory Committee public meeting which was chaired by Scott Rayder, Chair, U.S. IOOS Advisory Committee. She noted that NOAA appreciates the time and diligent work of the Committee in preparing for this meeting and for their forthcoming deliberations. K. Arzayus provided an overview of her role as the Designated Federal Official (DFO). As the DFO for this meeting, she serves as a liaison between the Committee and NOAA and the IOOC. She is responsible for ensuring all provisions of the Federal Advisory Committee Act (FACA) are met regarding the operations of the U.S. IOOS AC. She noted that a critical responsibility as DFO is to work with appropriate Agency officials to ensure that all appropriate ethics regulations are satisfied.

K. Arzayus noted that the objective of this meeting was to finalize the phase 1 recommendations to NOAA and the IOOC from the Committee's work plan and to begin scoping and refining the work plan for phase 2. Recommendations are an important outcome of the work of the Committee. The federal government tracks how many recommendations are generated and how many are implemented.

Lastly, K. Arzayus reviewed the protocol for questions, public comments, meeting minutes and convened the meeting of the U.S. IOOS Advisory Committee.

Opening Remarks

Scott Rayder, Chair, U.S. IOOS Advisory Committee

S. Rayder welcomed the committee to the public meeting and outlined the agenda for the first day of the public meeting, including updates from the U.S. IOOS Office and time to focus on the Climate Change and New Blue Economy phase 1 priorities. He expressed great appreciation for the committee's input in shaping these recommendations. He also noted that at the spring meeting, he'd like to invite the NOAA Administrator, Dr. Spinrad. He also welcomed the new members of the committee.

U.S. IOOS Office Update

Carl Gouldman, Director, U.S. IOOS Office

C. Gouldman provided an update on the IOOS Program Office (PO). FY23 Priorities for the IOOS PO were shared with the committee. In terms of coastal, ocean, & Great Lakes observing, predicting, and informing, the PO aims to continue delivering, diversifying, enhancing, and increasing accessibility of IOOS products and services for all Americans to meet customer needs. The three areas of focus are:

- Climate Data & Services - Detecting the climate signal at the coast and understanding its manifestations and helping to prepare a Climate Ready Nation
- Improved Coastal Resilience including coastal modeling / predictions - Enhance ecological forecasting supported by observing, science, and equitable service delivery
- Economic Development - healthy blue economy and growing “new blue economy” and services in the face of coastal hazards - including workforce development

C. Gouldman provided budget updates for the FY22-24, the Bipartisan Infrastructure Law, and the Inflation Reduction Act. The total enacted for FY22 was \$48.2M, \$41M for the Regions and \$7.2M for the PO. FY22 appropriations got signed into law on March 15 and awards were submitted to GMD in early July. For the FY23 budget, the House is proposing to fund IOOS at 44M and the Senate Committee is proposing to fund IOOS at \$46M. The IOOS PO is waiting on OMB passback for FY24 within NOAA. C. Gouldman shared that through the Bipartisan Infrastructure Law (BIL; formerly IJJA), IOOS is receiving funds to support 3 provisions (3, 11, and 12). The non-competitive RFAs were issued in fall, proposals were received, and the grants management division has approved proposals from the IOOS office for all 3 provisions. BIL FY23 amounts will be similar to FY22 amounts and the IOOS PO has been asked for FY24 spend plan updates in December and expect review of those over the next few months. Initial plans include a small increase for IOOS for FY24-26. Planning for the Inflation Reduction Act is in progress, and the PO expects announcements to become public in February 2023 and some NOFOs to be published in the months following the announcement.

C. Gouldman provided an update on the ongoing New Blue Economy work within NOAA. NOAA has a new Strategic Plan that includes the New Blue Economy, and NOS is releasing a new strategic plan in January 2023, and there is strong alignment between the two. Additionally, there is an NOS team and a NOAA-wide team that are working on a draft roadmap for growing the New Blue Economy. Climate resilience and a sustainable and resilient economy are the result of a robust New Blue Economy, and data alone does not get us there - the data needs to be provided in ways that are useful, usable, and ultimately used. A key message for the committee is that there is a whole value chain of observing, data, and predictions that NOAA and partners are involved in with co-development and co-delivery that provides great potential for growth in both market and non-market benefits. The NOS and NOAA New Blue Economy teams are engaged in a variety of upcoming external engagements including AGU in December, the NOAA OAP Community Meeting and American Meteorological Society Annual Meeting in January, Coastal GeoTools and Oceanology International Americas in February, and AGU Ocean Visions in April. The New Blue Economy intersects and overlaps with NOAA’s other priorities of ‘Building a Climate Ready Nation’ and to advance diversity, equity, inclusion and accessibility.

C. Gouldman provided a few highlights of the activities in the IOOS PO. **The Ocean Technology Transition Program** released a NOFO for FY23 - final proposals are due on January 17, 2023 and funding decisions will be made in April 2023. The IOOS PO has been working to blend together all biological data under the **Marine Life Program** banner. They are working to advance the Marine Biodiversity Observation Network, Animal Telemetry Network, and Harmful Algal Bloom activities. 5 new projects involving regional associations (RAs) were recently funded through the National Ocean Partnership Program (NOPP) FY22 Marine Life Solicitation - CeNCOOS, NERACOOS, GCOOS, AOOOS, and SECOORA. Globally, the Marine Life 2030 program was endorsed as a UN Ocean Decade Action. **National Harmful Algal Bloom Observing Network (NHABON)**: NHABON funding of \$2.5M is now going out to all 11 RAs. The IOOS PO has written a NHABON Implementation Plan with our partners at NCCOS in response to a charge from

Congress working to integrate existing assets and research across NOAA into a more formal national observing network. **Glider Program:** We had a really successful Underwater Gliders User Group workshop in September in Seattle sharing operations, data standards, and technologies communities of practice. Sustained glider operations are an important part of the glider program within IOOS, including the California Underwater Glider Network, which is important for long-range forecasting and understanding ocean state and detecting the climate signal. IOOS also has ongoing hurricane monitoring efforts in collaboration with the Navy and others, as well as ecosystem monitoring projects. Increases in the Senate and House marks for the Office of Marine Aviation and Operations for autonomous marine operational systems might bring additional funding to IOOS. **Data Management and Cyberinfrastructure (DMAC):** A lot of successes this past year, including the Marine Biological Data Mobilization Workshop, the second U.S. IOOS Code Sprint hosted by the Great Lakes Observing System, the DMAC Annual Meeting, participation in OceanHackWeek, 4 projects in this year's Google Summer of Code program, and getting the DMAC Topic 2 project "Reaching for the Cloud" well underway.

G. Gouldman shared that the IOOS Strategic Plan was published in August after receiving the light refresh. It maintains IOOS's goals and objectives and reflects the current status and observing needs of our Nation's oceans, coasts, and Great Lakes. The plan has a three-year window that will be lightly refreshed annually, with the intent that IOOS will regularly revisit the plan as part of an iterative, agile, and predictive approach that is responsive to current events. The IOOS Implementation Plan is now going to include quarterly meetings. The PO kicked off the first one in October, which included discussion around office milestones with high value and high effort, and what resources and clarifications are needed to make the biggest difference. The next quarterly implementation meeting is scheduled for January, where the PO plans to discuss developing performance metrics as well as the outlook for program plans.

C. Gouldman shared that the IOOS PO has been dealing with a heavy workload moving out of the pandemic. Surveys across NOAA show a real risk of burnout, and IOOS PO leadership are working on addressing this issue within IOOS. The work IOOS is doing is important and the demand for it is going up, and the ability to grow the IOOS team and staff has been challenging. The PO has been making some new hires and is planning on making more with BIL funds, although this process has been slow.

C. Gouldman thanked the committee for their attention and opened the floor for questions.

Questions:

S. Rayder asked if the advisory committee was asked to provide comments on the NOAA Strategic Plan? He noted both the committee and the Hydrographic Services Review Panel should be given the opportunity to comment on that. K. Arzayus noted that the IOOS PO emailed the committee about a public comment period in June. There were also listening sessions that we invited you to.

D. West asked who is the leader that keeps track of what's going on NOAA-wide for New Blue Economy activities? C. Gouldman responded that Dr. Spinrad tagged Nicole LeBoeuf (NOS Assistant Administrator) as lead for New Blue Economy who has in turn tagged C. Gouldman as her lead. D. West asked if C. Gouldman meets regularly to get guidance on how to coordinate New Blue Economy across NOAA? NOAA needs better New Blue Economy messaging. C. Gouldman responded that the New Blue Economy team created a website that they will provide to the committee. The team is finding it important to give specific examples when briefing it. We have a cross NOS- and NOAA-team working on consolidating use cases to use in slide decks

for leadership. D. West suggested that whoever is in charge of NOAA's New Blue Economy should put out some guidance on succinct, consistent messaging for everyone across NOAA (maybe five bullets) to describe NBE so everyone is saying the same things.

J. Biggs noted that the Advisory Committee was alerted about the comment period for the NOAA Strategic Plan, but there wasn't necessarily a formal call for the committee to provide comment together as a body. It might help if we formalize these types of processes in the future because it has more gravitas as a group rather than individual public comment. S. Rayder mentioned that in the past, NOAA had regional meetings where they solicited input from external stakeholders. It would have helped to have brought in some of the extramural communities outside of NOAA prior to make sure there was alignment. S. Rayder doesn't think the broader ocean community realized the NOAA Strategic Plan was taking off. Now we have definitions out there but where are the performance metrics? We need to have metrics to show success.

M. McCammon asked about regional ocean partnerships (ROPs) - the funding gets split between those regions that have ocean partnership programs and for the regions that don't, the funding goes to the IOOS RAs. Are you working with Deerin Babb-Brott to develop a plan for that funding, and where is that going? Do the RAs have to do something formally now to be ROPs? Where do you see that funding going? C. Gouldman responded that there are two different pots of funding now, and this is being coordinated closely with the Ocean Coastal Management (OCM). Total amount in Provision 12 of BIL is \$11M per year - \$9.2M went to the OCM ROPs and \$1.8M to IOOS RAs. IOOS is coordinating jointly on reporting. For regions like AOOS, we are building a report structure that matches what the ROPs are doing with AOOS. M. McCammon noted that it seems like the funding amounts are not the same, those with an established ROP are getting substantially more funding. How closely in those regions that have an established ROP are they working with the existing RAs within that structure? Does it make sense for the 4 non-ROP regions to formally establish something so that there's more additional funding available on a more equitable basis? Is there any strategy that's going on there or discussion of that? C. Gouldman responded that the pieces dedicated to data sharing (the part the IOOS regions have been asked to be a part of) is relatively equal to all of them. He acknowledged that there are other components within the ROPs that are being funded at a higher level. IOOS regions are being funded separately through IOOS core funding as well. C. Gouldman will get back to the committee on this after checking with Dave Easter to get the necessary details.

B. Winokur asked if the committee will get specifics next week on what is actually being done within each of these program areas? High-level overview is great, but the real question is "what are you really doing?" He also asked whether NOAA has a specific implementation plan for the \$3.3B from IRA? Is there someone in charge of the \$3.3B over a 3-4 year period? C. Gouldman responded that there are 7-9 sections of the IRA \$3.3B and different NOAA entities are leading different sections. Process for developing spend plans has been slow. OMB and the Hill have asked for spend plans, so NOAA will be providing them. Detailed information is not public yet, this will come out in February, including leads and funding for each section. IRA law itself outlines different sections - e.g., Section 40001 is \$2.6B focused on climate and coastal resilience and some fisheries issues. C. Gouldman offered to provide these references if B. Winokur would like.

K. Arzayus also responded that the way the agenda is structured for next week is where the committee will get briefings on specific topics as they relate to the committee's work plan.

These briefings won't cover everything that IOOS is doing. B. Winokur noted that it is useful to get detailed briefings on activities within IOOS to make sure recommendations are helpful. K. Arzayus clarified that the IOOS Office Updates are the broader look at more of the activities that the IOOS PO and Enterprise are doing. For the work plan, we started with Dr. Spinrad laying out his priorities for NOAA, which helped shape the current phase 1 priorities. Then last spring we had briefings that helped introduce the topics and what IOOS is doing in those areas. As we mature and work through the Preparatory Work Groups (PWGs) we then will get to the discussions to finalize recommendations. That's why next week as we go into phase 2, there are more speakers that will be giving more programmatic details that are going on in those areas (e.g., Marine Life and Enterprise Excellence). That will be another opportunity to identify what other information the committee needs for future meetings.

B. Winokur noted that for the New Blue Economy there is a lot of money being spent, but he doesn't know what it is being spent on. S. Rayder noted that the definition should drive where the resources are allocated. The committee can make recommendations to ensure definitions are robust enough to accurately describe for stakeholders the body of work. C. Gouldman emphasized that the agenda does have specific panels to meet the committee's desires for this meeting, including a deeper dive on the marine life panel, NOPP, etc. The IOOS PO has to put in a lot of work ahead of time to get topics teed up and invite presenters, so if you want more details on things like gliders, for example, we can do that but need more advance warning. On the New Blue Economy, there are no new investments yet. A challenge with this subject is that it is pretty inclusive of a lot of activities that already exist that are the things that you all understand are IOOS and IOOS-related but not just the IOOS PO. Ocean observing, data and service delivery from core data programs like Coast Survey, CO-OPS, etc. It's all ocean data and information that supports decisions. In terms of funding, it gets back to questions on what is the total funding in NOAA that goes to ocean observing? Struggling with how to get to the substance of what the committee wants more detailed information on.

S. Rayder noted that B. Winokur was looking for more fidelity on how to rack and stack the New Blue Economy? And what is heard for the IOOS PO is "we haven't done that yet." This is an opportunity to engage with the community writ large to work on a plan to best execute the money. B. Winokur gave an example for New Blue Economy - money that's been invested in IOOS and across NOAA on things related to Blue Economy, is some of this money being used as an example to accelerate ongoing activity, and is some of it being used to develop and implement new programs? S. Rayder clarified that we need to know what is in the current program that is defined as "New Blue Economy" and going forward, what new programs will get layered into the bucket? Integration of the New Blue Economy across NOAA is important.

K. Arzayus closed the loop on the NOAA Strategic Plan conversation and noted that the IOOS PO emailed the committee about a public comment period in June. There were also listening sessions that the committee was invited to. In regards to deliberating as a whole federal advisory committee - one thing to be aware of is that if the committee does this, we would have to have a public deliberation on those comments. We can pursue this type of consolidated approach in the future.

J. Biggs expressed some comments in regards to the New Blue Economy and Diversity & Inclusion. The Pacific Islands are disparate in terms of coverage and placement of assets. The important part of this is that the nation needs to be reminded that over 90% of marine natural assets of the nation are in the Pacific and over 80% of these are in the western Pacific and

Oceania. It is important for the Pacific to have a role in steering IOOS and NOAA. One of the things that led me to believe things are going in an opposite direction is that the Pacific Regional Ocean Partnerships were recreated, but the Pacific was left out of this for some regions - they were disbanded and not recognized when they were rebanded. That's a big issue, especially in regards to marine spatial planning, siting, military operations, and the blue economy for eco-friendly energy creation. It is important for the Pacific to have that brought back as well as some of the bodies we sit on for steering these committees. Another thing J. Biggs mentioned was that the Pacific is moving forward to restore coral reefs and ecosystems. The indigenous way is more of a steward as opposed to putting moratoriums on human behavior - in the Pacific this doesn't actually help. In a Blue Economy sense, Guam especially as well as Palau sees restocking of coral reef fishes as a lucrative move that could create an entire business sector that could feed the world, but this is not on NOAA's radar. There is opportunity here for private and public investment with huge growth potential.

Climate Change - Phase 1 Priority Wrap-Up and Discussion

Lead: Oscar Schofield, Chair, Department of Marine and Coastal Sciences, Rutgers University

O. Schofield presented to the advisory committee on behalf of the Climate Change Adaptation working group. He gave an overview of the PWG's conversations and recommendations. The ideas he presented were developed from the coastal climate signal white paper that was produced last summer, which highlights in a concise way that our coastal communities (which represent a good chunk of the population) and ecosystems are experiencing increased climate impacts. The white paper notes that it is important to get reliable and timely information to coastal communities to help understand things like storm intensity forecasts or migrating fish. Climate is expressed differently across the country - one size fits all does not apply, local differences are critical. What works for New Jersey doesn't work for Alaska and vice versa. IOOS provides a national backbone that unifies measurements and models, but also customization for local communities and what they need. There is a nice iteration cycle there. IOOS is a unique opportunity to provide a coastal climate observation system for the country. IOOS should be recognized for its coastal climate observing system, and should be supported in this work.

O. Schofield walked through the Climate PWG's specific recommendations, including:

1. Expand coastal observations and support regional-scale models that collectively can be used to monitor trends, detect changes, provide forecasts, and deliver tailored information products to users for decision making to improve coastal resilience.
 - a. IOOS provides a coherent national baseline of climate relevant data. The measurements on continental shelves fill a critical gap in the US climate observing network.
 - b. The diverse stakeholders in each regional association allow for development of focused data products meeting local needs.
 - c. Regional observations are complemented in most RAs with numerical models providing the capacity for ocean forecasting.
 - d. *RCE certification provides a means of data standardization for core climate variables to ensure RA's meet the GCOS Monitoring principles.*
2. Recapitalize and modernize existing infrastructure for continued success, including the national network of moorings, profiling gliders, high frequency radar (HFR) and shore stations, updating sensors, and expanding to comprehensive nationally standardized

physical, chemical and biological data in order to detect change.

- a. Example: IOOS is relying on a CODAR network that is past its time. IOOS needs to refresh the system so we can maintain the time series that is important for detecting climate change.
3. Increase engagement with historically underrepresented communities that are often disproportionately affected by climate impacts by co-producing observation systems and tailored products to ensure all have access to the information and tools needed to fully prepare for and respond to coastal change.
4. Invest in technological innovation for new types of observing tools and sensors and to improve regional scale models, reducing costs and improving the understanding and delivery of information.
5. Expand regional data integration services to better integrate IOOS with other coastal and global climate programs and to better provide products and services for communities. This can be achieved by supporting advanced platforms that can more rapidly communicate information, alerts and warnings to users, thereby building synergies, filling critical gaps, and developing cost-effective solutions.
 - a. Example: Glider DAQ, coupling of HFR work with wave SWAN model to do wave forecasts. Tools and data systems provide the bridge between RAs and local stakeholders. Recommend IOOS expand the efforts and keep moving forward.
6. There is an urgent need to develop a national integrated coastal climate capability. This requires establishing a recognized leader to collect-collate-synthesize continental shelf data. IOOS should be designated and supported as that leader.
 - a. Given the scale of getting the U.S. to be a Climate Ready Nation, it might be helpful for the IOOS office to appoint a coastal climate program manager that would help work across the RAs and with IOOC agencies. This might help accelerate the development of data products, increase data quality, help with data integration, make sure coastal climate data is included in national climate efforts, and police RAs to make sure they are completing this task. Having a champion with this as a full time focus would accelerate these efforts across IOOS. Developing a climate ready nation is a fundamental challenge for this generation of scientists and deserves someone to help coordinate the efforts.

O. Schofield concluded by noting that the Climate PWG struggled with how much implementation strategy to provide, and decided that the IOOS PO should have flexibility to decide the most effective implementation strategy.

Committee Discussion:

S. Rayder opened the floor to comments from committee members on the Climate Adaptation recommendations. He noted that these recommendations would tie into NOAA's Climate Ready Nation, and would support operational climate service.

D. Rudnick emphasized the recapitalization recommendation. He noted that for climate observations to be valuable, they also need to be long-term. IOOS has been good about developing climate records, but old equipment needs to be replaced occasionally. B. Winokur noted that the recapitalization recommendation was a key recommendation made in the last report. He asked what has been done since then? M. McCammon noted that there has been some progress on recapitalization, and there is money in BIL for recapitalization of radars and

gliders. She shared that the amount given was just a small fraction of the amount needed. She suggested acknowledging this fact as an overarching recommendation at the bottom that IOOS can't do any of the above recommendations without recapitalization. O. Schofield suggested alternatively moving this recommendation to #1 because it is central to the previous set of recommendations. Important to note progress but that the scale of progress is not up to the challenge before us.

C. Edwards agreed with the recapitalization recommendation being a foundation for everything, especially with the need for long-term time series for assessing climate change. How do we weave climate resilience into measurements themselves? We need to develop a strategy to do so. We just had a HF radar burn in a wildfire. Might want to advise some strategic thinking for how to harden our networks. O. Schofield asked C. Edwards if that should be included in the recapitalization and modernization recommendation, or in the "expand coastal observations" recommendation? C. Edwards thought it could fit into either place.

S. Graves thanked O. Schofield for representing the Climate PWG. She noted that the PWG had quite a few discussions on points brought up today. She clarified that the recommendation was not just to recapitalize existing infrastructure but to modernize as well.

B. Winokur asked if the committee should number these recommendations or just put them as bullet points so they don't show prioritization? He suggests not using numbers. O. Schofield agreed that they shouldn't be numbered. He suggested that changing the order emphasizes what the committee thinks is most important. They moved the "underrepresented groups" recommendation up in the list so it wasn't last. S. Rayder asked if anyone thinks they should be numbered? B. Winokur suggested that prioritization is implied just by the order you present them. He thinks it's probably not good to explicitly prioritize any of the PWG sets of recommendations. M. McCammon still suggests switching the order to strengthen the recapitalization recommendation to say that all others are dependent on this recommendation. S. Rayder noted that OMB would ask for a prioritization, and asked the committee whether they would prefer someone else prioritizing the content?

O. Schofield summarized that two things that should be at the top based on the discussion are recapitalization and modernization of existing infrastructure and getting recognition that IOOS is providing the coastal climate signal through its mission. The other recommendations flow from these two. New technology is great, but if we don't have a basic time series, how do you embed in novel measurements? M. McCammon agreed.

S. Rayder asked if the committee wants to say anything about the role of Global Ocean Monitoring and Observations (GOMO), National Data Buoy Center (NDBC), etc.? If IOOS is being tapped as the coastal climate observations leader, should GOMO and NDBC support IOOS in this effort? This is an opportunity to offer a vision towards integration. D. Costa noted that "Integrated" is the first word in the IOOS acronym. The Climate PWG had a big discussion on this. O. Schofield suggested starting with this point on the last slide - "IOOS is the Integrated OOS, given that, we recommend..."

D. Rudnick emphasized that the committee needs to have a discussion about having someone in the PO dedicated to climate. This is a necessary move for IOOS to be a leader in climate. D. Costa noted that this was their effort to bring some integration across NOAA on the topic of climate.

J. Morrell recommended merging the “expand regional data integration services” and “IOOS as a leader” recommendations - there’s a little bit of overlap there. S. Rayder suggested trying to do this before next week as fewer recommendations that are more punchy may be good. D. Costa noted that the two recommendations are similar but are not saying the same thing. The “expand regional data integration services” recommendation is more regional within the program, while the “IOOS as a leader” recommendation is looking outside of what is currently IOOS. We could put them together but the intent was to point out different forms of integration. M. McCammon agreed with D. Costa’s comment. The latter flows from the former - In order to expand data integration services, we need IOOS to be the leader of the coastal climate signal. There’s a need to have them separate.

K. Arzayus noted that the recommendation of “IOOS as a leader” doesn’t include the yellow text from the last slide of O. Schofield’s presentation (IOOS PO appointing a full-time coastal climate program manager). Should this be explicitly stated as its own recommendation? O. Schofield responded that this was the recommendation where they had ideas about implementation. For the read ahead document they left it out. O. Schofield agrees that you need a climate champion to realize IOOS as a climate leader. Happy to add this in.

B. Winokur mentioned in regards to comments about GOMO and NDBC that the last set of recommendations discussed the coordination of observations programs within NOAA. What is the procedure/process/implementation for this? (NESDIS, NWS, OAR, etc.) Is OAR the leader for climate within NOAA? Does this get into organizational conflict? S. Rayder thinks this should be IOOS. He thinks IOOS is integrating more than just regional observations.

C. Gouldman wondered if the committee was burying the lead for the recapitalization recommendation in terms of the purpose/reason for the recommendation. I.e., it could start with "Ensure climate data and information are sustained time-series measurements ... by recapitalizing and modernizing etc etc." She asked because the "voice over" by O. Schofield made this point but she’s not sure the text reflects the "so what" reasons O. Schofield verbalized. O. Schofield agreed that they can add something to this effect.

D. Rudnick expressed the important distinction that IOOS should take lead in *COASTAL* climate variability, not the whole open ocean. IOOS is the sensible place to lead that capability. Not talking about taking over Argo, just for the coastal ocean (e.g., EEZ). S. Rayder mentioned a chart that used to exist displaying the architecture of observing. Do we need NOAA to come up with something like this for climate? Do we need to explicitly delineate lanes within NOAA? D. West agreed, if you want to take the lead you need to be careful that you don’t step on other toes. NOAA leadership will have to designate lead. B. Winokur noted that the coast is part of the broader ocean. He agreed with D. Rudnick’s point. NWS has a data buoy office and most observations are in the coastal environment. The integration and coordination aspects need to happen within NOAA. S. Rayder suggested defining what the observation zones are, and give IOOS the coastal piece. Define what GOMO, NDBC, etc. does vs. IOOS. IOOS is the only player in the Great Lakes, which is a distinct advantage for IOOS to be the lead.

B. Winokur re-emphasized that the committee needs to make a strong recommendation that NOAA fund recapitalization and modernization. Part of the issue is that strategies, plans, etc. come out without any funding to accompany it. It’s important for NOAA to develop a plan, but NOAA needs funding to carry out recapitalization and modernization.

D. West suggested explicitly defining what coastal areas are. IOOS regional systems might not cover all of EEZ. J. Read noted that the EEZ doesn't exist in the Great Lakes. Need to make sure language makes sense for all regions. GLOS is working on both sides of the binational border. S. Graves asked if we need to make anything more definitive? J. Read suggested that not using "EEZ" and just saying "coastal" should encompass the Great Lakes, however, a geophysical way to describe the coastal zone might be better. O. Schofield noted that this is difficult - we can't use "continental shelf" because for the east and west coast, this area is very different. Good to be more general on that front, which is why the PWG leaned towards using just "coastal." C. Gouldment highlighted that the ICOOS Act uses "oceans, coasts, and Great Lakes, head of tides to EEZ" - does this work? J. Read agreed that as long as the Great Lakes is included this should be okay. D. Costa agreed that the Great Lakes are often left out of discussion and that they should be called out specifically. When we say "coastal zone," does this also include the land component, or are we assuming it's just the marine area? C. Edwards asked what is "offshore" vs "inshore"? Rivers can be tidal far inshore. We want the definition to be as general as possible to be inclusive. D. Costa noted that in CA they sometimes define the "coastal zone" as watersheds. Not sure if this is what we want to do here, but want to make sure we recognize that this term could be interpreted in a variety of ways. M. McCammon agreed, and suggested that the committee could get a definition from OCM that includes watersheds, impacts to land, EEZ, etc. Or maybe the committee shouldn't choose a definition and should stay general and maybe leave things ambiguous.

B. Winokur agreed with being ambiguous. Does the current program do anything on the inshore part of the coast? If not, maybe don't bring it up. C. Gouldman responded that he did not know of assets far up rivers, but knew of assets in Chesapeake Bay for example. M. McCammon noted that water level sensors, beach erosion and access and beach closures, etc. include "inshore." D. Costa noted that salmon go way up into the watershed. In CA, most of the coastal zone was washed into the ocean from wildfires. The two are intimately connected. Best to keep ambiguous to include all. J. Read noted the collaboration between IOOS and NERRS in the tidal areas, and that collaborations in watersheds are served through the IOOS program. She suggests being as broad as possible to get as much out of it down the road as possible.

J. Virmani noted for the recommendation about "technology innovations for new tools and sensors" that there is also innovation in methods of delivery. Looking at inclusivity - might be new tools e.g., "TikTok." At the end of the recommendation, it says "improving the understanding and delivery of information" - if we're thinking of future-proofing this, we might want to add in something about "tools, sensors, and delivery mechanisms" to address this.

M. McCammon wondered if the "IOOS as a lead" recommendation and the "IOOS climate program manager" recommendations should be merged - IOOS should be designated as lead, and resources (including personnel) should be provided to manage/guide that effort. The latter just talks about having staff to implement what we'd like to have done in the former. B. Winokur suggested wordsmithing the "IOOS as a lead" recommendation to read "this requires establishing IOOS as a recognized leader." We could then work in "including providing resources to do so, including a program manager." S. Graves emphasized that it never hurts to explicitly say that we need funding.

K. Arzayus mentioned that there will be a chance for a last look next week as well for official

sign off. She wanted to make sure that all the hard thinking and decisions were made during this climate deliberation session. M. McCammon asked if the committee is sending just recommendations, or also detail in support of recommendations? K. Arzayus responded that it is up to the committee to decide how much detail to provide. She noted that the committee should make sure new recommendations don't repeat prior recommendations to avoid redundancy.

S. Graves noted that the committee did have recapitalization as a previous recommendation, but suggested that this is still a huge need. She asked for some guidance on this - if the committee feels really strongly, what should they do? M. McCammon suggested that they acknowledge that progress has been made, but express that the need is much greater than what was provided so this is still a huge issue of concern. B. Winokur suggested saying that the committee is reinforcing the recommendation made in the previous report, and explaining why it is being recommended again.

S. Rayder tied this back to strategic planning - you can't do science and operation without infrastructure. He noted that infrastructure is missing from the NOAA Strategic Plan. He expressed that he will be angry if infrastructure is not recognized as important for NOAA to business in the NOS Strategic Plan. He mentioned a hearing tomorrow on Capitol Hill where Steve (lead of NESDIS) is testifying - will he mention ocean observations? B. Winokur responded that it depends on what he's testifying about. D. Costa emphasized that the committee really needs to make the point that infrastructure hasn't been addressed enough, and that this is an ongoing problem that hasn't been addressed.

S. Rayder mentioned a comment C. Gouldman added to the chat indicating that NOAA mentions infrastructure 43 times in its NOAA strat plan. S. Rayder believes that infrastructure should be an explicit priority, and asked where the NOAA infrastructure plan is? NOAA has fallen back into "we have all this money, we don't need a plan." The committee needs a recommendation specifying the need for a coastal ocean observing PLAN. What is the plan that we're actually investing in? O. Schofield suggested that they put the infrastructure recommendation up front and write "Just like last year, we are putting this up front." He also suggested ending on the comment that C. Gouldman had - if you want to be a player in climate, you need to have a long term time series.

S. Rayder asked if there is a GANT chart for IOOS for how to tackle infrastructure needs? C. Gouldman responded that there are detailed unfunded requirements lists from each RA to address aging infrastructure from program to program, but that there is not a systems-wide architecture on ocean observing. B. Winokur asked S. Rayder - when you say "NOAA needs an infrastructure plan" - are you talking NOAA-wide or IOOS-specific? Do we want to get into this broader picture? S. Rayder responded that right now in the FY23 mark there is a big discussion about adding funding to satellites. He asked why we aren't having the conversation on how many satellites, vs. ocean observations, etc.? He suggested that we need to grow things together in a common architectural framework across ocean observations portfolio - want to see how IOOS, GOMO, NDBC fit together and interact. He suggested maybe adding a recommendation about creating a framework for these players to work together. Want these organizations to be aligned and not duplicate efforts. B. Winokur highlighted that the committee made a recommendation along those lines in the last report. S. Rayder noted that he doesn't want to see the same cycle repeat itself, e.g., Build expectations → community does a

lot of work to push things forward → the final product falls on deaf ears. The Weather Investment Act produced EPIC and other programs on the weather side. We need to figure out how we do this in the IOOS community.

M. McCammon suggested adding a recommendation asking the NOAA SAB to work with NOAA to develop a process for doing so? This would be implementable rather than leaving it in the hands of NOAA to do. B. Winokur responded that he doesn't know if the committee should be specific in telling NOAA how to do it. Sometimes the SAB is not organized well enough to take on large tasks, but can take on external people. M. McCammon clarified that it wouldn't be telling NOAA how to do it, but giving insights and recommendations into ways the coastal climate signal could be enhanced and developed. C. Gouldman agreed that the SAB should not be a specific recommendation. He suggested instead maybe some cross-talk between SAB working groups and this work? He noted that if you don't have infrastructure investments you can't do operational oceanography. D. West suggested that maybe S. Rayder gives a brief to the SAB on what IOOS AC is doing?

S. Rayder brought up the Environmental Information Services Working Group (EISWG) and asked how do you tie everything within NOAA together? Do you work with this FAC the SAB to do this? C. Gouldman replied that the Weather Research Act section that references IOOS directly tells the NWS to use data from IOOS where needed. They haven't done much on this. The committee could look at this and provide a recommendation about it. S. Rayder highlighted C. Anderson's comment that NESDIS has staff working exclusively on ecological forecasting initiatives with little interaction with NCCOS/IOOS.

K. Arzayus asked the committee about format - Do you want general introductory text followed by the recommendations, or do you want elaboration on each of the recommendations? M. McCammon suggested consistency across groups. B. Winokur suggested referencing the meeting with Dr. Spinrad - "following up on that meeting and set of conversations, here are a set of recommendations that follow up on Dr. Spinrad's request." He also suggested getting rid of lengthy discussion in each of the sections. M. McCammon noted that there are two recommendations that start with complete sentences, while others start with a verb, and suggested consistency there. S. Graves noted that it is not bad to start with verbs because it means action. But consistency is key. The urgency is probably in establishing enterprise within IOOS and NOAA so that the entity can carry out other recommendations listed here. M. McCammon noted that even though there has been some recapitalization and modernization of existing infrastructure, there are still huge gaps in the infrastructure system. We not only need to recapitalize what is existing, but also fill those gaps. O. Schofield responded that rather than "gap" it's an "opportunity!"

S. Graves wondered about whether the emphasis on the need for a program/person might cause NOAA to try and appoint this person before everything else? C. Gouldman replied that he did not think this was a risk to worry about. M. McCammon wondered if the "program manager" recommendation should be moved up the list to #2? B. Winokur asked if the last recommendation needs to be the first recommendation? IOOS as leader before everything else? M. McCammon replied yes, because even if there's no money for recapitalization, we still want NOAA to acknowledge IOOS as a leader.

K. Arzayus explained that for each PWG there will be 2 hours of discussion to finalize

recommendations. There is 15 minutes next week to look at all three sets of recommendations as a whole and finalize things, and we can build in extra time as needed. The google documents were distributed to the committee for offline work as well. C. Edwards noted that she already saw opportunities to tie recommendations together between the groups, and this is where numbered recommendations would come in handy. We need to come up with ways to cross-reference or discuss overlaps between documents. B. Winokur suggested keeping numbers for the time being and then taking them out before the final report is submitted.

The following recommendation was cut from the document, but was saved for the record:

“The IOOS Program Office should appoint a full-time coastal climate program manager to manage and guide aspects of collecting, integrating and dissemination data work with NOAA’s climate programs and the IOOC agencies to:

- Help guide the development of new coastal climate products
- Ensure RAs deliver robust climate quality variability
- Promote the integration of regional data streams into federal products and services
- Ensure ocean and coastal data is included and considered in the advancement of NOAA climate services
- Provide guidance to RAs on data needs / requirements of NOAA’s climate products and services
- Provide program management and coordination expertise to oversee IOOS’ “climate program” - bigger picture overview - NOT platform specific, but broader.”

New Blue Economy - Phase 1 Priority Wrap-Up and Discussion

Lead: Eoin Howlett - Vice President of Digital Products, Trinnex

- Lots of conversation about the themes listed on slides-- particularly about defining NBE and considering a more appropriate name. Eoin decided not to take the group in that direction, but this is important for maybe future consideration.
- Tech advancement, data management, data buys, etc.
- SG: clarify we are talking about the NOAA or the IOOS strategic plan? Will circle back
- **Topic 1: Tech advancement**
 - Had some conversations about the DARPA/ ARPA-E approach-- appealing, fast-moving approach for funding quickly-developing new technologies. Group interest in exploring that concept
 - OTT projects are fantastic, committee would continue to encourage expansion of that program
 - Proposed bill S.3866 - interesting in terms of innovation clusters-- but would be good to see IOOS closely involved in this type of activity.
 - Need to evaluate the RA business model
- DW: expanding the readiness levels: are you suggesting something different than what already exists?
 - EH: worth reviewing the performance of previous OTT projects, look at challenges, and think about what we can do to expand this program
- DC: We hear the analogy that we should “do things more like DARPA”-- who understands really how DARPA works? Once received a briefing on how DARPA actually works, and

involves a tremendous amount of oversight from the program manager. Curious how many people actually understand this.

- SG: And the adaptation of that into the NOAA environment is another thing
- EH: When I was interacting with DARPA, on some of their ocean projects-- sensors, reefs, -- program managers have a lot of autonomy and responsibility, but when I was interfacing with them I thought it was a great model.
- DC: Think it's a great model- at cutting edge of high risk high reward. There is a whole process of how they do their work, and a lot of us propose this model without really understanding them. I just think a lot of parts of NOAA would have trouble adjusting to this mode of functioning.
- EH: True, this would be a very significant change.
- BW: ARPA-E model might be better for NOAA than the DARPA model-- some differences in the approach
- CS: I think the two are actually more similar in structure
- CE: About OTT projects-- at levels 6 and higher, these are all pretty advanced projects on the scale. Gap on the "feeding into readiness level 6" side that a lot of data science can feed into, leveraging obs and data science. That data science level with NOAA and IOOS assets is a real gap we can recommend filling.
- EH: Just so I'm clear-- are you specific to the role of data science here?
- CE: Not specifically, I was trying to do a couple things in the idea of the NBE building on the role of data and knowledge in the blue economy. How we use the data and the economic value of the data used, and how they enable economic growth. Data science is the closest way to emphasize that but doesn't need to be restrictive.
- SR: The Hill wants to create another ARPA called "Basic Research ARPA". 10% success rate but that 10% changes the world. Some people think we are too comfortable with doing things-- when I think of the tech advancement, you want to fund some stuff that REALLY changes how we observe the ocean. Transformative. Revolutionary not evolutionary. It takes money and a different philosophy about R2O that is embedded across the gov't
- SY: Requesting clarification: be more specific about what is meant by "technology" here? To what extent does this overlap with climate recommendation for tech advancement?
 - EH: great point, can mean a lot of things. Broad sense: hardware, sensors, AI, hardware-- very broad, not limited.
 - SY: Is this an overlap with climate then?
 - EH: Probably, we will reconcile this
- BW: maybe reworded to new extramural funding model to be more similar to ONR? Very explicitly fund 6.1 research. Like gliders that came out of ONR and NSF partnership-- maybe rather than using DARPA there is another model for expanding extramural research similar to how DOD does it. DOD service agencies have a little more latitude than DARPA/ARPA-E. DOD Office of Technology Innovation-- not part of DARPA or ARPA-E.
- JV: Regarding the tech conversation: my understanding of NBE vs BE is the extraction of data from the ocean, without extracting from the ocean, which will require new technologies. This is the USE of new technology and I think this is where there is a tie-in to the climate WG. The use of new technology for marine life and a host of other things. Tech in the context of NBE has a double meaning for me-- not just growing the economy but using the new technology.

- DW: NOAA is an operational agency putting stuff into the field, not a basic research agency. You're supposed to grab that stuff out of ONR, NSF, whatever, and make a product for the public. NOAA needs to be careful about this.
- **Topic 2: Data management**
 - This conversation centered around the whole "federated vs. centralized" system with the national office and RAs.
 - Is it time to consider within IOOS a centralization of data services?
 - Benefits of this is management of 1 system not 11 systems-- allows for modernization, cloud migration and all those benefits
 - Will this help us measure the data flow - can we do a better job monitoring the use and value of that data
- OS: This is very interesting. For the climate group, centralization could be a key thing. Might consider a split hybrid model for things that are going to go into the GTS or NWS-- maybe that is centralized. But would still be nice for the RAs to have own laboratories for local stakeholders. Fear of losing the unique products for regional needs. Needs to strike a balance.
- BW: NOAA already has a centralized data management system - NCEI. We need to be careful how this is worded because the implication could be NCEI is not doing it's job and people are not putting their data into the appropriate data center/ data set. What is the relationship between RAs and NCEI? This should be examined.
- SG: Key of centralized/federated system question is stewardship-- helping people use the actual data.
- EH: I've always viewed NCEI as the archival solution, not the operational solution. NCEI doesn't have the capacity to take on all these types of data. But good to not duplicate efforts.
- SR: Who at NOAA does have the role of operationalizing data?
- CG: It's distributed-- CO-OPS, OCS, we do, etc-- EH is right that NCEI is archival.
- SR: Perhaps we want to recommend moving NODC into NOS to help with data archival and requirements.
- BW: NODC has been integrated into NCEI-- that will not go over well.
- SR: My issue here is that if you go into NOAA and are trying to find data, it's like a giant knot-- it's hard to find. Is the data architecture capable of meeting these needs going forward?
- BW: I get your point, that much of the data collected by NOAA is not usable and accessible and not being archived by NCEI so resides in the programs.
- SR: Isn't that important?
- EH: NCEI is not the right platform for real-time operational data.
- BW: I agree with that totally - what's missing in this recommendation is "real-time operational data"
- SR: Should we push this further and seek the establishment of a RT operational data center?
- DR: Very uncomfortable with centralizing everything - need to examine everything and see what works and what doesn't. Not personally comfortable with recommendation to create a new data centralized system.
- BW: Really need to distinguish between archival and operational.

- **Topic 3: Data buys:**

- SR: NOAA increasing use of data buys for years. In weather enterprise and NESDIS, there are data buy galores coming. Everyone is buying data. Talk within NOAA of a centralized office to manage data buys for the agency. Looking out 5-10 years, what if NOAA told IOOS RAs “hey, we are going to buy your data”. How would this work?
- MM: Concern with how data purchase agreements are set up. How many times can NOAA use? For what products? That is concern about data buys.
- In weather, WMO model: if you are a member of WMO, you must give your data out to the public. This has indeed been an issue.
- DW: But with public money, has to be made available.
- SR: Let me clarify: if you sell your money to NOAA and they distribute it for everyone, then you only have one customer. Different price points for usage ranging from publicly available, to internal use only.
- JV: Ocean is evolving and changing all the time, so data won't even be the same at different time points. Will always need to buy more to get the latest data.
- DC: agree this is complicated in how it all works. This is also relevant to NSF grantees-- grantees have access to data but cannot take data to other projects. Very complicated agreements and the data buys are all going to vary on the situation and partners.
- BW: Agree with Dan. Another example: C-WIPS program two pricing models depending on use.
- SR: In the case of TANDAR data, this was immediately ingested into weather models. But sometimes the government doesn't know what it's buying. This is a big issue, and it's coming faster than people see.
- CE: What's different about RT and thinking about data centralization issue? What's the purpose of the data buy? Is it for replacing an NDBC buoy, or a part of an RA, or part of a dedicated science project- those all have different needs and may need to be considered separately. The other issue that has come up in working with saildrone is the issue of risk, which is not insignificant. Who takes on risk, who does it benefit, and how that is set up in the data buys is critical to think of as well.
- BW: Quality control aspect as well. For RT still have to do quality control and review.
 - SR: Right-- radio occultation data provided by three companies, and is all QA/QC'ed
- Carl: Have we discussed the RAs as a data buy? We send them money to provide data and services to meet our mission needs. Difficulties with saildrone pricing model to figure out value of a day, wrt mission needs.
- DR: Agree with Carl. IOOS is in a sense buying data from the regions. See no reason why this couldn't happen thru a private company-- but needs to be similar cost of better. Can't do it for more money. Go with the group that provides the best value for the money.
- EH: Talking about transformations, data buys is one of those high impact things

- **Topic 4: Offshore wind:**

- Rich discussion around OSW, lots of momentum around this topic.

- IOOS should be the leader in the coordination of data exchange between the energy developers and the fed agencies
- IOOS and the RAs should be advisors for OSW development
- Model in the UK data exchange program-- should look to that as example of how to mature and develop
- MM: No one entity in charge, all of OSW is ad-hoc and confusing. From the RA perspective who have been involved, stakeholders need there to be better management. Regional Wildlife Science Collab is very good about sharing wildlife data but no coordination with ocean data, bathy, etc. Need stronger lead from ocean programs to help facilitate this effort and glad to see this here.
- OS: Agree with molly about IOOS being well-suited for integrated data products. Leases are often tied to the states for baselining, kickback of cost for the energy delivery for the company that makes them competitive in the state the lease is tied to. IOOS provides a huge group of users-- CA will be different from Northeast region. Molly is spot on about the importance of the integrated data products. Will be harder case to make to get money into RAs for more observations.
- DC: with CeNCOOS and SCCOOS - starting to look at this. Another comment- USCG plays a big role here too because in some places they have responsibility but not stepping up to the plate and delivering. We were really surprised at USGC's response on that.
- **Topic 5: Education, Citizen Science, and WF Devel.**
 - Need to promote the IOOS brand in being a leader providing data and content
 - CE: need to be teaching our students programming skills, IOOS should facilitate these pathways. Hard to find people to do the work we're doing.
 - DC: ATN-- get a lot of request from people who are looking at the tracking

 - BW: On the last bullet, how does that relate to Sea Grant? This is something we should look into
 - JV: any conversation as using IOOS as a training platform, so at-sea vocational development? Internship programs? Etc? This is an area where we can tie to the DE&I working group as well.
 - CG: Thank you Jyotika- that's a great thing we should be doing for experiential opportunities, technical work in the field, and to help with the work we need done on IOOS assets. CARICOOS does this every year with 10 students. We want to do more of this and we should and can. Other piece I wanted to comment on wrt Sea Grant is that this fits with what SG does-- they do extension and outreach in the field, but that's not a data-driven services program like IOOS, and we would work with SG to accomplish this.
 - BW: One term I haven't heard throughout this conversation is AI-- does it fit in or doesn't it?
 - EH: This is grouped within tech advancement, maybe worth pulling out specifically.
 - SG: I work a lot with AI stuff and it sort of pervades everything we've been discussing.
 - BW: Where did we leave the discussion on data buys?
 - MM: Confused about where we are with this group-- when are we looking at actual recommendations?

- SR: Let's do this now.
- DR: Uncomfortable with several of the recommendations, including the centralized system. We have not done any analysis that this is the way to go and would be better. Need to do the evaluation first.
- EH: Understood, but think this is worth looking at. This is worth an evaluation.
- CE: Centralized data centers we have now are successful because they are technology-specific (i.e. gliders, HFR)-- analyzing what has been done and then expanding to other techs is an intermediate step
- BW: two parts to this: real-time and archival. Need to separate these two components.
- DR: The overarching recommendation here is too leading in the wrong direction. What I think we really want to do is do an evaluation. That evaluation should not be pointed or biased toward a specific solution.
- JV: Quick comment on data management: lots going on with UN Ocean Decade. (missed the rest of this comment about applying machine learning)
 - EH: that's really an application, what would come after the data management and archival. What we're talking about now is at the core of how the data is collected and managed and stored. The use and access comes later.
- EH: Will re-write this section and then we can discuss further tomorrow.
- SR: Review and evaluation should include where is NOAA getting it's data from and how is that working?
- DR: On data buys, ARGO is not the right platform-- not aware of any U.S. data buys that are happening with ARGO.
- SR: Agree-- we have liquid robotics, mesonet, ect. Different offices buying data in different ways. NOAA not a science agency, it's an operational agency. NOAA has to make a forecast, count fish, etc. Data should be infused into that, and where NOAA can buy it to improve services, that it where we are investigating.
- SR: has NDBC been in touch with IOOS regarding the current technology bid? (no responses) this is telling. IOOS is more than a demo project, it's operational.
- DR: When this section is re-written, I want to make sure it's more about evaluating data buys than pushing in the direction of executing data buys.
- SR: I have the same concern with evaluation relating to OSW: Are we telling IOOS to engage in OSW or are we pushing for an evaluation?
 - EH: This one was challenging. This is the one that needs a little bit of work.
 - CE: one nuance worth keeping in mind is how this recommendation is implemented. If funding, then it puts more assets where OSW is being developed and may not align with IOOS priorities or be equitable.
- DR: General advice as this is re-written: the difference between this and the others is it goes more into the specifics of implementation and less about the topics that need to be addressed.
 - SR: There's a way to thread that needle.

Public Comment Period

K. Arzyus opened the public comment period. No public comments were provided so the comment period was closed.

Day 1 Adjourned

S. Rayder and K. Arzayus thanked everyone for their time and adjourned the Day 1 of the meeting.

DAY 2 - December 1, 2022 (Virtual)

Meeting welcome

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office and Scott Rayder, Chair, IOOS Advisory Committee

K. Arzayus welcomed everyone and thanked all participants for their time. She noted that NOAA appreciates the time and diligent work of the Committee in preparing for this meeting and for their forthcoming deliberations. K. Arzayus provided an overview of her role as the Designated Federal Official (DFO). As the DFO for this meeting, she serves as a liaison between the Committee and NOAA and the IOOC. She is responsible for ensuring all provisions of the Federal Advisory Committee Act (FACA) are met regarding the operations of the U.S. IOOS AC. She noted that a critical responsibility as DFO is to work with appropriate Agency officials to ensure that all appropriate ethics regulations are satisfied.

K. Arzayus noted that the objective of day 2 was to hear updates from the IOOC and IOOS Association and to continue to finalize phase 1 work plan recommendations to NOAA and the IOOC. Next week's sessions will focus on phase 2 of the work plan. Recommendations are an important outcome of the work of the Committee. The federal government tracks how many recommendations are generated and how many are implemented.

K. Arzayus reviewed the protocol for questions, public comments, meeting minutes and convened day 2 of the meeting.

S. Rayder thanked the committee for their robust feedback during day 1, as this is essential for formulating good recommendations. He also thanked E. Howlett for cleaning up the New Blue Economy recommendations following the discussion on day 1, which the committee will continue to work on and polish.

IOOC Update

Laura Lorenzoni, IOOC Co-Chair

L. Lorenzoni provided the update on behalf of the IOOC, and thanked N. Rome, K. Desai, and D. Legler for their support. The Advisory Committee provided a list of recommendations last year. One was about new task teams, in particular environmental justice and linking with potentially minority-serving institutions - this action is on-going. Another was a crosswalk between essential ocean variables and what IOOS has been measuring. IOOC's initial response was that this was being done through the BIO-ICE Task Team and we wanted to table this for now because we want to have the Bio-ICE Task Team report on lessons learned before conducting the crosswalk. The Bio-ICE report was just released about a week ago and is a great product. The committee also recommended linking OceanObs '19 and the Ocean Decade. The IOOC is actively working on this. The Ocean Studies Board put out a document that identifies some priorities for the Ocean Decade which align well with some of the OceanObs '19 priorities that were identified. IOOC's purview is ocean observations, so their priorities address those things. L. Lorenzoni is a co-chair for the Ocean Decade IWG and is working closely with them to make

sure the Ocean Decade reflects priorities that OceanObs '19 identified - funding for implementation has been the trickiest part. The committee also recommended the IOOC develop a list of IOOC accomplishments in the last decade and this was completed.

L. Lorenzoni shared some IOOC Activities underway. **BIO-ICE Task Team:** The IOOC is really proud to have the BIO-ICE report out. The BIO-ICE Task Team was sunset in January, after which the report underwent lots of iterations and reviews before its final release. We have a list of ocean Essential Variables (EV) that the Global Ocean Observing System (GOOS) put out during OceanObs '09, which are intended to take the pulse of the ocean in physics, biology, and biogeochemistry. We've had a hard time tracking what the implementation of these Essential Ocean Variables (EOVs) and Essential Biodiversity Variables (EBVs) are globally. We know that IOOS is taking many of these measurements, however the nomenclature is a little different. The goal of this group was to reconcile the IOOS core variables with the GOOS essential ocean and biodiversity variables to understand what we're measuring and what is the extent and what are the standards utilized across these groups. The second goal was to identify data flow pathways from measurements to whoever utilizes them. Is there a way that we can push forward best practices and data sharing? The group focused on two specific groups: corals and marine mammals, and two reports came out of this work. **Ocean Societal Indicators (OSI) Team:** Trying to expand between science that we're doing and link to society. One of the first steps for IOOC was establishing the Ocean Societal Indicators Task Team, which is looking to build a baseline of what kind of ocean variables do we have that are actually linked to societal and economic indicators. Group has put together a suite of indicators and are working on a synthesis report. We hope this contributes to new efforts underway for ecosystem accounting and links to social and economic issues.

L. Lorenzoni shared some upcoming activities/tasks teams. **Ocean Coastal Climate Signal:** Ocean-climate nexus has been at the forefront of this administration's interests (e.g., Ocean Climate Action Plan in development). This team is working with CLIVAR to do a workshop with the goal of stemming a task team from there. The goal is to use the workshop to narrow down some of the topics that are adequate and appropriate for IOOC to undertake together with their partners. **Open Data Science:** Goal is to bring together federal agencies that are working in the open data space (e.g., NASA) from methods to standards to coding to data. Trying to find gaps as independent agencies are investing independently in the open science realm and want the task team to come in and contribute something that is of interest to all agencies. Group is currently working to hone into the definition of the work they will be doing in order to really move forward the open science plans.

L. Lorenzoni asked if there were any questions. S. Graves thanked Laura for sharing the open data science, and is excited to follow the progress. L. Lorenzoni elaborated that the IOOC is trying to find something meaningful and gap-filling to help the agencies move their work forward. J. Virmani noted that there is work internationally through the Ocean Decade on open data sharing for industry, and Schmidt is also about to release a workshop report in Europe on academia. L. Lorenzoni replied that the IOOC is aware of the work that the Decade is doing but wasn't aware about the work with industry. The focus of the IOOC task team was initially focused on the federal family, but will eventually want to understand how this activity translates outside the federal government. J. Virmani offered to share links to the reports.

L. Lorenzoni reported on some IOOC Strategic Planning topics. **Ocean Climate Nexus Task Team:** Already mentioned this team and the relationship with CLIVAR as we try to put together a workshop to drive task team focus. **Coastal Resilience:** We've considered standing a task team but want to make sure the team has something meaningful to do. Coastal resilience lives in the SOST, different federal agencies, USGCRP linked coasts, White House team, etc. How can IOOC guide some of these activities around coastal resilience, considering the observing system array that our federal agencies already have as well as existing coastal resilience activities? Is there a way to identify areas of observations that we're missing in the dynamic coastal zones? Lots of interest from federal agencies, but want to raise the value of what the IOOC can bring. **New Technologies:** Ties back to priorities identified in OceanObs '19 of how can we develop new technologies that improve the way we observe and value the ocean? Lots of interest and ties back to activities that the administration and previous administration did with public-private partnerships. **Wind Energy and Arctic Observing Network:** A little further behind in planning but front and center in terms of Ocean Climate Action Plan that the administration is developing. Lots of interest in renewables. What can IOOC provide in terms of information so that when renewables are further developed, they are developed with the right information in hand? Same thing for Arctic Observing Network. There's already a lot of work ongoing, looking for areas of intersection to bring together and harmonize information coming back. This ties back to open science idea. With increased role and interest in Arctic, what role can the IOOC play to better coordinate the observing part of those activities. Working with the Arctic Observing Network to hone in and refine some of these thoughts.

L. Lorenzoni closed her presentation by announcing that Bob Hautmann is about to retire, and the new NSF co-chair for IOOC is Liza Clough. She also noted that observing and the work that IOOC does is relevant for other groups, such as USGCRP. One thing the IOOC started is having conversations with different IWGs within the USGCRP - the first conversation was with the Obs Group, who focuses on land, atmosphere, and aquatic environments, but a ton of synergies between the groups and looking for points of intersections and activities to leverage. Two more conversations are coming with the Carbon Cycle Group IWG and the Coasts IWG.

L. Lorenzoni thanked C. Anderson, M. McCammon, and C. Edwards for their comments in the chat - C. Anderson noted that there is a complementary Coastal Climate Working Group proposal to US CLIVAR led by Manu DiLornzo that she is the RA representative for, M. McCammon noted that most of the AOOS activities occur in the U.S. Arctic, and C. Edwards noted that for NSF connections for new technologies it would be worth expanding beyond the technology directorate, particularly Engineering and Computer and Information Science. L. Lorenzoni noted that when we think about technologists we think about more affordable instrumentation or down the lines of measuring and we seldom think of the computing power and that infrastructure. The IOOC will keep this in mind.

L. Lorenzoni thanked the committee for the feedback they provided to the IOOC.

S. Graves asked L. Lorenzoni to comment on her participation in COP in Egypt. L. Lorenzoni said it was very interesting getting to see the En-ROADS model for climate change which is a model based on IPCC science where you can tweak different parts of the model and see the impacts on expected warming of the planet. Interesting to see how little some of the nature-based solutions will impact our trajectory and the weight that the continued use of fossil fuels and deforestation have on warming. Everyone is looking for that silver bullet, but it's actually buckshot and it

needs to be a multi-pronged approach to climate mitigation. Also talked to folks that look at blue carbon and the manipulation of our ecosystems and how observations could better inform and provide the baseline science before any work. Responses from NGOs say that science is too late - need to implement something yesterday. Independent entities are going forward and trying to implement carbon mitigation solutions without having some of the science. We need to do a better job of communicating the science we already have to support those already implementing carbon mitigation strategies.

D. Costa commented that they have a paper coming out in TREE looking at the role of whales in the carbon cycle and an overview of what we do and do not know. L. Lorenzoni asked him to share that with her when it's available as this is a big question the IOOC is getting asked. They had some conversations on how we expand the footprint of our current observing systems into biology. We don't have a good grasp of biomass in the oceans so this is exciting to hear. D. Costa noted that the bigger the organism, the better it will be at putting carbon into tissue rather than CO₂, and so the irony is that we keep taking large organisms (tuna, whales, etc.) out of the environment that are best at contributing to long-term carbon storage.

S. Rayder asked at the next meeting if it would be possible to take a moment for Liza Clough to introduce herself to the committee.

IOOS Association Update

Kristen Yarincik, Executive Director, IOOS Association

K. Yarincik presented an overview from the IOOS Association. She thanked the committee for having her. She started her current role as executive director on October 17, but has been in the DC ocean community for over 20 years focusing on community engagement, building partnerships and ocean literacy adjacent to IOOS. She also thanked J. Quintrell for helping with the transition and sharing her experience.

K. Yarincik started with an update on recent IOOS Association Activities. **National Engagement:** Recently open request for information from OSTP to help inform development of the Ocean Climate Action Plan and the IOOS Association provided coordinated input against the questions posed in the RFI. The Association presented a letter to Dr. Spinrad describing the role of IOOS in coastal resilience and making a request for ways those funds could support the RAs. This letter was also shared with a few members of Congress. **Meetings:** K. Yarincik has been meeting with different folks to make introductions and build relationships. Gerhard Kuska, chair of the IOOS Association, came to DC a few weeks ago and they met with Nicole LeBoeuf (NOS AA), Kim Miller (OMB), and some congressional staff. All were supportive of IOOS and were interested in boosting the visibility of the success stories of IOOS. **Initiatives:** IOOS Association has recently formed a working group on Offshore Wind as it relates to observing - still working on scope for this group. The Association is also focused on promoting low cost sensors, and recently submitted two pan-regional LOIs (led by SECOORA): one on water level sensors to OAR and one on webcams to the IOOS Ocean Technology Transition program. The Association is working on Infrastructure and IRA communications and providing input around what the regions need. We participate in the NOS Roundtable about coastal programs, in the NAML Public Policy

committee to advance coastal program needs, and talking to the Coastal States Organization about a possible Capitol Hill “Coastal Week,” which would be a great opportunity for outreach.

K. Yarincik shared an overview of the IOOS Fall Meeting, which was hosted by CARICOOS in San Juan, Puerto Rico in November and was the first in-person regional meeting since COVID. This meeting included RA directors, operations managers, and outreach specialists, which created opportunities to discuss common needs, priorities, goals and challenges and we will continue to try to bring these groups across the regions together. Agenda had a lot of discussion around topics including the New Blue Economy, coastal resilience, and preparing ourselves for funding opportunities that might arise. The IOOS Association presented on some on-going pan regional opportunities including cross-regional efforts around gliders, Back-Yard Buoys (NANOOS, AOOS, PacIOOS), and low cost water level sensors, and how we scale these up efforts from regional to national levels. There was also a spotlight on CARICOOS highlighting their work and their fantastic public visibility. Puerto Rico Congresswomen Jenniffer Gonzalez-Colon (Co-Chair of the House Ocean Caucus) also provided remarks at the meeting and shared her support for CARICOOS and IOOS and long-term ocean observations.

K. Yarincik shared about the IOOS Diversity, Equity, Inclusion and Accessibility (DEIA) Session that was held at the IOOS Regional Meeting. The RAs reviewed DEIA mission and vision statements for IOOS, which might integrate well into the recommendations that the committee is drafting. We heard lightning talks on a few regional DEIA efforts including mentoring (SECOORA), co-production through the Backyard Buoys program (NANOOS, AOOS, PacIOOS), indigenous metadata considerations (GLOS), and community engagement audit (NERACOOS). DEIA next steps include looking at what the year 2 work plan might be for our DEIA Fellow, restructuring the DEIA Working Group, and considering a possible workshop possibly in conjunction with the Spring IOOS regional meeting.

K. Yarincik shared that the IOOS PO and NCCOS are funding the Association to support a community of practice between federal and non-federal representatives to discuss operational needs around harmful algal bloom (HAB) observing. Congress has funded HAB pilot projects over the last few years and those are continuing. This year with the funding for the community of practice we are supporting a webinar series that has been highly attended, and organized a special session at the International HAB Symposium around community engagement in NHABON. This work will continue at least for the next year.

K. Yarincik shared that the IOOS Association, working with the IOOS Advisory Committee, the IOOS PO, and the IOOC developed a whitepaper to articulate the ways that IOOS is already detecting the coastal climate signal. The fact that the committee is working this into their own recommendations is a great example of the enterprise coming together to advance priorities. L. Lorenzoni already mentioned the CLIVAR workshop that is under consideration to look at a plan for addressing the science needs in this regard, and the IOOC Task Team that would build on the outcomes of the workshop.

K. Yarincik discussed appropriations and congressional transitions, and thanked Emily Patrolia and her team at ESP Advisors for help with these slides. For FY23 appropriations, December 16 is the deadline to pass an omnibus or a continuing resolution (CR). In the House, there are 6 of 12 appropriations bills passed, and CJS has not yet been considered. The IOOS mark-up has \$44M in it (\$39.5M base + \$4.5M for HABs), which is \$3M above the FY22 enacted, and \$3.5M above the FY23 President’s Budget Request. In the senate there is a draft bill released, but republicans and democrats have not yet agreed on top-line numbers so the final numbers will

likely be lower. What's in there now is \$46M (\$42.5M base + \$3.5M for HABs), which is \$5M above FY22 enacted, \$5.5M above the FY23 President's Budget request, and \$2M above the House mark. The enacted figures have increased over the last few years but only slightly - not enough to keep up with inflation and the needs for operations and maintenance of observational assets. In FY23, the Association request jumped up significantly with \$50M for Core RA Support, \$20.3M for Infrastructure repair and modernization campaign (in year 1 of a 5-year campaign for "repair and prepare"), and \$5M for innovation and competitive grants.

K. Yarincik next discussed the infrastructure component of the IOOS Association's FY24 Request. This is still in development, but will take the total of the 1 and 2 year infrastructure funds and subtract that from the overall \$137M and then divide by 4 years instead of 5 years to come up with the new amount. Assuming no change or additional funds, the infrastructure component request to Congress will be \$25.5M for FY24. This would make the total IOOS Regional request for FY24 \$80.5M. Once we know what the actual FY24 BIL and IRA funds look like, we will be able to update our requests and plans.

K. Yarincik shared the results of the 2022 election for the 117th Congress. Republicans control the house, and democrats control the senate, but both are by slim margins. Things to expect include a lot of oversight in the House, gridlock except for extremely bipartisan measures, fighting over spending, republican climate policy leader (Garret Graves from LA) could be a potential champion, republicans likely to do away with proxy voting, and House offices will likely be fully open.

K. Yarincik shared committee leadership changes, which is happening right now. Party rules and processes for picking committee leaders include:

- After the election, each chamber's party leaders and steering groups vet, recommend, and vote on committee leadership picks; once the new Congress convenes, each full chamber begins formally voting on its assignments. In the Senate, committee leadership is determined based on seniority. In the House, seniority is only a factor.
- Republicans have long-standing term limits on their committee leadership roles. In the Senate, a GOP member can serve as chair for a maximum of six years or ranking member and then chairman for maximum of six years for each; accrued service does not need to be consecutive. In the House, rules limit GOP members to six consecutive years in a committee's leadership role, no matter if that time was spent as chair or ranking member. Waivers are possible, but rarely granted.
- Democrats in both chambers haven't placed restrictions on committee leadership service and generally defer to a colleague's seniority on the panel as a deciding factor. Since Republicans will control the House, the GOP may seek to alter tradition and propose that its term limit rules also apply to House Democrats, adopting a change like this would drastically alter Democratic assignments.

K. Yarincik shared that in Senate Appropriations, both leaders (Patrick Leahy D-Vt and Richard Shelby R-Ala) are retiring. Patty Murray (D-Wash) and Susan Collins (R-Maine) are the next by seniority. As far as we know, Shaheen (D-NH) and Moran (R-KS) could still be leaders on the CJS. For Senate Commerce, Maria Cantwell (WA) is likely to stay as top Democrat on the Commerce, Science, and Transportation Committee. Roger Wicker (R-MS) is likely to leave the committee to replace Jim Inhofe (R-OK) on Armed Services. Ted Cruz (TX) will take the lead Republican position as Ranking Member.

K. Yarincik shared that in House Science, Eddie Bernice Johnson (D-TX) is retiring, and Zoe Lofgren (CA) has expressed that she will seek this position in House Science. Frank Lucas (OK) is likely to stay on as the top Republican on the panel. For House Transportation, Peter DeFazio (OR) is retiring and Elenor Holmes Norton (DC) is the most senior Democrat on the committee, but her status as a delegate could factor into the race. The other contender is Rick Larsen (WA). Sam Graves (MO) is likely to stay on as the top Republican.

K. Yarincik announced that the 2020 Caraid Award was given to M. McCammon. This award is in honor of Ru Morrison, and represents care, love, and a spirit of collaboration and partnership across the IOOS community. Congratulations to Molly!

K. Yarincik shared some emerging issues and topics where the Advisory Committee may be able to assist the Enterprise and Association. A read ahead was provided to the committee that outlines what each of these areas are and a possible recommendation that might come out of these topics. These topics include offshore wind, interagency participation, inflation reduction act, low-cost sensors for coastal resilience, and the new House Committee chairs.

Committee Discussion:

B. Winokur asked whether the IOOS Association budget request is to NOAA or to the Hill? K. Yarincik replied that the Association lobbies on the Hill and is focused on the regional line for the IOOS budget.

B. Winokur asked if the Advisory Committee could see a copy of the Infrastructure Recapitalization Plan? M. McCammon replied that the committee saw this last year, but K. Yarincik offered to share it again. C. Gouldman also added that for BIL, the IOOS PO has just put our awards to the Grants Management Division within NOAA, so the PO will be working with the RAs to get that money out to the RAs. A summary of what will be funded with BIL funds will be written up soon.

S. Rayder asked to hear more about the webcam idea. K. Yarincik deferred to others. M. McCammon answered that low cost cameras are installed on the coast to help monitor coastal change. It requires some artificial intelligence to review the footage. SECOORA is using them to monitor coastal change. S. Rayder responded that in ~2012 we were using remote cameras to look at the weather signal that the doppler signal produced (Helios data). M. McCammon added that AOOS also uses it for sea ice monitoring and pilots use it for determining safe passage. C. Edwards also added that webcams can assist with rip current predictions. S. Rayder commented that there's a huge opportunity for IOOS to show their wares for ship transportation in the new Transportation Bill. Is CO-OPS aware of this capability within IOOS? C. Gouldman replied that they are. In the southeast, Greg Dusek has been working with SECOORA on the rip currents through a cooperative agreement with Surfline, where they are installing cameras on some of our HFRs. S. Rayder commented that this is a great story and asked if IOOS still has the agreement with Chevron in the Gulf where they're putting instrumentation on oil platforms. C. Gouldman responded that there are still some assets in place through BSEE with the oil and gas platforms and GCOOS is managing that data rather than the agency. S. Rayder expressed that this is a great success story to use on both sides of the aisle.

S. Rayder asked if the IOOS Association has considered liaising with other associations (e.g., the Southeastern Universities Research Association (SURA), American Meteorological Society, etc.) now that the Center for Ocean Leadership (COL) is gone? K. Yarincik responded that the NOS Roundtable is an opportunity for coalition and coordination within NOAA, but the Association is

also looking at other advocacy partners. D. West mentioned that there is a huge gap with COL shutting its doors and that there is a meeting later this month with COL former members to discuss how that gap will be filled. K. Yarincik added that it will probably need to be filled by multiple groups. D. West suggested this might take a while. S. Graves noted that the meeting next week is being held in the SURF conference room and suggested having the President say a few words to begin that dialogue. D. West noted that COL had many collaborations with SURF in the past.

J. Virmani asked what's happening with the UCAR COL that was established - are they maintaining some presence in DC? K. Yarincik responded that the only formal transition of activities from COL to UCAR is the transfer of grants and programs supported by those grants. They have said they will take on oceans within their advocacy. There were some feathers ruffled over how they announced their interest in joining the ocean advocacy realm. Not yet sure how they will fit into the broader ecosystem of ocean and coastal groups involved in advocacy. S. Rayder mentioned that Andy Rosenberg was named interim lead for our community programs. UCAR has an advantage with NCAR as a place they can draw overhead from. The Ocean Observing Initiative (OOI) was an attempt from the ocean community to build that capability in the 1990s, but it's also different. K. Yarincik explained that OOI was going to keep COL going, but ultimately our members didn't want us doing that anymore. D. West added that you don't want to pollute your advocacy. You want to keep it pure. You don't want to mix big programs with education and science. Until we figure out how things are going to re-settle, there will be a lot of baggage on everyone's agenda. We'll need someone to do ocean advocacy in DC. S. Rayder also mentioned that there is NOPP. Started building programs because people didn't pay. Core ocean leadership funds were expensive. That's where industrial partnerships came from. UCAR has different priorities. All 4 of the major oceanographic institutes are individually bigger than UCAR and NCAR. How do you balance competing interests?

S. Rayder asked whether the IOOS Association looks at NASA, NSF, Navy etc. or just NOAA? K. Yarincik replied that they have been largely focused on NOAA but are looking to expand. M. McCammon mentioned that they have reached out to others (NSF, USGS, EDA, BOEM, NASA etc.), and they always get started with great meetings but then there's not enough follow-up to get anything going. S. Rayder mentioned that the weather community seems to admire IOOS. M. McCammon mentioned that most regions have other agency connections at the regional level, but we still need help at the DC end. K. Yarincik added that we're hearing more about NOPP 2.0 and the new NOPP Program Office next week, which could help renew interagency interest in observations and IOOS. S. Rayder noted that we need a diverse stream of funds to really keep IOOS successful. Can we give recommendations on advocacy/education? K. Arzayus replied that it depends who the recommendations are for. M. McCammon suggested reaching out to new House chairs with an introductory letter from the committee describing the program - fine line between advocacy and education.

C. Gouldman expressed his excitement of K. Yarincik taking on her new role, and discussions between the IOOS PO and the IOOS Association have begun to make sure we're coordinated in understanding the battle rhythms between our two organizations and it's going great so far.

S. Rayder brought up the list of ideas on K. Yarincik's last slide and considered how these could be added to the committee's existing work plan. Interagency partnerships could fit under many categories, low-cost sensors could fit into DEIA. Where does offshore wind fit in - New Blue Economy? O. Schofield responded that offshore wind fits squarely under the New Blue

Economy. NSF and their convergence accelerator program has a bunch of New Blue Economy themes for big pots of money and some offshore wind ones. New tip directorate at NSF is directly there to catch that. Over time this will fit with climate just fine because platforms can hold instrumentation to collect long time series with.

S. Rayder also mentioned that offshore wind could potentially increase grid reliability by allowing for energy capture at night. Offshore wind allows IOOS to integrate itself with non-traditional partners in the near-shore that they might not think about. K. Yarincik wanted clarification on S. Rayder's comments on grid reliability. What she's hearing is that the incentive that energy companies or distributors have in the success of offshore wind which is ultimately linked to ocean condition information - how do we get new stakeholders invested in IOOS because we can help them be successful? S. Rayder brought up Xcel in the middle of the country and the fact that they are looking at the coast due to grid reliability issues. More people in coastal communities driving electric vehicles. How can we use offshore wind as a renewable source to put electrons in Teslas at night so we don't crash the grid? Is the electric vehicle economy going to make it if we can't charge them? B. Winokur asked if this is a government issue or is this an issue that the private sector power companies need to deal with? They're the ones providing the electricity. S. Rayder mentioned that the private sector power companies would benefit if they knew what IOOS had in different spaces to help them make better operational decisions. B. Winokur asked if this is an issue that DOE deals with? Some electric vehicle companies provide free charging. Murky in terms of who's in charge. Understand the point about reliability and that the offshore wind community could step into help by understanding variability of winds. Trying to figure out interagency as well as public-private sector relationships and coordination here. S. Rayder asked C. Gouldman about who would own this in the federal government in terms of integration of offshore winds to nearshore power grids? C. Gouldman replied DOE probably, but don't know for sure. B. Winokur asked if we have the same issue with wind farms on land? S. Rayder responded that there is a diurnal component on land, while wind farms offshore get energy at night. J. Morrell noted that there is an energy storage issue here that can't be avoided. By going offshore, you avoid the diurnal wind shift, which makes it more stable than solar energy where you need a lot of storage. S. Rayder agreed. The issue is that people are banking on offshore wind being a panacea for us. How can IOOS help maximize this capability? J. Morrell replied that IOOS can help right away with unique datasets on wind and modeling that has been in place for 20 years.

S. Rayder announced a break for lunch and thanked everyone for their participation in the morning session.

Diversity, Inclusion, Equity, and Accessibility - Phase 1 Priority Wrap-Up and Discussion

Lead: Jyotika Virmani, Executive Director, Schmidt Ocean Institute

J. Virmani presented on behalf of the Diversity, Inclusion, Equity and Accessibility (DEIA) PWG. She started by displaying a vision and mission statement portraying a view of where we'd like IOOS DEIA efforts to be in ~10 years. She noted that since the PWG came up with vision and mission statements, the IOOS RAs have reviewed these statements at the meeting in Puerto Rico and their feedback hasn't been incorporated yet, including that these statements should ensure there's two way communication between underrepresented communities and decision makers, should mention bringing people into community through capacity building and education, should emphasize community empowerment and involvement and decision making

especially through IOOS structure and governance, and should focus on internal efforts for IOOS to bolster DEI efforts within the enterprise

- Vision: To empower and ensure that communities, specifically including those who are underrepresented and underserved, have the local capacity, technology, and other resources they need to access information on the ocean, coastal, and Great Lakes to support lives and livelihoods.
- Mission: Engage with diverse communities so that, together with these communities we define and design observing systems to provide timely information, empower all to access the data and knowledge tailored to each regional community, provide decision support and to inform policy, and enhance stewardship of our oceans, Great Lakes, and coasts.

She then walked through their draft recommendations:

1. Expand support for DEIA activities within NOAA and the broader IOOS community.
 - a. Develop or expand NOAA programs to provide competitive grants and funding opportunities specifically for minority serving institutions leveraging STEM expertise, including internships and opportunities for sabbaticals and IPAs at NOAA or the IOOC agencies.
 - b. Establish a permanent IOOS DEIA fellowship program to work with the RAs, IOOS program office and stakeholders to identify and assess issues, identify opportunities, recommend improvements, and recommend new or expanded partnerships.
 - c. The IOOS Program Office, working with the Regional Associations, should develop an IOOS DEIA Strategic Plan and Implementation Plan for execution by the Program Office.
2. Develop and execute investment strategies in DEIA activities that will ultimately strengthen the new blue economy.
 - a. Conduct an assessment of barriers to and opportunities for DEIA, including workforce development, funding, R&D, technological innovation, observation systems and information access.
 - b. Assess how data sources, metrics and analytical methods can be used in decision making for investments in DEIA programs.
 - c. Develop and implement an investment strategy for DEIA efforts that could have the greatest impacts for DEIA elements, but especially underserved communities.
 - d. Where appropriate develop, expand, and implement partnerships with stakeholders and minority serving communities to foster technological innovation and inclusivity, including the IOOC agencies, academia, NGOs and the private sector
3. Gather knowledge and enhance access to information to increase diversity, equity, inclusivity, and accessibility in coastal ocean communities and programs.
 - a. Enhance program development and assessment by expanding stakeholder engagement and information gathering sessions with diverse and underserved

- groups and communities that rely on access to information and data from the ocean.
- b. Support the development and enhancement of networks to link communities, provide information and ensure access for communities that rely on knowledge from the ocean to guide decision making and sharing knowledge from and for the local and regional environment.
 - c. Find and connect to a centralized repository of knowledge that includes information on best practices, technology, observing systems, and training materials for DEIA, with a focus on underserved and underrepresented communities.
4. Increase coordination of DEIA activities across NOAA.
 - a. Work with other NOAA Line Offices and the IOOC to ensure coordination of DEIA initiatives, avoid duplication, focus, and maximize investments.
 - b. In coordination with other entities, convene a workshop on DEIA with representation from diverse groups, including scientists and technologists from diverse fields (including social scientists and students) from academia, government, industry.
 5. Endorsement: IOOS RA's DEIA Fellow's work, including tracking and maintaining close contact throughout the Fellowship.

B. Winokur added a disclaimer that their PWG did not do a deep dive with respect to everything going on at NOAA. "Enhancing coordination" across NOAA (NWS, Office of Education, other LOs, NOS, etc.) is important. In regards to the future workforce, a report by the NOAA SAB Weather Research Response found it impossible in the context of NWS to continue to hire people because they couldn't compete with the private sector. Another point that was made was the inability to find folks that have technical background to provide expertise that NWS needed, which demonstrated the necessity of working with the academic community to establish a pipeline to meet demands of the RAs and government. He wanted to emphasize that the PWG did not coordinate these recommendations with ongoing activities at NOAA.

Committee Discussion:

J. Read noted that twice yesterday there were recommendations about staffing. The DEIA PWG recommends continuing the fellowship, but if we had someone in this position for more than 2 years, do we want to harmonize our recommendations around personnel? J. Virmani responded that she thinks later in the meeting there will be a chance to harmonize across PWGs so that a cohesive set of recommendations is presented.

C. Edwards commented that in regards to a lack of pipeline, there could be an opportunity to develop a program larger than just a fellowship, e.g., the Significant Opportunities in Atmospheric Research and Science (SOAR) program through NCAR, which is a multiyear (up to 5 years) internship bridge from undergraduate to graduate for members of underrepresented

communities. Should we build a recommendation to develop a complementary group for marine sciences as well? S. Rayder thought this was a great idea, and thought that things could be worked inside of that as well.

S. Rayder asked if we have any data within IOOS or NOAA to baseline this so we can show improvement? K. Arzayus responded that she tried to do some of this. She looked at organization charts and then tried to get info through HR, who weren't willing to share it. She suggested that it might help if there was something from the committee. S. Rayder agreed that the committee should do this. He shared about a huge analysis in July 2008 about turning NOAA over - 30% retirement age and an opportunity to rebuild the workforce. We should figure out how to take advantage of this. Creatively what we want to ask in this space. O. Schofield agreed that this would be a great idea. The RAs consist of diverse communities involving lots of universities, where there's a big push to improve the diversity of graduate students. It might be effective to include those lower levels in that analysis as well. B. Winokur agreed that the committee should include a recommendation to NOAA and/or IOOC that they conduct a baseline survey, and maybe also work with AGU and MTS etc. because they might have already done some of this. S. Rayder mentioned that marine biology is the first PhD field with a women majority. O. Schofield noted that this is true, and that this issue is generally getting that gender distribution up to the senior levels.

B. Winokur noted that having worked in NOAA, DOD, and the Navy, he's found an organization like the NWS was more diverse than an organization with a concentration of oceanographers and acoustics. He suggested that in conducting a baseline might need both a broader baseline and also baselines for each discipline or organization. J. Virmani mentioned that there is a series of work within NSF tracking publications in different fields, and the report shows approximately 8% of graduate students are underrepresented in geological sciences, and 18% for marine science. S. Rayder suggested looking at the EPP program for how they conduct baselines, and maybe they can present to the committee? He thinks there is likely a success story that NOAA ought to track over time. He also noted in response to B. Winokur that he thinks of NWS as the least diverse group. C. Gouldman expressed that he thinks this work is so important and is a must do. He noted that we're in this for the long haul - we need to change pipelines, build skill, improve service delivery, etc. Metrics can be tricky because we can't always ask for this information. He suggested the committee be as specific as possible in your ask for D, E, I, A-specific metrics.

J. Morrell shared that a small, effective pipeline in Puerto Rico is the partnership between the NWS and undergraduates studying atmospheric physics. 4 undergraduates have done internships at CariCOOS and 2 are now in the NWS and another 2 are working in the U.S.. Could bring one of them to talk to the committee as well and tell their story. C. Gouldman agreed that this is a great story and example.

R. Perry agreed that everything talked about is great and good info. She cautioned that we need

to script the recommendations specifically to the IOOS enterprise, as there are so many aspects of this that NOAA is working on. The committee needs to be careful not to intersect efforts by making things too broad. Want it to land on receptive ears at the Dr. Spinrad level. J. Read agreed that the committee should focus their recommendations to specific parts of NOAA to determine where we can add value in IOOS. J. Virmani shared that the intent of this recommendation was to reduce duplication and replication.

M. McCammon noted that for other past recommendations we targeted whether they were going to IOOS, IOOC, or NOAA - what do we do with these? We have them binned by PWG right now but we might have different audiences within each PWG.

Wordsmithing of Recommendations:

S. Rayder noted that fewer recs with actionable moments can help. B. Winokur agreed, and noted that up front the committee should call out top 5 recommendations across all themes with a lengthier list below this. K. Arzayus commented that all the way up to GSA we have to track the number of recommendations and have to evaluate each year how many are fully implemented, partially implemented, etc. When they are broad, that gives us flexibility on what “fully” or “partially” implemented means, but makes it harder to track and report out on. Prefer more specific recommendations. J. Virmani asked if we are looking at all of the recommendations from the 3 PWGs to total 5-6? S. Rayder responded that the committee should not worry about that right now. Merging recommendations will be a helpful first step. K. Arzayus elaborated that it doesn't matter how many the committee has, however we don't want to overwhelm the system so the IOOS office likes fewer more specific recommendations.

Recommendation 1 - Expand support for DEIA activities within NOAA and the broader IOOS community.

J. Read mentioned that 1b is where the compromise on personnel capacity is to have a permanent fellowship program, but we could propose a permanent person whose role is to be this coordinator if we want uniformity across our recommendations. We could also add a new recommendation on the pipeline piece that could pull in this staffing recommendation too.

Recommendation 2 - Develop and execute investment strategies in DEIA activities that will ultimately strengthen the new blue economy.

J. Virmani suggested that determining baseline metrics fits within one of the 4 existing recommendations. B. Winokur agreed and suggested putting it under 2a. J. Read commented that she's not sure that doing that at our level is the right one, and suggested making that recommendation at the NOAA level. B. Winokur identified a conflict between making a broader recommendation and R. Perry's point about being too broad. It might be hard to come up with a baseline just within the IOOS community as we might not have those statistics. K. Arzayus clarified the committee is providing recommendations to NOAA and the IOOC on IOOS-related activities. The committee is advising interagency levels and the head of NOAA, but is bound within IOOS Enterprise and what we're doing within IOOS. J. Read suggested putting that recommendation at the IOOC level, higher than NOAA. B. Winokur suggested that this may speak to NOAA and IOOC because they are broad issues that cut across all agencies. K. Arzayus encouraged the committee to be specific about making this baseline assessment publicly available, as data might already exist but might not be shared.

B. Winokur suggested taking out “investment” in the recommendation 2 and adding “ocean observing community” before the “new blue economy.” He also suggested taking out “ultimately” to say “strengthen the IOOS Program, ocean observing community, and the new blue economy.” J. Virmani clarified that recommendation 2 was more targeted to increased investment for the new blue economy. B. Winokur suggested leaving the new blue economy in there to be cross-cutting.

B. Winokur asked if the committee wants the baseline to be publicly available so that it’s available to decision makers? J. Read replied that transparency is really important, which is why publicly available information is important.

Recommendation 3 - Gather knowledge and enhance access to information to increase diversity, equity, inclusivity, and accessibility in coastal ocean communities and programs.

S. Rayder asked whether “coastal ocean communities and programs” includes Sea Grant? B. Winokur clarified that this is broader than SeaGrant, but Sea Grant is definitely a target.

M. McCammon noted that this recommendation is more generic and less actionable. B. Winokur clarified that the intent was for a broader recommendation with specificity in sub-bullets. M. McCammon responded that the 3a and 3b are also generic. C. Gouldman mentioned that the IOOS PO values the more specific you can get, but is okay with a more general recommendation with more specificity in the sub-bullets.

J. Virmani asked whether the comment from the RA meeting on capturing “two way communication between underrepresented communities and IOOS” is captured here? M. McCammon responded that two way communication is part of co-production and co-design principles, and suggested adding “with a goal of Incorporating principles of co-production and collaborative science” to 3c.

J. Virmani noted that they avoided using the word co-design and instead used “design together,” as “co” is a perception that there are two or more separate groups working in parallel rather than working together. J. Read suggested saying “incorporate principles of collaborative science” instead.

M. McCammon noted that for 3b there are lots of networks through Sea Grant, RAs, etc. and asked what the thinking behind 3b was? She suggested making it more targeted - increase the linkages between/among NOAA’s existing networks and other agency sponsored networks. Looking for more specificity so you get a more definitive response from NOAA and IOOS. C. Edwards asked if this could be another “IOOS could play a leading role in...” recommendation to make it more specific? J. Virmani agreed that IOOS serves as an integrator. M. McCammon noted that there is networking with other NOAA programs that have stakeholder engagements - fisheries councils, NERRS, sea grant, RAs, etc. all have stakeholder networks but not necessarily networked together. C. Gouldman noted that it’s important to acknowledge the official role of the IOOS network because of legislation, etc. M. McCammon mentioned that IOOS is the only one in the statute that is mandated to work with the private sector. B. Winokur noted that “support” implies that IOOS is already doing something. Is that the right word, or is “designate” better? Does IOOS already have this role? M. McCammon responded that from the RA perspective, support is the right word, or “recognize” or “reinforce” because IOOS already has that role.

J. Virmani brought up two way communication and asked if the learning of communities back to IOOS is captured anywhere? Traditional knowledge incorporation, etc. is a missing element to

this one. M. McCammon noted that this is somewhat in the “collaborative science piece” of the recommendation but having those words there could be helpful.

Recommendation 4 - Increase coordination of DEIA activities across NOAA.

J. Virmani noted that this recommendation’s intent is to help IOOS avoid duplication to maximize investments. K. Arzayus asked why this is important for IOOS? J. Virmani responded that it is so we aren’t spending money replicating something that’s already happening within NOAA.

S. Rayder asked who is going to own this across enterprise at NOAA? J. Virmani asked C. Gouldman if there is anyone who is designated to oversee DEIA efforts across NOAA? R. Perry answered that the simple answer is yes. Not as straightforward as the intent of what we’re trying to do. The group sits in an internal area of NOAA, while we’re focused on more external. Maybe because of IOOS’s role, the external exchange of what NOAA is doing could sit within IOOS. J. Virmani suggested adding an extra bullet specifying “establish IOOS as NOAA’s coordination lead for DEIA activities across NOAA with diverse communities”? B. Winokur disagreed, saying that this is a broader NOAA issue and not a uniquely IOOS issue. He warned it might be too much for the IOOS Program Office to take on. Suggested instead: “Ensure coordination of DEIA activities across NOAA and with the broader IOOC community.” Need to be more specific about ocean observing. R. Perry agreed. Everyone has very little money and resources. J. Virmani asked about who would do this then? Do we need to make a recommendation about the entity that does this? B. Winokur asked if there is someone on the administrative staff, maybe the Office of Civil Rights, documenting broader activities across the agency? C. Gouldman noted that workforce development and hiring within NOAA has their own set of rules that we can’t influence much. We could put in language of leveraging and identifying success stories within IOOS, and finding opportunities to hire more people to help. In regards to service delivery, we need more capacity, social scientists, etc. In regards to workforce development, maybe we can ride the Office of Education’s coattails to link up the IOOS network with those efforts. M. McCammon suggested saying in 4b: “maximize investments and best practices (or lessons learned).”

C. Edwards noted that if the committee wants to keep things starting with verbs, there are two sub-bullets here starting with nouns. In 4a there’s talk about expanding support for DEIA activities, and in 4b there’s an action to publish a report - What we’re missing is whether or not we recommend pipeline-style programs. There’s a gap between what was in 4a and 4b that we might want to fill. J. Virmani asked if this fits into recommendation 1a? C. Edwards responded yes, maybe split it up into two sentences, and need to add in something explicitly about pipelines.

Public Comment Period

K. Arzayus opened the public comment period. No public comments were provided so the comment period was closed.

Meeting Wrap-Up

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office

J. Virmani suggested moving on from wordsmithing the DEIA recommendation and instead thinking about how we present all of these and how we merge across them. S. Rayder suggested not integrating across PWGs and instead keeping them in three packages. Staff will put these into the final form and send it out to the committee prior to the meeting next week. He'd like to get consensus that all of these would be put forward for recommendation. There won't be time for wordsmithing next week, as the committee needs to finalize, vote, and send the recommendations off. B. Winokur agreed that they should remain in three thematic groups.

J. Virmani suggested adding a cover note highlighting that these were Dr. Spinrad's priorities and that we tackled these three first would be good. S. Rayder noted that the IOOS PO can draft this cover letter, and suggested using this to pull Dr. Spinrad into our next public meeting: "we look forward to addressing this at our next meeting face to face."

S. Graves noted that the New Blue Economy PWG sent out revised recommendations this morning, and that she's still uneasy with some of these recommendations. She noted that the committee might need more time to deliberate on these recommendations. S. Rayder suggested trying to do as much work via email prior to next week's meeting as possible. C. Edwards and O. Schofield both suggested spending some time on it now, followed by email exchanges. S. Rayder noted that all final comments from the committee would be due by Monday at noon.

New Blue Economy working session:

Recommendation 1

B. Winokur suggested not including "DARPA/ARPA-E" and just saying "investigate new technologies." S. Rayder agreed with leaving this more general. D. Rudnick indicated confusion about what is intended here, and asked what "venture style" for an agency means? S. Rayder commented that he liked "venture style," but asked if there's other ideas on how to do this? He noted that OTAs are the rage right now, and that there are other ways that the government can move money in a more agile, efficient way. C. Edwards elaborated that the idea behind this was to bring in high-risk and high-reward opportunities. Including DARPA and AARPA is hard because of their large scales, but one way to retain the thought of high-risk high-reward would be to combine this with the bullet below. Funding or tracks with lower readiness levels could be examples of ways that IOOS could evaluate funding opportunities for programs that fit into these other categories that aren't long-term real-time observation networks. She advocated towards merging but noted that it would take the teeth out of what E. Howlett intended. E. Howlett noted that he liked the DARPA/AARPA stuff because it might help people understand these concepts, but noted that these recommendations might be focused more on implementation than they should be. "Venture style" organizations could be removed because of this. Ability to do disruptive funding without necessarily succeeding. D. Rudnick confirmed that taking out "venture style" would be helpful because he doesn't understand what that means, and suggests being more precise about what we're trying to do without buzz words. S. Rayder asked if the whole last sentence could be removed?

B. Winokur commented that he believes NOAA has authority now for OTAs, and noted that the committee might want to suggest expanding OTAs. He agreed with high-risk high-reward but

noted that NOAA doesn't have the budget to do this. Another point he suggested mentioning was to support technology incubators, but he didn't know if the government could do this.

E. Howlett changed the wording of the third sub-bullet to encourage collaboration based on the conversation yesterday around the difference between Sea Grant and NOAA. B. Winokur and D. Rudnick noted that their issue with this bullet is that he has no idea what the referenced bill is. S. Rayder recommended deleting this sub-bullet. J. Read suggested providing advice when the bill becomes enacted, and E. Howlett agreed.

Recommendation 2

E. Howlett noted that this recommendation was rewritten based on the conversation yesterday, and is recommending review of the current DMAC structure. C. Edwards noted that the committee also talked about the success of technology-specific things that integrate HFR, glider DACs, etc and role they've played, and whether we should consider them for other technologies - do we want to weave this in instead of saying "This organic growth has created a federated solution?" E. Howlett responded that he was trying to reduce specificity. J. Read recommended removing the word "may" because it could give an out. D. Rudnick agreed that the growth of DMAC has become a combination of a federation and centralized system. He suggested that it's a bit misleading to say it's only federated, but that it's fair to consider whether it's centralized enough. The way the recommendation is currently written is a bit misleading. J. Read noted that by ceding this recommendation with federated we're encouraging a direction to go in, and suggested taking out "organic growth" sentence to avoid this. E. Howlett agreed with this. C. Gouldman noted that it depends on which section of DMAC, as there are different parts of the value chain where this opinion might be different.

S. Rayder recommended sending around recommendations 3 and 4 to the committee and including a 30-minute discussion at the beginning of next week's meeting to finalize those. E. Howlett noted that recommendation 4 was updated based on R. Perry's comments but will need more time to review. S. Rayder noted that recommendation 5 could go into the DEIA recommendations, but wants to keep them separate for now. C. Gouldman noted that he added a comment to the OTT item, asking the committee to consider the audience of this recommendation.

Day 2 Adjourned

S. Rayder and K. Arzayus thanked everyone for their time. K. Arzayus confirmed that she will send out the running list of actions we've been pulling out from minutes as well in case there's other urgent things to cover, will send out a link to the New Blue Economy recommendations to make sure everyone has a chance to edit by Monday at noon ET, and will set aside time for final deliberation on the New Blue Economy recommendations. K Arzayus adjourned the Day 2 of the meeting.

DAY 3 - December 6, 2022 (In person)

Meeting Welcome and Administrative Updates

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office

K. Arzayus welcomed everyone to Day 3, in person for the first time since February 2020! She noted that NOAA appreciates the time and diligent work of the Committee in preparing for this meeting and for their forthcoming deliberations. K. Arzayus provided an overview of her role as the Designated Federal Official (DFO). As the DFO for this meeting, she serves as a liaison between the Committee and NOAA and the IOOC. She is responsible for ensuring all provisions of the Federal Advisory Committee Act (FACA) are met regarding the operations of the U.S. IOOS AC. She noted that a critical responsibility as DFO is to work with appropriate Agency officials to ensure that all appropriate ethics regulations are satisfied.

K. Arzayus noted that the objective for days 3-4 were to receive updates from subject matter experts related to the committee's phase 2 work plan priorities and to make progress toward developing recommendations to NOAA and the IOOC. Recommendations are an important outcome of the work of the Committee. The federal government tracks how many recommendations are generated and how many are implemented.

K. Arzayus reviewed the protocol for questions, public comments, meeting minutes and convened day 3 of the meeting.

Opening Remarks

Scott Rayder, Chair, U.S. IOOS Advisory Committee

S. Rayder thanked the committee for attending in person. He walked through the agenda for the day including more work time on the New Blue Economy recommendations, a working lunch not open to the public, phase 2 panels for marine life and enterprise excellence, and an opportunity to wrap up phase 1 recommendations at the end of the day.

S. Rayder also walked through the agenda for day 4, including a briefing on NOPP, a phase 2 panel on FY24 external review, and planning for the next meeting. He hopes the next meeting will be hosted by one of the RAs, and that Dr. Spinrad and potentially other members of Congress or OMB can attend.

Finalize New Blue Economy recommendations

S. Rayder expressed interest in more deliberations on offshore wind. E. Howlett noted that the recommendations document is pretty long, and that the introduction provides useful context but is long compared to other PWGs. He commented that there's a huge amount of data through the planning, permitting, and operating stages of offshore wind development, and that the consensus that the New Blue Economy PWG came to is that IOOS has been successful at integrating data from multiple stakeholders and could play valuable role for integrating data

generated through offshore wind. An example for data sharing is the agreement with Orsted. R. Perry added that the #1 thing mentioned across ocean stakeholder communities is that relationships should be set up with industry earlier. We did not have this discussion in IOOS. For the oil and gas industry there are great examples in the Gulf of Mexico and Alaska - it would be helpful to get lessons learned on setting up structures early. Some things have spun up ad hoc in the offshore wind industry, but it would be good to strengthen this with partnerships with BOEM, etc. to get IOOS cemented early. That's why we added more context to this section. This might apply to other industries in the New Blue Economy space, e.g. shipping. Orsted worked across NOAA, why are we doing this with one developer and not the whole industry? A lot of one-offs happening, how do we centralize this.

S. Rayder asked why the Orsted agreement is a unique template? R. Perry responded that Orsted was effective in building relationships early, and other industries are playing catch-up. She also noted some political motivation to get the Orsted agreement done first. C. Gouldman agreed that this model should be applied to more companies. R. Perry clarified that NOAA was approached at a political level, and some folks were working with specific regions. S. Rayder asked if the committee wants to change the recommendation to make the Orsted template available to others? M. McCammon noted that just because the model is available doesn't mean it will be used. Instead, we might want to write a recommendation from the committee that this model is required somehow. E. Howlett noted that something like this would originate from BOEM. R. Perry clarified that yes, if it's in the regulatory context under which the offshore wind industry is regulated, this is under the Environmental Policy Act, but that there's motivation to develop stakeholder relationships beyond BOEM. Developing offshore wind partnerships under the climate umbrella gives data more utility than if it's just for regulatory purposes. Offshore wind collecting data for baselining, NEPA, technology and engineering design while projects are out, etc. European developers are learning the utility of data beyond the private context - NOAA IOOS is a non-regulatory entity that is serving a broad stakeholder enterprise. Environmental data, metocean buoys, etc. can be integrated into the MBON concept, etc. pretty seamlessly.

M. McCammon reiterated making this a requirement in some way, maybe through BOEM regulatory since BOEM is a partner agency for IOOS. Even though its mission might be more narrow, it could have greater utility through IOOS. E. Howlett suggested rewriting to: "Recommend IOOS collaborate with BOEM on a data sharing process." R. Perry suggested a combination of both. Go the route for regulatory integration of data into the government enterprise, and to support broader NOAA missions. That's the hook so that you can get developers to do early integration before regulation is required. C. Gouldman agreed and suggested adding a hook with a wind turbine interference angle. B. Zelenke clarified that wind turbines confuse HFRs, and that you need supplementary in situ data (surface current and wave data) to make full corrections through mitigation software. IOOS is working with BOEM to get this data. The effort would be strengthened if it is written as an annex to the existing MOU that NOAA has with BOEM. S. Rayder suggested this language be added to the first sub-bullet.

D. West mentioned that the National Academies finished a study on HF Radar and wind farms. S. Rayder suggested obtaining a copy and footnoting it in the recommendations.

Phase 2: Marine Life Program Panel

Panelists: Gabrielle Canonico (U.S. IOOS Office), Roger Griffis (National Marine Fisheries Service), Mitchell Tartt (Office of National Marine Sanctuaries), Clarissa Anderson (SCCOOS)

Gabrielle Canonico - Marine Life Program Overview

G. Canonico gave an overview on the Marine Life Program in the IOOS PO. The way we're thinking about a Marine Life Program in IOOS extends all our partners, interagency, RAs, etc. and includes providing access to marine life observations, data and information products for management, forecasting and decision-making towards resilience and stability of living marine resources and human communities in the face of change. Defining marine life observations as direct measures of species. IOOS is committed to the GOOS biological variables as a guiding set of variables that we are or could be observing. We also acknowledge that physics, chemistry, biogeochemistry is integral to look at and forecast trends in biology.

G. Canonico shared key questions driving the work conducted with partners, including: What natural changes are occurring? What coastal and offshore activities are planned? What are the impacts on marine life? What data are needed for models and projections? What information products are needed to inform decisions? For marine life we could be looking at aggregations of animals, diversity, abundance, movement, response to stressors, etc. Some active networks that IOOS has leadership of are the Marine Biodiversity Observation Network (MBON) and Animal Telemetry Network (ATN). There are also global connections through GOOS, UN Ocean Decade including the 2030 Marine Life Program.

G. Canonico shared stakeholder requirements and things that IOOS is engaging on to some level. Very engaged across NOS around questions of place-based management and how we answer questions posed by sanctuaries managers or NERRS about the status of marine life in those systems. Related to that is work with NMFS on ecosystem-based management including work on ecosystem assessment programs. Receiving some indications from White House level about the need for marine life observations to inform climate discussion on impacts and adaptation, so we're engaged inside NOAA and with interagency partners around some projects specific to that. Also working with BOEM/DOE on the niche for biology within the renewable energy space.

G. Canonico shared the current state of the Marine Life Program, including strong interagency engagement (e.g., NOPP), MBON, ATN, Sanctuary Sound Monitoring Program (documents soundscapes across a number sanctuaries), SanctuaryWatch (collecting web-enabled products to assess status of marine resources in a given site), advancing biological data standards and data access (including Biological data mobilization workshops), IOOS RA products, and global activities.

G. Canonico shared some examples of SOST-level coordination, including the IOOC "Biology: Integrating Core to Essential Variables" Task Team, which tried to reconcile core variables across IOOS and GOOS and looked at data flow for marine mammals and tropical corals, and the SOST Biodiversity Interagency Working Group, which G. Canonico co-chairs with NASA and BOEM where they've established an eDNA Task Team and are drafting a National eDNA strategy.

G. Canonico shared a snapshot of the NOPP Marine Life Partnership especially advancing MBON activities averaging \$3M per year since 2014 with interagency and industry engagement. Most recently, 5 new awards were announced and more will hopefully be added in FY23. Latest round of projects continues to make efforts to bring strong input from the RAs to link together the

different tracks along which IOOS has been assessing marine life. A new focus is “real-world” applications of the data.

G. Canonico discussed priorities from stakeholders that are being addressed through MBON, ATN, RA activities, etc including fisheries, needs for climate modeling projections, and relevance to conservation.

G. Canonico discussed the IOOS niche that exists in these activities. We recognize that marine life observations represent a significant gap in our program, and we haven’t had deep investment from an appropriations point of view. We have built strong partnerships with funding agencies, including across NOAA programs bringing resources to address challenges and fill gaps (including resource management and forecasts and modeling). Our niche is also around coordination and delivery of those data either as raw data or through data synthesis and creating data products. Defining requirements with partners - What are the questions that partners are asking to meet their mandates for management or regulation, and how might we prioritize the collection of marine life observations and the development of products following that?

G. Canonico highlighted input that the IOOS PO may need from the Advisory Committee including how we can effectively grow IOOS capacity to delivery marine life products and recognizing the breadth of groups that are expressing a demand for data and products, use of emerging technologies to meet prioritized requirements, and how can we bring IOOS better into the dialogue as a resource for marine life data and information about standardized data sources.

Questions:

S. Rayder asked if the marine census story has been told well? K. Yarincik responded that we have been telling it, maybe not to the right people, and suggested a focus on spreading the message broader.

S. Rayder asked if you can see a taking under Endangered Species Act (ESA) with IOOS observations? G. Canonico responded that you can collect contextual environmental information and associate it with the animal movement, but she’s not sure if this has been applied to ESA regulatory oversight. D. Costa noted that CeNCOOS has been talking about doing that with crab fishery entanglements with humpback whales, and that other regions are talking about it as well. G. Canonico noted that this is also showing up in right whale dialogues. T. Curtis also noted that MBON and other IOOS products are used commonly in status reviews for species for ESA, and that there could be a stronger linkage there but there is a relationship. J. Biggs requested to PLEASE not do that - the Protected Species Division (NMFS) already has enough power to kick people around. When you look at current regulations, it really hampers tribal subsistence hunting/fishing. G. Kuska clarified that RAs generally have focused on tools to help avoid takes, not to help enforce restrictions on takes. IOOS has taken the angle of supporting regulations but not from an enforcement angle.

Roger Griffis - Advancing Climate Ready Resource Management

R. Griffis presented on the Climate Ecosystem and Fisheries Initiative (CEFI), which is a NOAA priority. How can IOOS join with the rest of NOAA to help advance climate ready resource management? Ocean decision makers are facing major challenges as the world and oceans change. These changes are happening over long time frames and punctuated by extreme events. The impacts are real - we’re seeing changing habitats, shifting species distributions,

changing productivity and abundance, and changing ocean uses. Action is needed now for effective response. NMFS has been wrestling with this for 2 decades, especially since they came out with their Climate Strategy in 2015. This said that we need to move forward to meet key information gaps and capacity gaps in key areas including what is changing, why is it changing, how will it change, and how to respond? CEFI was developed to identify most critical gaps and needs and how to best respond.

R. Griffis shared some major barriers that CEFI was designed to address. The current barriers include no regular delivery of ocean forecasts and projections, weak observation systems to track and project change, no operational system to produce ecosystem scenarios, risk assessments and management advice, low capacity to use climate-informed advice to reduce risks and increase resilience, and weak planning for extreme events and longer term changes. With CEFI, we hope to have regular delivery of robust ocean forecasts and projections, improved observations systems to track and project change, operational delivery of ecosystem scenarios, risk assessments and best management options, high capacity to use climate-informed advice to reduce risks and increase resilience, and improved planning for extreme events and longer term changes.

R. Griffis described that CEFI is designed as an end-to-end decision support system for climate-ready decision making for living marine resources in NOAA and our partners. It is designed intentionally as a cross-NOAA effort to provide climate-informed advice and increased capacity for effective resource management. It leverages existing NOAA investments in research modeling, observations and decision-making. And it is an end-to-end decision support system addressing four core requirements: 1) reliable delivery of robust ocean forecasts and projections; 2) operational production of climate-informed ecosystem projections, risk assessments and adaptation strategies; 3) decision maker capacity to use climate advice; and 4) targeted observations and research for continuous innovation.

R. Griffis showed a graphic describing the end-to-end CEFI system from climate and ocean projections on multiple time scales, that then are accessible and served via an information hub, that then are drawn into an ecosystem context through decision support teams and turned into the advice we need for marine living resource management, and then fed to the regulatory side for decision making with increased capacity for them to use it. Can also look at this like a feedback loop that operates top down and bottom up. Targeted research and observations supports all of this.

R. Griffis emphasized that NOAA needs to provide robust ocean outlooks across time and space from extreme events to the longer-term changes. How can we build on the existing NOAA-based ocean predictions and forecasting systems to better deliver the information that living marine resource managers need? Regional ocean prediction capacity from seasons to centuries is built from OAR's Modular Ocean Model 6 (MOM6). Regional Ocean Modeling Teams customize products for NMFS and other users. CEFI Information Portal provides national data standards and efficient access.

R. Griffis described that these decision support teams are designed to be expert teams at NMFS Science Centers. Idea is to create a small core capacity to fill a key gap in our ability to take climate and ocean information and turn it into advice on fishery management. This is currently on a research basis, not an operational basis. We need to drop core capacity into our fisheries science centers that can enable the use of ocean projections, turning that into ecosystem and

stock projections, and then using the normal pathways to then turn that into the advice that we give in the normal process to fisheries managers and other folks.

R. Griffis summarized with 4 messages: 1) Climate-ready resource stewardship is the challenge of our time; 2) CEFI is designed to provide advice for climate-informed decision making; 3) Expanded observations, modeling, and product development critical to CEFI implementation and overall success; and 4) IOOS regional frameworks and expertise can play key roles including must needed information on marine life, such as changes in species distributions, phenology and productivity, changes in ecosystem structure and function (indicators), where are the key gaps in existing observations and how do we fill them, how to use advanced technologies for improved performance, and how to collaborate to build the marine life observation system we need for climate-ready resource management.

Questions:

D. Costa mentioned that several fisheries science centers are making tremendous inroads on specific regional questions -- are you making the case for making this broadly operational across the board? Also, "Census of marine life" did a great job but the problem is that a lot of that data is old and there have been no studies to replace it-- lots of data used to build ecosystem maps is out of date. So along with everything else you're saying, filling these gaps is absolutely critical. The environment is changing -- you're right on target and I couldn't be more excited about what you're talking about, but we need the empirical data to feed these models.

M. McCammon mentioned that the SAB just submitted a report on this issue and the fact that we need more emphasis on managing under uncertainty. Change is erratic now and it's more difficult to manage stocks. End users need to be engaged earlier in the process, and we need more social science about how users actually use information, and to show where the disconnect is-- the human component needs to be emphasized. Also want to think about how to incorporate indigenous knowledge into this. How can IOOS be key to all this? Sometimes there can be some territorial sense about their mission space... it would be helpful to have a directive, something from the top-down to direct NMFS to work with IOOS. More leadership direction to work together on these issues is important.

R. Griffis thanked M. McCammon for her work on the Advisory Committee and the SAB. In regards to social science, he didn't flag it here but one of the key features is how to connect with social/human dimensions like fisheries management councils. The CEFI system very intentionally has that human side built into modeling questions.

J. Biggs noted that where R. Griffis works, the end product is management/regulation. One of my goals here is to beg for equity. In terms of forecasting, I'm not thinking as much about regulations as I am in terms of changing distribution and management impacts. Paper on expansion of Papahānaumokuākea - spillover of highly migratory species - these management decisions that expand protected areas and no-fishing zones and my fear is that these aren't actually improving stocks in the broader range of migratory species (in this example, across the Pacific). We need to look at the biomass in the ocean in order to manage anything in perpetuity. It's important to look at where species are going to be in the future. Timing of where fish come in and what size they are make us concerned about the future. Forecasting needs to inform fisheries as well as regulations-- ensure food security.

O. Schofield mentioned that they have all these decade-old datasets, and wondered if we could consolidate these for the forecast application of having test cases: can we bring together

communities to run tests to see if we can reproduce the past observations and produce confidence in the forecast ability? R. Griffis responded that absolutely, hindcasting is absolutely critical. S. Rayner mentioned that this is the kind of recommendation we can make to the IOOC to bring all the federal data to help the NMFS mission.

S. Rayder asked how much money is going into CEFI across NOAA? If you had a budget line item, where would it sit? R. Griffis responded that it has been in the President's Budget for two years - \$10M for each NMFS, OAR, NOS in FY22. Need to get back to the committee on the total cost of the initiative.

S. Rayder noted that long term continuous observations are the hardest thing to get money for, and asked if NMFS has a requirements management process that IOOS can plug into? R. Griffis rescinded that he needs to get back to the committee in regards to a requirements document-- NMFS is currently looking at its observational assets but IOOS should absolutely be involved in that process.

Mitchell Tartt - Office of National Marine Sanctuaries

M. Tartt presented on behalf of the Office of National Marine Sanctuaries. Our office tries to bridge the gap between science and management. The NOAA mission of science, service, and stewardship is fundamental to how we frame our thinking. How do we benefit, take NOAA Enterprise, NOAA resources to impact the lives and livelihoods of people and the stewardship of resources that they care about. For Sanctuaries, our core values include community, conservation, collaboration, respect, creativity, accountability, and teamwork. Our mandates include resource protection, education and outreach, research and monitoring, and community engagement. Research and monitoring is key for the other three, and fundamental to this is marine life.

M. Tartt showed a map of the Sanctuaries programs - 620,000 sq miles of protected area, 15 marine protected areas with 3 designation/expansion processes in progress, some recently designated sites in the Great Lakes as well as on the east coast. These encompass diverse ecosystems and people - the issues they face are very different across the nation. The information on marine life and other observational data from IOOS is critical to help us meet these marks. We work with resource management and policy makers including federal, tribal, state and local governments, advisory council working groups, and NGOs. We also work with scientists from academic, government, and NGO backgrounds and local, regional, national, and international scales. We also interface with teachers, students, and engaged communities through education and outreach. ONMS also has advisory councils with representatives across many sectors.

M. Tartt shared some system-wide issues of concern, including climate change and ocean acidification, soundscapes and noise impacts, biodiversity loss, vessel strikes and vessel traffic management, water quality and contamination, connectivity - tracking movement and site fidelity, invasive species, fishing impacts, and energy development. Marine life data is crucial for tackling these issues.

M. Tartt discussed some recent work. Sanctuary Condition reports, which are status and trends assessments of resources, the pressures that impact those resources, and the ecosystem trends provided by those resources to us. These reports are fundamental to our management plans. One project where we've been making great strides in partnership with IOOS is Sanctuary Watch (launching later this month), which is a tool that is web-enabling information that can be

used for decision making. This increases awareness, ability for the public to engage, and increases governmental transparency.

M. Tartt emphasized that if ONMS is the end user, they need to be involved in the beginning to help define the question that should be asked before they collect the data. The co-design perspective is important - managers, technical experts, product developers, and science translators need to work together from the beginning to define the problem, make data collection and analysis decisions, etc.

M. Tartt closed with some parting thoughts on integration and initiatives for change. Opportunities coming to increase community engagement with NOAA and ONMS processes, informing advisory council and external engagement, informing conservation policy and regulation. Interagency consultations are critical for us and are dependent on marine life data. Increased protection (expansion, designation, and change) can only come about with data to inform those changes. Governmental transparency is so important - how decisions are made and what information is used to make those decisions needs to be publicly available, and marine life needs to be part of that portfolio.

Questions:

D. Costa noted that what M. Tartt proposed is right on target-- the ability to co-create efforts requires a lot of handshaking. On the West Coast, he doesn't see that happening but agrees that's where we need to be. As a researcher, most of his experiences with Sanctuaries have been about regulating the science that we do rather than facilitating the research-- we need this to come into play more often and figure out how to work together better. M. Tartt responded that when he hears "regulations" he often hears "permitting" which can be a difficult conversation and process. One thing he wants to stress is that when we work better together, there is a big benefit to increasing understanding, collaboration, so it is often worth the pain to go through the process. D. Costa clarified that he works on marine mammals, so he deals with MMPA, ESA, it's a lot to ask to have folks also jump through ONMS permitting as well. M. Tartt agreed that there are ways to increase efficiency here.

R. Perry asked (from a private energy industry perspective) how do you use IOOS to modernize how we designate or balance use within sanctuaries? Many changes and evolutions in NOAA due to a variety of drivers-- how do we modernize the approach? M. Tartt responded that ONMS is not the National Park Service - we want to have the capacity for long term multiple uses, including consumption. Need to ensure the data is continually modernized-- that's having the latest and best data, and best analytical tools and approaches. We then try to facilitate the decision making. For IOOS, the quality of the data is what is most important for us-- current, accurate, and at the right scale data is important, and this needs to be identified at the beginning with users. Modernizing how we ask the questions and how we collect the data is where I think we need to focus. R. Perry noted that for risk acceptance strategies, data is the way to effectively evaluate risk. M. Tartt agreed and noted that this is a big topic with NGO communities as well.

M. McCammon asked if there is an effort among ONMS, NERRS, MPAs to connect data collection and ensure data are interoperable? M. Tartt confirmed that is 100% happening, and noted that there is a role for IOOS here. The condition reports are "a book written by many authors". Representatives across government, tribal, etc. - anyone with information they can provide about a place is invited to participate in creating condition reports. IOOS can help facilitate and standardize inputs and work with communities to help grow that understanding.

ONMS and IOOS work with other programs within NOAA as well on challenging issues where we all bring something to the table for condition reports.

R. Perry mentioned that co-users are missing and asked if there is an opportunity to bring in others like industry? M. Tartt responded yes.

C. Edwards mentioned that they have been participating with Grey's Reef Condition Report, and that the request is for heavily processed and averaged data. As part of this, there needs to be a thought towards what products are actually useful and what role IOOS can play.

Clarissa Anderson - Towards a next-generation coastal ocean observing network for ecosystem (and Marine Life) monitoring and prediction

C. Anderson presented the RA perspective on marine life. The message she wanted to convey today was thinking about ecosystem predictability through a West Coast lens, with end users giving the impetus to think long-term and short-term to meet user needs. Useful to think about the different components of the earth system, how they relate, fluxes between them, the processes that connect them, etc. C. Anderson worked on the Ecosystem Health and Biodiversity Task Team at OceanObs '19 where a focus was how to take the work happening at global to ocean scales that is happening on the earth system science side, and make sure we are meeting societal needs? To make oceanography more relevant to policy, management, and decision making by better understanding what we can and can't forecast, and what needs improvement. The modeling community needs to be part of this information service delivery mechanism that is talked about so much at NOAA - you can't do one without the other.

C. Anderson highlighted a few products that are being actively worked on at the SCCOOS, CeNCOOS, and pan regional level. The MPA dashboard has been an incredibly collaborative effort to bring together all kinds of data from ecologists, climate modelers, etc. into an incredibly useful portal where we can talk about these vulnerabilities to biodiversity in the future. One product of many that gets us towards understanding marine life from the IOOS perspective. We're also establishing things like the Imaging FlowCytobot (IFCB) dashboard and the OAH dashboard for shellfish growers. All incredibly collaborative and important.

C. Anderson discussed the success stories of MBON including satellite-driven views and Dynamic SeaScapes, eDNA monitoring, biodiversity, etc. IOOS, CeNCOOS and others are incredibly involved in creating Sanctuary Reports. This relationship has led to better product development and moving data into those products - and MBON has been a big part of that success. How do we strategize on taking that knowledge at these demonstration sites through MBON and getting them into a bigger vision of a build-out plan for biological observing.

C. Anderson emphasized that the RAs are not siloed in terms of marine life, especially on the West Coast. There is a lot of leverage and power in doing work together across the RAs. The RAs have collaborated on product development as well as through workshops with large stakeholder participation. In CA, SCCOOS and CeNCOOS partner together regularly in a strategic fashion to link marine life observations. C. Anderson showed a list of 20 collaborative projects in CA - 13 of these are co-funded by SCCOOS and CeNCOOS, and 8 involve marine life and aren't specifically connected to MBON funding. She highlighted the Underwater Glider Network, which is a collaboration across SCCOOS, CeNCOOS, and NANOOS, and has taught them a ton about ecosystem prediction and how this feeds into models in terms of state space estimates, etc. New efforts involve adding biogeochemical sensors onto the gliders, recapitalizing the next generation of gliders and including lots of plankton cameras to capture things more holistically.

C. Anderson shared that they are wrapping up a Coastal Ocean Modeling Testbed project to think about ramifications of what we do at IOOS and in the modeling space on ecological forecasting. They hosted a workshop covering issues on observational impacts in data assimilation, fisheries habitat, ocean acidification and hypoxia, and harmful algal blooms. One example of an issue that came up is for SCCOOS's California Harmful Algae Risk Mapping (C-HARM) System. Public health personnel, shellfish growers, marine mammal protection groups, Dungeness crabbers, etc. all use this data portal to track blooms that are happening in real time. Now that SCCOOS has switched the model to WCOFS in response to a request from IOOS, their salinity measurements are wrong and therefore so are their domoic acid predictions.

C. Anderson shared about the California network of IFCBs, which is a tight SCCOOS and CeNCOOS collaboration to put in 12 IFCBs (biggest network in the world!) doing real time plankton community measurements and imaging. These images are being classified in real time with machine learning models and displayed on a dashboard. SCCOOS also has an NCCOS project to help with HAB data assembly and management. This is an example of something happening in the RA that can be broadly applicable to a wider array of biology. We need to rebrand this as a "Plankton" or "Microbial" database to expand the bounds of the applicability of the data.

C. Anderson discussed what it takes to build an end-to-end observing system from physics up to marine life (beyond just \$6M per year). For SCCOOS, this includes ecosystem moorings that include biogeochemical sensors for model validation, instrumentation on lobster traps in the benthos through citizen science, monitoring toxins and marine mammals, fishing vessels of opportunity with biogeochemistry measurements, animal tagging, etc. IOOS consistently underfunds this effort, and we have to come up with a strategy to fund this kind of end-to-end holistic approach because there is nothing else like it anywhere. Want to think about how we take MBON and push it more into operational space - think about what's worked and how we spread this to all the RAs. This will likely take a lot of interagency collaboration.

C. Anderson closed with some recommendations: 1) Next-generation observing systems must take advantage of current RA investments from a variety of sources, i.e. honor legacy "backyard" time series but move forward deliberately and intentionally to include marine life observations; 2) Leverage interagency resources to meet global to coastal observing requirements – NEW PARTNERSHIPS; 3) Skillful ecosystem prediction will require robust sensor suites on fixed and Lagrangian platforms (cross and alongshore scales), complemented by successful and fully funded biological/ecological monitoring programs. Some ways to do these things include working groups to help fill these gaps from the top-down and the bottom-up, but might also need some grass-roots initiatives that surround some of these IOOS Association programs and products coming out - e.g., NHABON, Ecological Forecasting, Climate Signal.

Questions:

O. Schofield commented that this drives home one of our recommendations last year to not lose partners in IOOS-- if you lose the university partners who often are the innovation drivers and bring in extra money, that would be bad. Great to leverage.

J. Morrell noted that he fully agrees with going pan-regional, and that the RAs need to figure out how to share knowledge better and continue to collaborate. C. Anderson agreed that they need to do better particularly in the biological space. We have the opportunity to bring in RAs that lack expertise in one area or another.

D. Costa asked if the domoic acid data is used to open/close the Dungeness crab fishery? C. Anderson responded no, but it is used as an indicator of where the custodial agency in CA needs to do more sampling. D. Costa also commented about the mismatch of differing organisms - e.g., how can we use the modeling data to predict what Dungeness crab are doing when we don't have Dungeness crab data? C. Anderson mentioned that they have a lot of data from the state and they have a paper in press that uses machine learning to statistically constrain that relationship between what C-HARM predicts and what Dungeness crab are doing and it works pretty well, but it's hardly operational yet.

Phase 2: Enterprise Excellence Panel - Presentations and Discussion

Panelists: Jeff Payne (NOS Office for Coastal Management), Gerhard Kuska (IOOS Association), Derrick Snowden (U.S. IOOS Office), Jake Kritzer (NERACOOS), Brian Zelenke (U.S. IOOS Office)

Gerhard Kuska - Prioritization of RA CORE funding

G. Kuska presented on how the IOOS RAs prioritize within their 5-year agreements through which CORE implementation flows. He started off by touching on some history. The development of this process over time for each RA has varied based on interests and regional nuances. Over time, certain data, products, platforms have become emphasized in some regions more than others. Each region takes a slightly different approach. Each has developed a mature way of addressing the priorities in their regions. The RAs are driven by their needs to address societal benefits and stakeholder needs.

G. Kuska talked about the tier 1 and 2 priorities that the RAs set up, and how the RAs try to address the growth of capability and capacity over time. RAs have put a lot of time, energy, and people into these sustained systems and have developed strong relationships with partners and stakeholders that use this data to make products for the community. For 2 5-year cycles, we had a \$20M cap on each region's 5-year budget. The cap was raised to \$30M per region in FY21. Right now we receive \$41M for the RAs, with \$2.5-3M per region each year in CORE funding. \$6M would be a rough annual cap, so we have roughly half of that covered.

G. Kuska described that there is extensive dialog between regions and PO about proposed topics for each funding cycle. They take several months to respond to NOFOs and submit final proposals. During that time, the RAs have already started looking at what stakeholders want and what systems need and new proposals. Each region puts out a call for proposals from the community to bring in new partners. The challenge the RAs face is how we address the prioritization of what goes into that. They are often aware that they might not get more money, although they have seen growth over time. There is a great need and we have an order of magnitude less of resources, especially given inflation, aging infrastructure, etc. that impact day to day management.

G. Kuska described some tensions and challenges: **Sustained observations vs. new** - there are new requirements coming forward and new opportunities in certain areas (region-specific or national). How do we deal with the fact that there is a flat level of funding to maintain operations AND address new things? **National vs. regional** - regional management was a strong recommendation with the idea that FL and AK don't have the same needs. National partners like CO-OPS are looking for broad coverage of data products, which is difficult to do if not all regions are providing some level of data coverage. **Observations and modeling vs. engagement** - there's a strong need to put as much money as possible into observation systems but we are

pressed with understanding what communities want, and that becomes a challenge. Product development needs community involvement. **NOAA vs. other 16 agencies** - because of where IOOS is located, we still struggle with other agencies and their recognition of their role as equally as important to NOAA's. There are benefits to agencies working with us and investing.

G. Kuska posed the question: How do we address new needs in the face of this? RAs don't like being told what to do. But there's value in pan-regional or national efforts that allow us to leverage and make us more attractive as a national entity. The first answer you'll hear is that we need more money. If one objective is to have better usability of products, how do we move towards a more harmonized system and acknowledge new pressures? Each RA might want to do something different with more money. Compromise is where we might find the best path forward. This is also difficult as regions try to prioritize sustained vs. new. There's not always clear guidance on how to address new priorities - when is it necessary to adjust a work plan? Some colleagues will say it puts them under a lot of pressure. One last point is that the HFR plan is old. Gliders aren't at a national consensus. We can't do everything, and certainly not equally at the same time. The dialogues between national and regional that set markers for where to go aren't prescriptive but allows for picking and choosing while working towards national priorities.

Questions:

E. Howlett asked with \$3M as an average, in terms of basic fixed costs for an RA, how much flexibility is there when looking through the budget and looking at static funding? G. Kuska responded that there is not a lot of flexibility in terms of modifying the work plan, especially with inflation. Before the RAs do anything, they get less of each person in the field because costs are going up and supplier and energy costs are going up. People are invested and have been doing this for a long time, and it's hard to compare the value of HFR vs. what we might be doing in climate, biology, water level, HABs, etc. I have no idea how to do that with the current situation. We can come to terms with what direction to go in collectively.

O. Schofield commented that he thinks of sustained observations as climate. Sustained measurements might vary across RAs. Short-term experiments for new ideas need to be augmented. There's a great example from the West Coast where projects were paid for by other resources raised by the IOOS community. The junior community thinks that IOOS isn't a friendly place to work, and I worry that we will lose that innovation arm. If you want to argue you're an observing system you have to sustain at a certain quality. S. Rayder noted that we should come back to this later.

Jeff Payne - Regional Ocean Partnerships

J. Payne presented on Regional Ocean Partnerships (ROPs), including the relationship we've had with IOOS over time, the role of ROPs, how ROPs and IOOS RAs are distinct but might complement each other, and the data sharing and integration work we've been doing together. J. Payne is at the Office for Coastal Management (OCM), which focuses on resilience, ecosystems, and also ensures communities are resilient in the economic sense as well. OCM is regionally deployed like the RAs. This is a fundamental strength in how to get things done in today's world, as this makes them close to customers for user needs and requirements development, which allows them to take those requirements and move them into their functional programs so that they are responsive to what's happening in the world. OCM worked with the White House on wind energy development processes and policy to make sure key data products (e.g., automated identification system) were available to inform ocean decisions.

J. Payne described that ROPs are convened by governors and led by coastal fisheries, energy management, coastal management agencies, etc. at the state level and with federal and tribal members. There's a range of partners involved including academia, NGOs, and industry. The purpose is to set priorities based on issues that are of common concern and to respond to those. The power of this is that you build a consensus around where to focus effort or resources to address an issue together. For example, NROC has the northeast ocean data portal and convenes expertise that combines stakeholders with ocean and coastal data they need to engage BOEM for Gulf of Maine offshore wind. OCM is an active member across agencies and sometimes chairs subgroups of the ROPs. ROPs have value - they are efficient and effective to work across jurisdictions, they are useful for finding economies of scale for data, monitoring, observing, convening, and research, and they facilitate work with sister agencies.

J. Payne discussed the distinct roles between the ROPs and RAs. ROPs are governor initiatives and include state, federal, and tribal partnerships within their makeup, and they convene to prioritize and address ocean and coastal management issues. There are 4 established ROPs: Northeast, Mid-Atlantic, the Gulf, and the West Coast. RAs are designed to deploy and gather and integrate real time data and information to inform ocean users and promote our understanding of changes in the ocean ecosystem. The RAs also tap regional stakeholders to guide the development of regional ocean observing activities. The complement is where both respond to regional requirements. ROPs are management driven - they respond to management plans that are a part of why the ROP was established. RAs are user, observation, and research driven and deal with practical outcomes as well. Both are doing important work.

J. Payne asked: How can the IOOS partnership assist ROPs in implementing their management plan? One way is through increasing direct collaboration in regions where they both exist - some have MOUs with RAs. E.g., BIL funds for NROC will support advances in inundation involving NERACOOS, deploying water level sensors at NROC, building a community of practice for monitoring water level changes and connecting that data to management decisions. Another way is to increase communication where only RAs exist. The RAs in these regions (GLOS, CARICIOOS, SECOORA) work closely with local federal, state, and tribal entities and help to ensure that the work they're doing is informing management needs. A third way is to better understand and leverage parallels. For example, West Coast is focusing on ocean health while the 3 RAs are focused more on specific observations. There also might be new opportunities to look for collaborations with new BIL and IRA funds. Bottom line is that regional has proven to be an effective scale for relationships, data and observations, and coordinating management decisions.

J. Payne talked about their data sharing initiative, which is a 4 year partnership with the IOOS PO and RAs. The money for the first 3 years (FY19-21) came through the omnibus appropriations. In FY22, we again received appropriations from the data sharing initiative, but also received BIL funds for the ROPs and to also include where ROPs don't exist the ability to take some of that BIL money and put it towards the data sharing initiative as well. Funding from FY19-22 from omnibus appropriation has ranged from \$1.5M-2.5M per year for the 9 regions, totalling \$8.5M.

J. Payne emphasized that OCM and IOOS have worked nationally and regionally to encourage strong partnerships on the ground with ROPs and RAs where they both exist, and with the coastal management community where the ROPs do not exist. The RAs and ROPs have collaborated to set priorities for the data sharing initiative money. In FY19 the focus was on

addressing data challenges for priority management issues, characterizing the regional data sharing and maintenance capabilities, and outlining additional capacity including roles for regional partners and implementing actions articulated by the region. In FY21 we had another \$2.5M and made a move toward improving data accessibility, data products and data platforms. In FY22 we had continuing money through appropriations but also over a 5-year period an allocation of \$16.8-\$17M to be spread across all 9 regions for data sharing. The focus was to sustain and enhance data utility to inform regional ocean and coastal management challenges through data product development, data portal management, data accessibility and creation, and outreach and engagement with tribes and a diversity of stakeholders while ensuring equitable service delivery. There is \$1M set aside for tribes in the ROP funding.

J. Payne discussed ROP language in FY22 omnibus as well as BIL. **Omnibus Language** for Regional Data Portals - "the agreement provides \$2.5M for ROPs or their equivalent to enhance their capacity for sharing and integration of federal and non-federal data to support regional coastal ocean and Great Lakes management priorities." **BIL Language** for the ROP Provision - "\$56M shall be for established ROPs to coordinate the interstate and intertribal management of ocean and coastal resources, and to implement their priority actions, including to enhance associated data sharing and integration of federal and non-federal data by ROPs or their equivalent."

J. Payne shared that OCM, working with the RAs and ROPs, pulled together a 4-5 pager with examples of the kinds of things that happened over the last 3 years with this money. J. Payne will share this after the meeting. He concluded that the IOOS/OCM and RA/ROP partnership is working well, and that the BIL and IRA presents strategic opportunity to grow this partnership

Questions:

S. Rayder asked how much does NOAA ask for in their budget for ROPs and how much is congressionally directed? J. Payne responded that for ROPs they ask for nothing. The BIL money is the first real slug of money we've received. The last time ROPs were in a President's Request was ~2006-2007.

M. McCammon noted that there is a difference in funding levels to existing ROPs vs. ROP equivalents and asked if there would be an advantage to having regional equivalents to become full ROPs? J. Payne responded that there is a bill on the Hill where one of the intentions is to encourage regions without ROPs to establish ROPs. M. McCammon noted that the RAs are an appropriate equivalent, as they have all the regional stakeholders and are already doing the work. S. Rayder asked why you wouldn't just ask for it? M. McCammon replied that there's a big difference between governor-led, state-led and federally supported and community-led. C. Anderson added that RAs are leveraged, and then some RAs are the ROP. On the West Coast, we are not the ROP and there is little resource sharing. If you are an ROP you might have more resources to leverage. J. Payne agreed that an RA in a region where an ROP does not exist is a good nucleus for where this is happening.

J. Biggs asked what the original criteria for defining an ROP were? J. Payner responded that 2 decades ago when ROPs came into existence, OCM provided money to get these started. When Congress took over, some of the funding went away and some remained. This goes back to the Clinton Administration with the intention of a regional approach with states, through their governors, providing mandates to make good things happen. Many worked on resilience broadly, but they're dealing with issues in regions that can be very diverse.

Brian Zelenke and Jake Kritzer - Regional-National Partnerships Panel

Moderator: Derrick Snowden

D. Snowden started by highlighting the intent of the panel. We're trying to highlight partnerships and dive into the sweet spot for national oversight - what does it mean for us as a system, as a program office, etc. RAs are to operate observation systems, manage and integrate the data, and support ocean predictions. There is a prioritization scheme within the system that focuses on user needs, which makes national consistency difficult. The national office is responsible for interfacing with other NOAA programs, interagency, international activities, executive branch processes - this is where we apply our staffing resources. These competing perspectives present challenges. What is the extent of IOOS PO oversight, what types of decision making structures do we need, how do we build a budget within NOAA, and how do we spend increases when they exist? Challenges are exacerbated by budget realities, but we want to delve deeper.

D. Snowden introduced that the panel will dive into one example of a tension between national and regional decision making. HFR is the first observing system that we rallied behind in the early 2000s, and it is unique in NOAA and unique to the regions. Another example of national requirements is DMAC. We don't tell the RAs what data to provide, but we tell them how it needs to look, ensure it meets standards, etc. - the content is up to them. There is little to no oversight in things like the locations of platforms, products delivered to local stakeholders, etc. Recently, there were systems in the Gulf of Maine that were underperforming. We had an opportunity to either fix that issue or reinvest resources somewhere else, which became a tension. D. Snowden introduced Brian Zelenke (Surface Currents Program Manager in IOOS PO) and Jake Kritzer (NERACOOS RA director), and asked them to present the other person's perspective on this issue.

J. Kritzer started by noting that HFR is the only observing tool where we have a nationally coordinated system. Mapping surface currents is really important for search and rescue with the Coast Guard, and so full national coverage and coordination is incredibly worthwhile. I understood where Brian was coming from in funding this system and it really came down to where the priority stood.

B. Zelenke explained that NERACOOS has a long and rich history of operating buoys and moorings because they're used extensively by local stakeholders and prized by local politicians. Maintaining this system is a challenge, especially when you have to contend with other things like recapitalizing HFRs. Do you throw good money after bad when you don't necessarily have enough money to do a full recapitalization, or do you focus on new opportunities at the expense of pre-existing systems?

D. Snowden noted that national consistency has been brought up a couple times. There's consistency of data from 11 regional portals, but sometimes that's not enough. The nationally-consistent HFR network has a footprint in all 11 regions. How much national consistency do we need, and how would we know when we get there?

J. Kritzer responded that this question needs to be answered on a case by case basis based on the type of observing tool or variable. What AK needs is not the same as what FL needs. HFR might be an exception to that rule - most places can benefit from surface current data. However, some places are better served by gliders, buoys, ship-based data depending on data needs and bathymetry. The surface of the ocean exists everywhere,

so HFR is as close as we come to a national need. I might not make the same case for other tools.

B. Zelenke used HFR as an exemplar - the national plan that was revised in 2015 seeks to build an unbroken band of surface current measurements across continental US coastline, with more detail in shipping lanes and important harbors. Data coverage is important, accuracy and reliability are also important, and it's important for us to deliver this as a Surface Currents Program. HFR is also important for HABs tracking, larval tracking, MPA design and management, etc. Understanding the physics of the ocean has many uses.

D. Snowden highlighted the Surface Currents Plan and asked what sort of national guidance or oversight is helpful? Are national plans helpful? Internally, they drive us towards managing a technology rather than a product.

J. Kritzer noted that HFR is the best way to measure surface currents but not the only way. Buoy networks also measure currents and a fair amount of resources are put into forecast and hindcast models that use this data. This is an important question - is it about the variable, products, etc.?

D. Costa commented that it seems like there is a difficult problem - the goal is to get complete coverage but we don't have the funding to maintain the current systems let alone put in new ones. For search and rescue, you don't know where you'll need it. Ideally you would find the best places to deploy a regional program based on goals.

B. Zelenke noted that this is a critical question and is really a multivariate optimization problem. It would be better to think about variables rather than sensors. We need to design a system to deliver to these variables.

O. Schofield noted is appreciative of the stress. At some point it would be great for IOOS to have its own national backbone with data tools that integrate it into a national system. If we spend too much time prioritizing this vs. that then we might never have a national backbone.

E. Howlett noted that if you have to prioritize, you could potentially deploy temporarily without long-term. We've done this before. OR&R and the Coast Guard need this data.

S. Rayder asked if the Coast Guard has a requirement for this data? Shouldn't the coast guard fund this? People see IOOS as a free resource - we need to diversify funding streams. We want layers of revenue coming in to support the program. Outside of NOAA, who's the second largest contributor to IOOS? We need to think about a broader strategy for all agencies in the IOOC - these are public goods and other agencies should start contributing money for requirements.

G. Kuska responded to the question D. Snowden posed on whether national plans are helpful for the RAs. For the HFR plan, there was a steering committee and a team of experts that did this work - it was a \$20M plan and they dedicated \$5M to it as a down payment to start. Over time that committee went away for a variety of reasons. This is a document that you can lean on and plan towards. Use with Congress - e.g. fill the gaps campaign - advocated that we use other sensors as well depending on the region - switched it and got a good response. Tried to figure out the biggest priority areas based

on additional resources around the country. Had discussion, buy-in from the community, experts at the table. Seems like we took a step back without this.

C. Gouldman noted that the Coast Guard doesn't fund environmental observations. I'm trying to reconcile this with our having long term requirements identified - is there a known requirement that we're trying to meet? Are we trying to get their funding or show their requirement to get funding?

S. Rayder commented that you can't have 100% priority if you have no priorities. You need a process to balance national priorities into regions with recognition that politics might come into play too.

O. Schofield argued that the national backbone hasn't faded but stalled. There are still other regions that need to be filled in. Fill the gaps was one strategy to do this. Another thing to revisit at IOOC level is that models that assimilate CODAR are the most important for CODAR. You can reduce a search area by 75%. Not to knock other technologies, but this is potentially a great win. It's interesting timing - we're about to cross the cliff where the majority of the national backbone is aging - but HFR has also demonstrated system value. The IOOC approach should be made strongly and aggressively.

M. McCammon noted that what makes it challenging is that, for example, if HFR is used just for search and rescue, Alaska's HFRs are not where people live but where oil and gas is happening. We're putting out products that might never or hardly get used. If we only have X amount of money and we're trying to prioritize if HFRs are the most important to fund, this is hard. We're trying to contribute to the national program, but the technology might hardly be used until increased shipping traffic in an ice-free arctic.

B. Zelenke asked J. Kritzer to talk a little about NERACOOS, who has worked with state partnerships. When you ask for money: what's the least you'll take?... and then you end up getting half of that "least". For the Surface Currents Program Plan, we planned for lower money amounts. Creating gaps in the HFR network's coverage = breaking the national backbone.

D. Costa asked how we fund this? When the state of CA put up HFRs, they had to go through a proof of concept to figure out what you could do with it. The first one's free and you get hooked, but then have to pay. Everyone wants it for free because we've supplied it to them as a research goal. Now trying to figure out how to make it truly operational and how to pay for it.

S. Rayder asked if HFR is an operational network, scientific network, or both? O. Schofield replied that it is both. If you're doing science or operational, what are the surface current variability in space or time?

R. Perry asked if we're describing the utility of science correctly? When we have these discussions in the Gulf, everyone says it's great and they need it but they don't want to put any equity into it. It comes down to what we think stakeholders need vs. the product. There also might be other reasons it failed.

J. Kritzer noted that as we've been trying to figure out the fate of stations in the northern Gulf of Maine, the state came to us and asked us to build a new network in the southern and central coast of Maine because of the offshore wind farm with BOEM. We

are working with them to cover that array. They were going to build up the network over 4-5 years and we allocated BIL funding to get this done within ~2 years. There was a clear user need from the state, lobster fleet, offshore wind companies, etc. Difficulties in northern Gulf of Maine station is a good case study, but a new partnership in the state is an example of what we need to be doing more of. R. Perry added that states can also incentivize industry that can build long-term infrastructure.

D. Snowden noted that perhaps for the next conversation it would be interesting to talk about the debate in NOS about using observations to make models better vs. the way NWS sees observations. S. Rayder noted that the Ocean Prediction Systems Center in NOAA does not reside in NOS. But the center for operational oceanography does.

Public Comment Period

K. Arzayus called for public comments. No one offered comments. Public comment period then closed.

Final Review: Phase 1 Recommendations

DEIA recommendations:

M. McCammon shared that there is a new White House policy on tribal and indigenous knowledge. She wondered if we should have that somewhere in recommendations. The report has good materials, and it would be good to emphasize. B. Winokur asked where that should go? M. McCammon suggested in “Expand support for DEIA...”

B. Derex noted that how to implement is important for IOOS. She recommended coming up with a plan for how to implement. This could be a separate recommendation. Will add language to report on this.

D. Costa asked about how to coordinate NOAA and IOOS DEIA activities complementary to other activities (ex Ocean studies board)? R. Perry commented that she thought this was flagged for this IOOC and that the structure was the most important thing for IOOS to consider, given there are so many efforts in this area. IOOS shouldn't own this beyond IOOS. It still seems vague. Maybe give broad recommendations for the community, but then call out specific IOOS recommendations and regions served. She also suggested changing DEIA to DIEAJB+. We'd need to check about this with the SAB so that the terminology is consistent across NOAA.

B. Winokur suggested that for coordinating with other organizations, we should add a bullet on 4 or add to second bullet to say “coordinate approaches and policies.”

R. Perry brought up Employee Resource Groups, and suggested a recommendation for internal staff to be given support to participate in these kinds of efforts in the NOAA enterprise. This would help promote staff not currently getting that level of support. It's not just about serving external communities, but also the internal community. B. Derex shared that in IOOS, we have great support from leadership. There's also a group in NOS where every program office sends a representative to have monthly meetings to help with co-development of new policy and procedures within the workforce. B. Winokur suggested changing the first bullet on recommendation 4 to read “ensure resources available to NOAA staff to exchange ideas as

appropriate.” B. Derex noted that there’s a huge conflict between HQ staff and staff in the field offices (labs) where the latter feels left out.

K. Arzayus mentioned the DEIA fellow at IOOS Association (Ashley Peiffer), who has the goal of harmonizing efforts in regions. There are challenges the regions are having with diversity. K. Yarincik added that the DEIA fellow is looking across the RAs to see what each is doing in that space at each, and to find commonalities, build collaboration, discussion, and dialogue. For year 2 of fellowship, the goal is to find tasks to roll up into a deliverable. Currently talking about what that looks like, as each region has its own capability challenges to be able to support DEIA. C. Gouldman also added that we need technical assistance for how we do this. We need more capacity in the PO to work with the fellow. Maybe we can focus on one letter at a time of the DEIA acronym. Think about accessibility in terms of people accessing IOOS information, which is different from the workforce issue.

Climate Adaptation recommendations:

O. Schofield shared that the biggest changes to the recommendation were clarified language and the reordering of the recommendations. S. Rayder recommended that the group review these changes as homework.

New Blue Economy recommendations:

E. Howlett noted that he added a sentence on BOEM coordination based on the discussion this morning.

B. Winokur asked about the agreement with Ørsted? Does everyone know what it is? R. Perry answered that it is a data sharing agreement, and that there is a link in the report. E. Howlett clarified that he doesn’t think the report endorses the agreement, just references it, so it’s okay to remove it. R. Perry suggested moving it to a footnote. She cautioned members to look at it because this MOU went through multiple line offices. The intent is to put a framework in place so we don’t have to start from scratch. E. Howlett noted that another rewrite needed to clarify intent.

S. Graves asked if there were any questions on the data buy recommendation? E. Howlett responded that he’d prefer S. Rayder to be present for that conversation. D. Snowden expressed that he has a hard time reconciling data buys with regional requirements. E. Howlett clarified that this is a conversation about data buys, not about regions. C. Gouldman mentioned that he voiced last week the difficulty understanding the right pricing models by vendors. Vendors with flexibility make more sense. The policy about if NOAA is purchasing data notes that data needs to be open (FAIR). There are exceptions with folks like Weather Flow that ask data not be made public until later. E. Howlett clarified that the recommendations are about exploring data buys rather than promoting them.

C. Edwards noted that the language in the 3rd bullet was phrased like a question. She suggested rephrasing it to a statement. She also suggested adding that IOOS has a role in coordinating and that stakeholders can provide input. E. Howlett responded that this bullet came from S. Rayder, and suggested postponing that discussion.

B. Winokur noted that the first bullet for the data buys recommendation falls into 2 categories: models like Saildrone, where data is bought by the pound, vs. the wave glider where you are buying a service. These are two separate kinds of data buys.

D. Costa expressed that he is satisfied with the other New Blue Economy recommendations, but that data buys are concerning. He couldn't find any reference to data buys in past documents. In response to the previous comment about data services vs. data buys - this makes him uncomfortable as it seems to be getting ahead of what the committee knows. E. Howlett emphasized that the recommendations suggest more exploration of data buys, not endorsement of it.

J. Read added a comment in the document about internships. C. Edwards suggested a list of universities, RAs, and co-ops that provide internships to place students in the field of oceanography in the IOOS world. Regarding the confusion about the internship with universities, it could be with other universities, not the one they came from. The New Blue Economy PWG will reevaluate the wording of this.

Meeting Wrap-Up

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office and Scott Rayder, Chair, IOOS Advisory Committee

B. Derex mentioned that she drafted cover letters for each report and sent to the committee members for review.

B. Winokur noted that the DEIA recommendations don't have an introduction like the other two sets of recommendations. J. Read added that DEIA does have vision/mission - this is not the same structure as other reports, but provides the same purpose. M. McCammon asked if the committee is recommending that IOOS adopt this mission and vision, or just use it to frame their plan? She prefers the latter. K. Arzayus responded that the mission and vision statements came from the DEIA fellow, and that they are for IOOS as an Enterprise.

K. Arzayus mentioned that S. Rayder wants to vote on the Phase 1 recommendations tomorrow. It's not critical to vote on every word, so the committee can continue to tweak afterward.

Day 3 Adjourned

K Arzayus adjourned the Day 3 of the meeting.

DAY 4 - December 7, 2022 (In person)

Meeting welcome

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office and Scott Rayder, Chair, IOOS Advisory Committee

K. Arzayus welcomed everyone to Day 4 of the meeting. She noted that NOAA appreciates the time and diligent work of the Committee in preparing for this meeting and for their forthcoming deliberations. K. Arzayus provided an overview of her role as the Designated Federal Official (DFO). As the DFO for this meeting, she serves as a liaison between the Committee and NOAA and the IOOC. She is responsible for ensuring all provisions of the Federal Advisory Committee Act (FACA) are met regarding the operations of the U.S. IOOS AC. She noted that a critical responsibility as DFO is to work with appropriate Agency officials to ensure that all appropriate ethics regulations are satisfied.

K. Arzayus noted that the objectives for day 4 are to receive updates from subject matter experts related to the committee's phase 2 work plan priorities and to have final deliberations on the phase 1 recommendations to NOAA and the IOOC. Recommendations are an important outcome of the work of the Committee. The federal government tracks how many recommendations are generated and how many are implemented.

K. Arzayus reviewed the protocol for questions, public comments, meeting minutes and convened day 4 of the meeting.

S. Rayder welcomed everyone. He noted that Sean Hearn, the President of SURA, stopped by this morning and met with folks.

Special Topic: NOPP Program Briefings

Panelists: Alan Leonardi (Director of NOPP Office), Jeremy Weirich (Co-Chair for NOPP Interagency Working Group & Director of Ocean Exploration)

G. Canonico introduced the session. She appreciates the opportunity to have this conversation and go into more depth on the strong engagements between the National Ocean Partnership Program (NOPP) and IOOS. Exciting that there is a new NOAA-supported NOPP office convening our agency efforts. We will hear from A. Leonardi about the establishment of this office and from J. Weirich about the discussions and deliberations in the SOST IWG. Jeremy will take us through history and towards some vision and opportunities.

J. Weirich gave a brief overview of NOPP. The program has been around since 1997 and it was just reauthorized in 2021 as part of the National Defense Reauthorization Act. Typically a NOPP project is one that's designed to have the ocean agencies get together and look at big cross-agency projects and bring in academia, industry, NGOs, etc. to help move these projects forward. It is a program designed for communication, collaboration, and coordination. Funding came later through the Office of Naval Research (ONR). NOAA now has direct appropriations for NOPP, but otherwise it depends on other agencies coming to the table to provide services and

funding. NOPP has Broad Agency Announcements (BAA) that help facilitate some of the funding opportunities, as well as some other mechanisms.

J. Weirich walked through a timeline of the history of IOOS and NOPP. This is a great success story for NOPP. The timeline shows the work that was done on observing systems, how it got created within NOAA, and how it got support through other agencies. When earmarks went away, there was a tough effort to bring all the different IOOS fiefdoms together to make sure the networks stayed whole and productive, and that as a nation we stayed coordinated. Also wanted to leverage congressional support to keep those going. He was pleased to see NOPP help out and advocate for IOOS, and then the IOOS Program be able to survive and thrive.

J. Weirich walked through a general overview of NOPP-supported IOOS projects since 2011. We start with something that is general and basic, an ocean observing system, and then we move from there to different subject matters where IOOS can serve as the basis for science moving forward. One project we're working on now is marine carbon dioxide removal and sequestration - NOAA's Ocean Acidification Office is leading the charge on this with half a dozen different federal programs, including IOOS. With that comes a whole national-regional voice outside the federal structure which is important.

A. Leonardi introduced the NOPP Program Office, which was reestablished in September 2022 and awarded to Integrated Systems Solution (ISS) to provide administrative support for the IWG including facilitating partnerships, managing funding opportunities, panel/proposal reviews, managing NOPP forums, representing NOPP at various events, etc. Fully virtual office that provides meeting space for NOPP meetings as needed in the DC area. Short term activities in progress are the next Congressional Report, Excellence Partnership Awards, transferring the website and social media, working on exhibit materials, etc. What excites the IWG also excites the NOPP Program Office - our job is to help the community and the agencies facilitate communication and partnership through all things NOPP. J. Weirich added that there's been a lot of attention on the NOPP Program Office. There's been a number of years without a Program Office. We are working closely with the ONR to bring in elements that were part of the successful program back in the day.

J. Weirich outlined the NOAA NOPP budget history. Typically, ONR were the ones who had the funding and brought the backbone for the BAAs. Now NOAA has some funding to go with that as well. The funding was reinstated in 2018 with a resurgence for NOPP. Folks within the Trump administration, DC, and federal agencies were still supportive of it so there was a desire and need to move ahead. There are nimble ways to use non-defense discretionary funding to fund NOAA. Over the years, funding has ebbed and flowed - right now for FY23 appropriations there is \$7M in the Senate Mark, and there's direction that \$3M of that goes to carbon dioxide removal.

J. Weirich shared the FY22 NOPP projects to give a flavor of what was funded. There was about \$1-1.5M that they were able to support, but that's not the total of these projects, that was NOPP funding that came to the table to match NOAA or other federal funding that was out there.

J. Weirich shared an outlook of NOPP 2.0 over the next few years. This means expanding out partnerships to bring in more public-private partnerships and more philanthropic groups, including identifying what the best financial mechanisms to do this and the timing of this. Also important that we can't focus on the small pot of money that the NOPP provides - we need to learn how to better coordinate and collaborate to tackle bigger initiatives across agencies. For

NOAA and NOPP, the internal NOAA NOPP Committee coordinates what projects are coming up, what the ideas are, and who's involved. This is a way for us to make sure we're leveraging money appropriately, and IOOS is a part of this. There's also guidance from the SOST to work on UN Ocean Decade activities. J. Weirich discussed a success story: a project using Sairdrone to map uncharted waters in Alaska, in collaboration with NOAA, USGS, BOEM, and MBARI.

Questions:

B. Winokur asked if NOPP has a vision for the next big thing? Ocean Studies Board created a set of recommendations for the UN Ocean Decade - have you seen that and does NOPP have any interest in those recommendations? J. Weirich responded that the UN Decade has a lot of projects, some which dovetail well with NOPP projects. Goal is to stay in tune with the other agencies to see where there might be some collaboration, including internationally. The reports put out by groups like the Ocean Studies Board have been helpful. What are cross-agency projects that need leverage across agencies and how can we move those forward? We don't need more reports or working groups, instead we need people to set priorities and move ahead. This is the time to do it, and we need to leverage this opportunity.

D. West mentioned that the success of NOPP years came from the interagency meetings that spurred partnerships and projects. NOPP is important and I'm glad to see it revitalized.

R. Perry noted that private industry has been a huge supporter of NOPP to bring together the federal agencies, but have been frustrated by the lack of progression on the funding models and the integration of industry beyond the technology and SBIR community. Mapping for offshore wind under the New Blue Economy - no easy way to bring all that information together and integrate it into the U.S. EEZ mapping program. There could be a NOPP framework to support the data management, operations, and integration of that information. The funding mechanism has been the biggest roadblock to bringing industry in, especially at scale. Need to bring everyone together to start these conversations. There's going to be ocean observing that happens as a result of mitigation activities or because new industries are developing - how do we sync all that information? J. Weirich responded that funding mechanisms are a challenge but not insurmountable. From the SOST level, NOPP is meeting with all the different working groups to try to generate those ideas to work through these challenges. It's not just about the different federal agencies and the different funding mechanisms there, but it's about going one more degree of separation out - what can we do from a DOC perspective (e.g., non-ocean agencies)?

A. Leonardi reiterated that the NOPP office is responsible for supporting 2 partnership forums focused on topics of interest from the ocean community. R. Perry commented that it would be helpful to get the industry financials - they're spending lots of money (e.g., \$40M) on projects related to mapping, benthic work, fisheries work, etc. A small component of that that could go into a NOPP project (~\$0.5-\$1M per year) for something that industry will be doing for 30 years could be helpful.

S. Rayder asked if NOPP folks have talked to the HSRP? J. Weirich responded that they are looking at this both from the NOMEAC and Ocean Exploration side of things. From a NOPP perspective, it hasn't come up, but an extension of NOPP is a lot of these interagency working groups. R. Perry mentioned that these issues have been discussed there. The issue we're circling around is that it's easy to come and talk about the work that's being done, but the conversation needs to happen to put the puzzle pieces together to establish programs.

M. McCammon added that J. Weirich and A. Leonardi are masters at getting funding. There is so much being done by the private sector that isn't getting into the public domain because of lack

of mechanisms and incentives. As a committee, it might be good to hone in on 1-2 really big projects (e.g., mapping through offshore wind industry or building a comprehensive marine life program) and then work with these experts to figure out how to get the additional funding.

D. Costa expressed excitement that NOPP sits within Ocean Exploration. NOAA was not built to fund outside programs. A concern is that it's hard for NOAA to get money out the door and to move money around compared to ONR. He agrees with R. Perry and M. McCammon - in addition to industry there's philanthropy. J. Weirich agreed that Ocean Exploration is an external-leaning program. We are working on building more philanthropic partnerships and the funding mechanisms are a little easier than with industry. Good examples of projects with philanthropic partners include the Census of Marine Life and the new marine carbon dioxide removal work.

O. Schofield commented that NOPP is one of the great integrators. The academic community is fully invested in the NOPP model and NOPP should use this community as tools. S. Rayder echoed this - as a community, we've lost the innovation piece, the regions used to be testing grounds. M. McCammon responded that the regions are STILL testing grounds - testing a lot of low cost and low technology tools to help meet gaps in understanding. A. Leonardi responded that the community can help produce the money, the Hill can help distribute the money, and the agencies can help move the money.

K. Yarincik shared that the RAs are struggling with flat funding that is not keeping up with inflation and the ability to maintain sustained core observations, meanwhile the demand for the data keeps increasing. Given IOOS's role in data collection and provision for a number of agencies and the need to grow that, it seems like IOOS should be a cross-agency priority. What was the FY11-15 core funding referenced in the slides and can we rebuild that? J. Weirich responded that if you look at the projects that have been funded since IOOS was created, those partners are different regional centers that come into play to test gear, instruments, mode of operations, and that's why they've been key partners. There are areas well established - why don't we leverage them? G. Canonico added that the FY11-15 cooperative agreements to the RAs were announced and IOOS spent time trying to invite other agencies to participate but were not successful, so IOOS pursued NOPP partnerships on other things in following years. C. Gouldman asked if it was administratively complex and therefore more costly to execute it as a larger NOPP announcement? G. Canonico responded not necessarily, we had strong support from the NOPP office and it wasn't any more difficult than any other instance of leveraging funding across agencies - fostering these conversations is the tricky part.

C. Gouldman asked what the committee is trying to accomplish here. If it's private sector experience we have the MBON experience with Shell, IOOS is also contributing funding for the NOPP mCDR project. R. Perry was wondering if there is an industry entity that NOPP or the government trusts to be the fund-integrator, or is this IOOS? This emulates the philanthropy model that D. Costa referenced. Maybe this is the workshop that needs to happen. If that doesn't work, is someone like Fugro the financial investor for industry funds? J. Weirich added that it would be great to have a session to brainstorm solutions to some of these questions. A. Leonardi added that there's a huge list of examples from a NOPP Office perspective of doing exactly this. M. McCammon commented that the individual RAs can be multi-funding aggregators at a regional level. The opportunity here is to do more of a national program knitting together projects and meet national goals - the IOOS PO does not have the ability to aggregate by itself.

S. Rayder asked if an OTA (“Other Translational Authorities”) tied to NOPP would enable funding to be moved faster? A. Leonardi responded that the funding vehicle that currently exists that supports the NOPP office coming from NOAA, NOAA already has OTA authority. S. Rayder suggested that the committee make a recommendation to NOAA suggesting the use of OTAs as a mechanism within NOPP to efficiently move money faster to the regions. A. Leonardi clarified that the OTA exists but has only been used in the satellite space, but there’s no funding behind implementation of it as an authority. J. Werich added that NOPP authorization specifically directs agencies to bring the funding - be as creative as possible in the mechanisms available to do that. S. Rayder would like to send a letter to Dr. Spinrad letting him know the committee knows about NOAAs OTA and that they want to help in this. S. Graves noted that there are taxes on OTAs - could instead say something like “funding mechanisms such as...”

D. West agreed that a workshop to determine how the agencies can better work together would be a great idea and suggests those at AGU bring this up to their colleagues.

Phase 2: FY24 IOOS Program External Review Panel - Presentations and Discussion

Panelists: Aria Remondi (Chief of NOS Formulation and Planning Division), Carl Gouldman (U.S. IOOS Office), Marian Westley (Deputy Director, CO-OPS), Matt Stout (Chief of Staff, ONMS)

Aria Remondi - NOS Culture of Evaluation

A. Remondi presented on the NOS culture of evaluation, including what NOS has been doing in this space and why it’s important. She shared that in 2018 Congress passed the Foundations for Evidence Based Policy Act to improve the use of evidence and data to generate policies and inform programs in the federal government. This requires evaluation plans (AKA learning agendas) and systemic approaches for how to address important policy questions. These laws impact how we do evaluations and how we look at things in the future. In 2020, NOS set up their own evaluation framework. Our goal is to achieve a cycle of continuous improvement to improve public service and performance by enhancing processes, improving understanding of resource allocations and requirements, aligning processes, increasing efficiencies, and increasing stakeholder engagement.

A. Remondi described NOS’s formal evaluation framework that was set up to address these goals. Three legs to this: 1) Self-evaluation annually including internal controls, 2) Business and organization reviews twice a year for different program offices (IOOS is going this year) based on self evaluations with help from other NOS programs, and 3) External evaluations focused on mission delivery every 5 years. This is the area we have the least experience with. Multiple benefits including third-party objective feedback, apply input to future considerations of the program, solicit comments on program’s challenges, validate strategic decisions, and encourage information sharing.

A. Remondi shared that NOS wants to provide a systematic and standard assessment for how our program is implemented and offer guidance for future operations. External reviews are not consensus reports - we expect a third party to do them and submit them to us, although IOOS and NOS leadership would be very involved in that scope. They include on the ground work, benchmarking, interviews, academic evaluations, etc. We’ve had them done in the past through consulting firms, academic institutions, or blue ribbon panels. Three criteria set out by NOS for these reviews include: 1) Quality - soundness and accuracy of a set of products and services, 2)

Relevance - Societal impact and significance to the nation, and 3) Performance - whether a program is managed in a manner that produces identified goals effectively and efficiently.

A. Remondi noted that it can take time to set these external reviews up to be successful. Things to think about now include: 1) Scope - whole program in 1 year or subcomponents over 5 years - should be set with the help of NOS leadership, 2) Timing - it can take 9 months to prepare for an external evaluation, and 3) Use of Information - once you have this data there are a lot of opportunities for using this information to advocate for your program (e.g., at big events).

A. Remondi walked through what we get from these external reviews including support of budget requests, inform programmatic decisions and increase the effectiveness and efficiency of programs, products, and services, improve understanding and demand for provided services, complement and compare findings to self and internal evaluations, inform and validate strategic planning, and improve mission execution.

Marian Westley - External Review at CO-OPS

M. Westley presented on the external review conducted at CO-OPS. CO-OPS was the first office to conduct a business and organizational review, during the time when they were standing up their Business Operations Division, and so they were able to come out of the gate with great recommendations from doing that review process. CO-OPS also agreed to go first for the external review. It was critical for them to carve out a doable piece of what they do, so they decided to get their observations systems and the products and services that they generate from the observation system reviewed. They did this because they own and are responsible for that, and didn't want to tackle modeling yet because they'd have to engage all the partners, which needs to be done at a much higher level with more time.

M. Westley described that they started their external review in the early spring by putting out a contract to get help and building a panel consisting of critical stakeholders. They did 3 days of external panels, one on just the observing system, one on the products and services that they build from their observation system including some of the operational forecast models, and the third was on future directions to think about the big challenges with their observing system. They had the mixed benefit of Hurricane Ian happening while they were preparing for this, wiping one of their stations off the map and enormous impacts on people, so they built system resiliency into their third day. Based the panels on quality, relevance, and performance. Panelists included Captain George Hanes (Navy Pilots Association), Captain Brad Hitchum (Coast Guard), NY-NJ PORT system representatives, chair was Nic Kinsman (NGS), Greg Kukel (USGS), representative from the Tampa Bay Pilots Association, Joyce Miller (U Hawaii), and Josie Quintrell (IOOS Association).

M. Westley walked through lessons learned. They had a terrific contracting company organizing and making draft slide decks. The company mined their website for base information, which was out of date. They had the three days focused on the different topics mentioned previously and chaired by CO-OPS subject matter experts. Lessons learned: hire a really good contractor if you need that support, have a really good chair if you need that support, and the exercise of being forced to tell their story in a concise, compelling, clearly written way at the leadership level and at the expert level is super useful in itself. Timing-wise, it's the last year of their strategic plan, so this is a good time to think about who they are and what they're trying to say. It was important that the scope be doable for this first iteration. A big theme that came out of

the panel was equity, fairness, and other aspects of diversity. It was helpful that the panel was a reasonable size, and helpful to have a NOAA employee on the panel. Overall we found it energizing and exciting, and we will receive our final report at the end of the month.

Matt Stout - External Review at ONMS

M. Stout presented on the external review for ONMS. At ONMS, they started this process 2 ½ years ago because they knew they had their 50th anniversary coming up and that they were halfway through their Strategic Plan. They had a couple external reviews over the last 10 years. They set outcomes as increasing visibility, credibility, and effectiveness. In the past, they used the National Academy of Public Administration (NAPA) for their reviews, and received good insight from that report. Meridian is good at telling you operationally how you're doing and if you're meeting core aspects of your mandate, but they really don't dive into whether you're meeting your mission. ONMS wanted to look at stakeholder engagement, so they used Meridian. They started with what was in their 2017 Strategic Plan, and looked at where they said they were going to go and whether or not they were doing that.

M. Stout described how they approached the process, focused on whether ONMS was meeting their mandates? To get at this, they used Meridian to organize external review panels and stakeholders in roundtables, they used NAPA to look at the function of the system (threats, process for designation, and partners) through an academic exercise, and ONMS conducted an internal review through panels and workshops. They wanted to have deliverables from each of these three areas. 2 outcomes were a new strategic plan and a long term vision that looks 20 years in future.

M. Stout noted that they started with their 2017 Strategic Plan and looked at the 5 goals, did a deep internal dive and then sent this to NAPA for evaluation. NAPA conducted over 100 interviews with stakeholders, former NOAA administrators, etc. NAPA has the respect of Congress, so they met with appropriators 3 times (before the report, during the report, and after the report) to get some key messages out, including that ONMS has much less money per acre compared to other agencies (e.g., \$0.17/acre vs. \$47/acre for National Parks). NAPA professionals produced an organized report with 15 short, medium, and long term recommendations. The NAPA recommendations were very high level, which was a challenge. The key message from this report was "go big."

M. Stout shared that ONMS then went to Meridian. M. Stout participated in the roundtables just to answer questions. The purpose of their roundtables was more aspirational. There were 3 focused on science research, conservation and management, and public engagement. They wanted a cross-cut discussion with how they're doing with climate, justice and equality, indigenous engagement, and impact of the Sanctuaries system. Meridian's summary was that Sanctuaries were a collection of individual sites, but the story should be that the whole is greater than the sum of its parts. There was really great critical thinking and good ideas. He liked how they wanted ONMS to look at a unified agenda for science administration. One surprising thing they heard was that they lacked transparency.

M. Stout shared that they then took both reviews and summarized them, because NOS has a requirement that you report back the findings. Their areas of emphasis included climate change, tribal engagement, underrepresented communities, diversity and inclusion, look at new

technologies, unified approach to science programs, increase collaboration, and strengthen partnerships. This report was then rolled out into a long-term vision with where they believe they need to go, and how they plan to do it.

Carl Gouldman - Upcoming External Review for IOOS

C. Gouldman talked about the upcoming external review for IOOS. He thanked the other panelists for providing helpful context and background. It looks like the IOOS external review will happen in FY25 now instead of FY24. IOOS values the role of the committee has in approaching this review. It's up to you on how much you want to be involved. IOOS is open minded as to what we should do and how we do it.

C. Gouldman acknowledged that he heard O. Schofield yesterday talk about the principal investigators that feel like they can't be part of IOOS due to funding, conflicted with the sentiment that we need to be sustained observations to be a climate record. These are the types of tensions we have in trying to be an operational system, and what do we do in regards to the review on that type of subject?

O. Schofield replied that it's a hard tension to solve - not so much because there aren't funds to do things, but think of a young professor going for a tenure who's reviewed by the manuscripts they put out rather than operations, yet these are going to be the key innovators. He was heartened by the NOPP conversations to help put funding pots together. In regards to climate, think of the Keeling Curve - the value is the long term rise. Making sure we have avenues to keep both parties engaged is where we have to put our heads together.

C. Gouldman also noted that IOOS wants to be forward looking - for example, figuring out how to get DOIs for datasets to give attribution to data systems, partnerships, advancing technologies etc. C. Gouldman suggested the committee share the top 3 areas of focus to include in IOOS external review, and how deeply the committee would like to be involved in this process.

Panel discussion

S. Rayder noted that the statement about budgets hit home - statement of priorities. How do you set priorities and requirements within NOS? How do you do it today and how do you set it up for the future? A. Remondi replied that NOS is currently looking at the FY25 budget. The role at NOS is to advocate for NOS at NOAA. They want the NOS budget to grow. What we need is to show NOAA budget that we need money as a whole, and show data that reflects this. Data to give us that ammunition to back up what we're saying - external voices help, benchmark against others, talk about upcoming things, etc. S. Rayder added that the way to get more money is to show that you're executing your budget well - NOAA needs to get back to basics.

D. Costa built on the funding discussion and discussion yesterday on how we maintain IOOS as a system. He suggested engagement with end users and social science. A lot of what we've done is implement an idea without an end user in mind. Now have a constituency that we can better engage to develop our end user community so they can support us.

S. Rayder commented that he appreciated how CO-OPS identified their customers, and asked how they'd recommend IOOS do this? M. Westley responded that they focused on maritime services and the stakeholders they've worked with for years through the PORTS program.

Where things get fuzzy are who are resilience partners? This came up in their reviews - get data out in APIs - don't know what uses are and not our job to. Sea Level Report - britta datasets through APIs - climate central combined data with real estate data and taxes to produce a report.

E. Howlett acknowledged the great story on APIs. He noted that the challenge is implementation of strategic plans - what is the process on check ins and milestones? Were there concrete metrics? M. Stout responded that ONMS is about 3 months into writing the implementation for their strategic plans as a living document. At the same time, senior leadership is honing down 3-5 different "hows" on how they are equipping units to accomplish what they say they want to do. They are actively working through this process.

S. Rayder asked A. Leonardi about his program review at Ocean Exploration and whether they called in a FAC to help? A. Leonardi responded that they had 2 program reviews. The FAC was involved in the review process, but it was chaired by a member of the federal community. The input from the FAC was collated by a federal employee, and was not provided as official advice to the government. S. Rayder commented that we need to make a note of this because it's clever.

S. Graves commented that they've also served on evaluations and reviews. There are pros and cons in trying to bring in constituents and stakeholders, as this sometimes can lead things in the wrong direction. We can all help in one way or another. NOAA has a lot of experience in running external reviews. A. Leonardi clarified that the reason Ocean Exploration went in that direction was because the FAC had been meeting with them 3x a year for 5-7 years and knew the ins and outs of their program. It's important for that internal perspective to exist, but in terms of the external perspective, the FAC wasn't part of it.

S. Rayder commented that there are really great metrics in NOS. He asked C. Gouldman how IOOS assessed measures of delivery, or do these need to be written? M. McCammon noted that she's been on so many working groups on performance metrics, and they are very difficult, especially for a program like IOOS where there are things in common among regions with different implementations.

M. McCammon noted that if this review is done in 2024 that will be midway through IOOS's current Strategic Plan. Do you see review as also a review of implementation of the Strategic Plan? K. Arzayus answered that this is a critical part of the Strategic Plan process - it will inform the process in whether it kicks off a deeper dive, or an overhaul, or just a light refresh. M. McCammon commented that one of the major comments from the committee was that we didn't see "strategic," and that the plan was more focused on performance and implementation. What's the big thing coming - where do we want to go and how do we get there? Curious to see thoughts on the review and how that incorporates these ideas of the big picture in where we're going.

C. Goulman shared that one of the things he's learning and hearing is that IOOS needs to better capture the customer signal. They need to get better at performance metrics and to better capture the list of all products and services being delivered. This is a people-built feedback loop, and we need to up our social scientists and service delivery. We need to increase our understanding of this realm, which includes a whole value chain.

A. Remondi noted that in the learning agenda piece of DOC strat plan, based on the question that DOC is asking, they realized that metrics can be quantitative and difficult. Learning

questions are more qualitative - one is “what new and sustained observations data....” This is relevant for IOOS, and can help steer the review and get you to answer something hard but less performance metricky.

S. Rayder shared that the Coast Guard used saving lives as a performance metric, which the Hill loved and subsequently boosted the Coast Guard budget. Performance plan - Strat plan = performance report. The NWS produces quad charts on how each office performed, how it compared to neighboring offices, how it compared to the regions, and how it compared to all offices. S. Rayder encouraged the committee to think about something like that. It’s a pain to produce but it allowed them to go up to the Hill to get more investments.

O. Schofield asked C. Gouldman: On the FAC we’ve been doing reports and letters of support, but we could get involved in strategic overview. From your perspective, would it be useful for us to sit on the sidelines of the review or be actively involved? C. Gouldman responded that he was not sure yet. He is learning in this session from the experience of IOOS partners. The answer will depend on how we structure what we need to get done, and it could be helpful for the FAC to weigh in on different aspects. No clear answer at the moment.

B. Winokur noted a parallel between IOOS and ONMS as both federated systems. One of the complicating factors with respect to IOOS and RAs is a co-dependence on funding between funding coming from NOAA and external sources. How does that fit into this review? This complicates execution and responsibility. The NOAA SAB does a review every 5 years of every cooperative institute - could look at these to structure the way we do a review, although my impression is that their structure is a lot more flexible. S. Rayder responded that it depends on how the CI is structured. Within NOAA, CIs don’t see that they have an operational partner that they are required to work for.

S. Graves commented in regards to the review/evaluation with RAs, that we all have a fair amount of external funding and leverage a lot from universities. In trying to do a cross-RA evaluation review, we need to recognize the differences from funding, which could be difficult.

S. Rayder asked if NOS is an operational line office or research office? NWS is so operationally clear so it is easier for them.

O. Schofield noted that they need to have an engine. A great example is C. Anderson’s amazing network doing ecological forecasting. There's some gray space in operations, but it's a holy grail. That is something that is a synergy for operations.

S. Rayder commented that this gets to technical readiness levels. One recommendation from this committee might be to revisit this because it doesn’t work. He asked C. Anderson if her models could be moved to NOAA? C. Anderson responded that a lot of modeling is operational already at Coast Watch. She commented that if she had \$100 for every time we debated operational definition at NOS, then she wouldn’t have any problem with funding. There needs to be sustained funding, and there is no such thing if we’re beholden to annual appropriations. She likes to think of her products as operational - even if they aren’t reliable 24/7 they are produced regularly and highly used. There are certain RAs where they don’t receive any funding from ROPs, and this is an incredible leveraging opportunity that we are missing on the West Coast. In regards to evaluation of RAs, we need to think about this. There is radical variation across the RAs in how much we can leverage ROP funding. S. Rayder asked if these are official forecasts? C. Anderson answered that for HABs, yes this is part of CoastWatch, due to NASA funding. There is nothing in writing that allows this to be sustained.

C. Gouldman commented that we can use service level agreements to do a handshake across, and could create an administrative process to do this, but there's a cost to this.

M. McCammon noted how difficult it is to do this review given the complexity of regions. A key area for review is how the program office is set up and supported and how this feeds into the regions. By doing this, IOOS could tease out the major questions and focus on examples within the regions and program office. One major question is the gray area on operations. Another example of this is NHABON - this is an entity that is being created and implemented through direct grants to do pieces, but there is no real piece for national HABON yet, this is still in the development process. NOS has not yet said that they are responsible for HABs. Ocean acidification (OA) is another one - all OA efforts with federal funding come through OAR - they say they are not an observational operational program, they are research. But we need sustained OA observations and networks on the coast. There are questions and issues that we could raise through the review that would foster improvements to the program.

S. Rayder mentioned that we need to get agreement and alignment within NOS and NOAA.

C. Gouldman noted that there are features of partnerships that frustrate IOOS, and that service level agreements help facilitate these conversations.

M. Westley commented that CO-OPs is closer to the NWS than OAR, and she's really interested in strengthening products as a source of R&D and products coming in. She suggested thinking of CO-OPS as an operational partner. S. Rayder asked if they've defined what they need for R&D as next steps at CO-OPS? M. Westley responded no, and that this was an outcome of the review. They use SBIR and RAs, but they don't have a clear wishlist of what they need. They plan to develop this as they write their Strategic Plan.

S. Rayder thanked the panelists for their participation.

Committee Work Time/Extra time for Phase 2 panel deliberations

S. Rayder noted that at this time, he would like the committee to reach agreement and move forward by consensus or vote. M. McCammon asked how significant the changes were to the documents last night? E. Howlett noted that for the New Blue Economy recommendations, based on the discussion yesterday on wind, he reordered the bullet points for recommendation 4 and clarified the language. B. Winokur noted that they did fine-tuning on the introduction for DEIA.

S. Rayder brought the conversation back to the New Blue Economy recommendations. He brought up the recommendation on data buys and asked if the committee was okay with that one? K. Arzayus responded that the committee needed to better understand the intent of that recommendation, and that D. Rudnick was wondering if this recommendation is getting ahead of what the committee knows? The assumption from the recommendation is that NOAA IS doing this. S. Rayder confirmed that this is happening. E. Howlett added that there was concern that we were endorsing/promoting data buys. He doesn't see it that way, he thinks of this recommendation as a gathering of information. M. McCammon asked if they should add something about keeping the committee looped into the process? S. Rayder suggested keeping it at this level for now, then deciding based on NOAA's response.

B. Winokur specified that there are two different types of data buys listed and that this is mixing apples and oranges (raised this yesterday). Might want to acknowledge this. S. Rayder recognized this but wants to give NOAA the latitude to respond in whatever way they'd like.

D. Rudnick shared that he thinks the recommendation makes a prediction for the future. He's uncomfortable with it for that reason. There was nothing presented to the committee on data buys, so it seems to be getting ahead a little bit. S. Rayder responded that he's fairly confident that something like this was thought of. He doesn't think the committee is doing anything presumptuous. He just wants to make sure that if NOAA starts thinking about data buys in the IOOS space that we understand them. "In order to understand data buys, we would like to understand current programs and if there is a best practice."

C. Edwards noted that bullet 3 is more targeted towards NOAA rather than just IOOS. Do we want to direct this towards IOOS in some way? S. Rayder suggested leaving it at the NOAA level. His concern is that this is going to be a way for them to fill data gaps - how do we get ahead of it so we're smart enough to know how it works when it arrives? D. Rudnick explained that that's where he becomes uncomfortable - how do we get ahead of it if we don't understand it? He thinks it would be nice to get presentations to the committee to understand what we're recommending.

B. Winokur commented that this is a recommendation for NOAA, but we're not a NOAA advisory committee explicitly. S. Rayder disagreed with this. B. Winokur explained that these recommendations need to be in the context of IOOS, not the broader NOAA. The committee isn't advocating for no data buys, it just seems like we're missing the context.

J. Morrell confessed that he's a little lost. In trying to see ahead, do we see ourselves selling our data to NOAA as a business model? We do buy data from private industry already. Sairdrone sells data for very specific purposes. People were worrying that saildrone data should be available for future studies. E. Howlett clarified that this is the exact topic that this task is helpful for - to support the RAs in reviewing those terms and data buys and how data is used. No advocacy here.

S. Rayder noted that Congress is telling NOAA to buy more data.

C. Goldman noted that in the FY23 Senate Mark there was an increase for autonomous systems, and asked what that increase would mean? It's a piece of background that might not have been provided.

S. Rayder explained that this recommendation seeks to understand data buys, not advocate for them. He would like to leave it as is. Could hold a vote on it.

B. Derex suggested that what might help bring us together is to add a clause to 3rd bullet - "in order to ascertain how they can be used to support the NOS/NOAA mission." B. Winokur asked why not say the IOOS mission? S. Rayder responded that we don't want it to sign as an endorsement by calling out IOOS.

O. Schofield commented that the one part that makes him nervous is if there's a push for Sairdrone specifically - Sairdrones don't have nearly the track record of the tools in the IOOS tool box. It's sexy and cool. We don't want to grease the wheel by pushing towards a new technology. He sees the intent but we need to be very clear that it's not about reaching a minimum data requirement, but serving a certain data requirement for a specific user.

B. Derex noted that the IOOS team is editing in real time to try and incorporate O. Schofield and J. Morrell's thoughts. We changed "how" to "if" - not an endorsement. When these agreements are made by individual programs with a company, this happens outside of NOAA requirements. We might have to pay for data twice for different applications. The point is to make sure agreements that are made are equitable and data can be used freely. O. Schofield confirmed that this makes him feel better. We've also got to be clear that IOOS needs to figure out what data to buy because that comes from the RAs. We don't want to be forced to take on a platform where we don't have control of the data or a platform that isn't robust. E. Howlett responded that this is in no way seen as a push to move to Sairdron. It's really just that IOOS needs to become more familiar with data buys, licensing, etc.

B. Derex mentioned that IOOS is strengthening its requirements management process and communication of requirements gap - then where do we need to evaluate?

D. Rudnick suggested for the last bullet removing all words before "NOAA should." S. Rayder agreed with this. He also suggested deleting the second bullet.

D. West commented that the HSRP spent two years looking whether they should buy all their surveying data and came up with lots of reasons why they can do some but not all. That's what we're dealing with in IOOS too. There are reasons why NOAA doesn't do it all commercially.

S. Rayder asked D. Rudnick if he was comfortable with the data buys recommendation now? D. Rudnick replied yes, and commented that we don't mention current successful partnerships with NOPP. He thinks this is a missed opportunity. Another missed opportunity is to endorse the recapitalization that's in other places, e.g., buying equipment. S. Rayder replied that NOPP will be worked into the phase 2 recommendations. M. McCammon noted that she does appreciate D. Costa's comments here - we're not looking at the entire NOPP issue. There could be a sentence that NOPP could be helpful in meeting these goals. She asked D. Cost if he had an idea about where to put that? D. Rudnick responded maybe in the introduction. NOPP is a huge success story in how we can partner and it's worth mentioning. S. Rayder agreed that it's an integrator across everything. He suggested putting a sentence at the end that says - "NOAA was recently briefed on NOPP and supports using NOPP as a vehicle to support these recommendations across NOAA."

S. Rayder explained that the IOOS team will send around these recommendations one last time for review. At this point, content and conceptual changes are not okay, only grammatical changes.

FAC Business and Planning

S. Rader commented that he liked what we heard this morning and yesterday on phase 2 recommendations. Want to assign people to the PWGs for these three groups.

B. Derex flagged that the scope of these objectives needs to be updated as they were drafted a year and a half ago.

B. Winokur noted that it's not clear to him how Enterprise Excellence differs from review structure, and what we mean by Enterprise Excellence. Could see merging these. M. McCammon agreed, Enterprise Excellence ended up being a catch-all for a bunch of topics.

Enterprise Excellence NOW vs. FUTURE (leads into review). The review is not until FY25 now, so there's lots of time. Happy to co-chair that with someone.

C. Edwards asked how long are these working groups trying to last? S. Rayder responded that we're trying to get ahead of this. We want to go into the next meeting with Dr. Spinrad and the leadership team with some flavor on the next meeting. K. Arzayus added that Phase 1 and Phase 2 were supposed to divide up 3 years of this term. We want it to be done by August '24. M. McCammon suggested that the review will be a preview of it, and the next group might take it on from there.

S. Rayder asked if there was anyone opposed to merging the two? B. Derex asked if the committee wants to do more work and have 3 priorities or have 2? -If 3, she suggested NOPP could be a standalone, or nested under Enterprise Excellence? M. McCammon replied that she thought NOPP should be a standalone, as there was a lot of energy around that topic. D. West agreed. K. Arzayus noted that we can still call it out as a separate group. In terms of how we manage the number of people in each group, especially if people can only commit to one, the Enterprise Excellence PWG could still tackle NOPP as a separate part of the recommendations. I think having 2 PWGs instead of 3 could be beneficial because we've had issues with attendance in working group meetings that impedes progress.

B. Winokur noted that NOPP is broader than IOOS and is a NOAA-wide issue. D. Costa responded that the IOOS Advisory Committee advises the IOOC, and he thinks it's okay to talk about NOPP in that respect.

S. Rayder put the issue to a vote - consensus was changing it to 2 distinct committees (Marine Life, Enterprise Excellence+review).

D. West suggested renaming "Enterprise Excellence" as "IOOS Program Engagement" with NOPP as a subset.

S. Rayder commented that the committee wanted to drilldown on the NOPP-IOOS relationship, and suggested doing this first and then exploring other avenues later. In regards to what the NOPP committee would do, he sees NOPP as a mechanism to participate with other organizations. D. Costa noted he sees the NOPP portion as advisory to IOOC. M. McCammon agreed, and suggested taking it out, because politically NOPP has the potential to add to our programs. She thinks there's strength in doing it separately. K. Yarincik expressed favor in keeping the focus on NOPP - scoping the issue, where do you draw the line, could get too big, too fast. J. Read suggested having 2 panels. NOPP may be handled more quickly, and then could switch to a third topic. B. Winokur noted the issue with people's limitation to work on three committees in addition to day jobs.

M. McCammon suggested seeing who wants to participate in each of the 3?

Marine Life volunteers - O. Schofield, D. Costa, J. Biggs, K. Yarincik, M. McCammon, J. Morrell, and J. Virmani.

NOPP committee volunteers - B. Winokur, D. West, K. Yarincik, D. Costa, R. Perry (chair?), C. Shmaus

Enterprise excellence volunteers - E. Howlett, M. McCammon (co-chair), C. Edwards (co-chair), S. Graves, J. Read, S. Rayder

S. Rayder suggested adding an IOC ex-officio on each panel. K. Arzayus suggested S. Ye might serve on the Marine Life PWG as an ex-officio.

S. Rayder brought up the next public meeting. He suggested that it not be in DC with changes in the House and appropriators. He suggested considering the West Coast for next spring/summer, one idea was Seattle as Patty Murry is the next chair of appropriations.

O. Schofield commented that academic conflicts will be resolved by early June. B. Derex flagged that it will be hard to get Dr. Spinrad out West in the June time period. S. Rayder suggested April/May instead.

M. McCammon suggested coordinating with RA directors in the area we go to. Is there another conference or meeting that Dr. Spinrad would be going to to tag this meeting on to?

D. Rudnick offered hosting at Scripps.

S. Rayder noted that the IOOS team will put together a doodle poll for times and locations, and will check Dr. Spinrad and Nicole LeBoeuf's calendars. B. Derex emphasized that we need to identify which members of NOAA leadership you want early so we can coordinate this.

Public Comment Period

K. Arzayus called for public comments. No one offered comments. Public comment period then closed.

Meeting Wrap-Up

Krisa Arzayus, U.S. IOOS Advisory Committee Designated Federal Officer and Deputy Director, NOAA's U.S. IOOS Office

S. Rayder asked if there was any other business for the day? K. Arzayus asked if we captured things from the memo?

M. McCammon asked if S. Rayder was going to look at an introductory letter to the new House committee with K. Yarincik? S. Rayder confirmed that he will work on this with M. McCammon and K. Yarincik.

M. McCammon responded to S. Rayder's point that IOOS is not a testbed for R&D, noting that a lot is going on for low cost water level sensors, waves, HABs monitoring, webcams. This is an issue that we could wrap into enterprise excellence - working with other line offices, individual RAs developing programs or products and how do we share them more broadly across RAs? S. Rayder commented that NCAR runs a testbed for ocean modeling. M. McCammon responded that a number of RAs are doing modeling testbed activities that other RAs/other parts of NOAA may not know about.

S. Rayder asked if there was anything else we have to do at this point today?

L. Gewain mentioned that for those being reimbursed for travel, please send receipts. We will need to get you to sign the travel voucher, and we will send those when they're completed. You can send a scan or picture.

K. Arzayus expressed that we've had a super productive couple of weeks both virtually and in person. She thinks the committee is very much on their way to finalizing the phase 1

recommendations, and we will work on pulling together a nice package for review. The committee also made great headway on phase 2 recommendations. She thanked the committee for all their hard work and engagement on these issues.

B. Derex noted that she was nervous that with the new priorities, most of the subtopics are a year and a half old - she confirmed that we will send a work plan around and asked the committee to update these subtopics while material is still fresh in their minds.

K. Arzayus asked folks to provide any feedback they had on the virtual side of this hybrid meeting.. We're trying to improve the experience for everyone. And any other aspect of meeting planning, we appreciate feedback at any time.

Public Meeting Adjourned

K. Arzayus adjourned the public meeting.