

Fifteenth Meeting of the NOAA Science Advisory Board's Environmental Information Services Working Group (EISWG)

May 5-6, 2016
Sheraton Silver Spring Hotel – Persimmon Room
Silver Spring, Maryland 20910

SUMMARY

The following summarizes the Fifteenth Meeting of the Environmental Information Services Working Group (EISWG) of the NOAA Science Advisory Board (SAB).

EISWG Members in attendance:

Dr. Phil Ardanuy, Innovim
Mr. Ron Birk, Northrop Grumman
Ms. Nancy Colleton, IGES (Co-Chair)
Dr. Walter Dabberdt, Vaisala Group (Co-Chair)
Mr. Eddie Hicks, Morgan County, Alabama (*by phone*)
Dr. William Hooke, American Meteorological Society
Mr. Barry L. Myers, AccuWeather, Inc.
Dr. Justin Sharp, Sharply Focused, Portland, OR
Dr. Bob Weller, Woods Hole Oceanographic Institution
Dr. Julie Ann Winkler, Michigan State University
Dr. May Yuan, University of Texas - Dallas
Ms. Jean Vieux, Vieux and Associates
Dr. Xubin Zeng, University of Arizona

SAB Liaison:

Mr. Robert Winokur, Retired NOAA and the Navy (SAB Liaison)

EISWG Members unable to attend:

Dr. Ann Bostrom, Univ. Washington
Dr. John Snow, Univ. Oklahoma (Emeritus)
Ms. Veronica Johnson, WJLA TV - ABC7, Washington, DC

Presenters and Guests:

Ms. Laura Furgione, NOAA Deputy Assistant Administrator for Weather Services,
and Deputy Director, NWS

Ms. Andrea Bleistein, Physical Scientist, NWS Office of Organizational Excellence

Mr. Kevin Cooley, Director, Office of Planning and Programming for Service Delivery

Dr. Tom Graziano, NWS Chief of Staff, and Acting Director, NWS National Water Center

Mr. Peter Colohan, Senior Advisor, Office of the Chief Scientist, NOAA

Dr. Kevin Werner, Director, NWS Office of Organizational Excellence

Mr. Tim Owen, National Center for Environmental Information, NESDIS, Asheville, NC

Mr. Mike Halpert, Deputy Director, NWS Climate Prediction Center, College Park, MD

Dr. Wayne Higgins, Director, OAR Climate Program Office, Silver Spring, MD

Dr. Glen Anderson, Principal Associate and Senior Climate Change and Development Economist, Abt
Associates, Research Triangle Park, NC

Dr. David Legler, Director, Climate Observations Division, NOAA Climate Program Office, OAR,
Silver Spring, MD

Ms. Josie Quintrell, Executive Director, IOOS Association, Harpswell, ME

Mr. Brian Eiler, Sr. Advisor to NOAA Administrator, Washington, DC

Mr. Jed Sundwall, Amazon Web Services, Seattle, WA

Dr. Mohan Ramamurthy, Director, UNIDATA, Univ. Corp. Atmospheric Research, Boulder, CO

Dr. Richard Spinrad, NOAA Chief Scientist, Washington, DC

Dr. Shalini Mohleji, Senior Advisor to the NOAA Administrator, Washington, DC

Ms. Jennifer Sprague-Hilderbrand, Senior Advisor, Office of the Chief of Staff, NWS/OAA/COS,
Silver Spring, MD

AGENDA – DAY ONE

Thursday, May 5, 2016

TIME	TOPIC	SPEAKER/FACILITATOR	EXPECTED OUTCOME
8:15 - 9:00	Meet and Greet	<i>All</i>	
9:00 - 9:15	Welcome, Introductions, and Overview	<i>Nancy Colleton & Walt Dabberdt, EISWG Co-Chairs</i>	<i>Adoption of Agenda</i>
9:15 - 10:15	Update on NOAA, NWS, and WMO activities	<i>Laura Furgione, Deputy Director, NWS</i>	<i>Informational. Resolution 40 Overview. WMO private public partnership discussion in June 2016</i>
10:15 - 10:30	Break		
10:30 - 12:00	Ocean Data Access and Use	<i>Bob Weller (facilitator) David Legler, Head, NOAA OAR Climate Program Office, Climate Observations (Invited) Josie Quintrell, Director, IOOS Association</i>	<i>Informational. Identification of potential topics for EISWG consideration.</i>
12:00 - 1:00	Lunch Break	On your own	
1:00 - 2:30	NOAA Big Data Initiative	<i>Brian Eiler, Senior Advisor to the NOAA Administrator Jed Sundwall, Amazon Web Services Mohan Ramamurthy, UNIDATA/OCC</i>	<i>Informational. Identify issues or recommendations</i>
2:30 - 2:45	Break		
2:45 - 3:00	NOAA Chief Science Officer Membership Perspectives	<i>Richard W Spinrad, NOAA Chief Scientist</i>	<i>Identification of possible ESIWG topics, expertise, and candiates</i>
3:00 - 5:00	EISWG Membership	<i>Executive Session: All EISWG Members</i>	<i>Review draft EISWG work plan; Discuss membership vacancies and identify new members</i>
5:00 - 6:30	Adjourn, Break		
6:30 - 8:30	EISWG Dinner	<i>All EISWG Members and Guests All Set Restaurant & Bar 8630 Fenton Street Plaza 5 Silver Spring, MD 20910</i>	<i>EISWG Members, NOAA Participants, Guests</i>

AGENDA – DAY TWO

Friday, May 6, 2015

TIME	TOPIC	SPEAKER/FACILITATOR	EXPECTED OUTCOME
8:00 - 8:30	Meet and Greet	<i>All</i>	
8:30 - 9:00	Welcome, Introductions, and Overview	<i>Nancy Colleton & Walt Dabberdt, EISWG Co-Chairs; CWG Chair; DAARWG Chair;</i>	<i>Review of previous day results and actions. Review engagement with CWG and DAARWG</i>
9:00 - 9:30	NWS Office of Organization Excellence	<i>Kevin Werner, Director, Office of Organizational Excellence, NOAA NWS</i>	<i>Provide input to planning and strategy</i>
9:30 - 9:45	Break		
9:45 - 11:00	Regional Climate Services	<i>Panel discussion with short (10 min) presentations from the following: NESDIS/NCEI regional climate services (Tim Owen), NWS climate prediction (Mike Halpert), and OAR Climate Program Office (Wayne Higgins).</i>	<i>Informational.</i>
11:00 - 12:15	Water Center Case Study	<i>Bill Hooke (facilitator) Tom Graziano, NWS/NWC Glen Anderson, Abt Associates</i>	<i>Informational and discussion on collaborations.</i>
12:15 - 1:30	Lunch Break	<i>On your own</i>	
1:30 - 3:00	EISWG Workplan, Discussion and Nominations	<i>Colleton and Dabberdt (closed session) All EISWG Members</i>	<i>Identify future EISWG meeting topics and finalize recommendations for EISWG nominations</i>
3:00 - 3:30	Summary and Adjourn	<i>Colleton & Dabberdt</i>	<i>Review actions, update work plan, and identify next meeting time and venue</i>

SESSION SUMMARIES

Update on NOAA, NWS and WMO Activities

Laura Furgione, Deputy Director, NOAA's National Weather Service and Permanent Representative to the UN World Meteorological Organization, discussed various NOAA, NWS, and WMO activities. Key points include:

- Furgione will be attending the WMO Executive Council meeting in Geneva in June. A partnership meeting will be held June 16 in conjunction with the Executive Council meeting to examine the role of the private sector. Mason Brown, NOAA Deputy Administrator, will also be attending the meeting.
- One of the areas of high priority for NOAA is examining the weather-water-climate nexus.
- NOAA is considering how to contribute to the 2030 Sustainable Development Goals (SDGs) and Future Earth (a global research platform launched in 2015).
- Open Data and Big Data continue to be a major focus for NOAA. Open data being defined as an internal data management challenge to allow better access by external actors. Big data being defined as external exchange for improved integration and product development. It has become clear that the government as well as Silicon Valley (the private sector) have much to learn in this area. Furgione thanked EISWG for the role it has played in advancing concepts of big and open data.
- There is a current focus on WMO Resolutions 40, 25, and 60 with respect to international data sharing policies and the meaning of "free and open" data. Concern exists that these policies are old and would need to be updated, but the US position is that there is sensitivity with countries that may have different objectives. Therefore, the current thinking is that the US should not change these resolutions and make data exchange more liberal.

Ocean Data Access and Use

Two presentations illustrated the breadth of NOAA's involvement in the collection of ocean data and point to their many potential uses. The first presentation was by David Legler, head of the Climate Observations Division of the Climate Program Office in NOAA OAR; this presentation focused on the open ocean or blue water observations and data. The second presentation was by Josie Quintrell, Director of the IOOS Association, and focused on the coastal observations and data collection by the Regional Alliances in place along U.S. coastal waters.

Open Ocean

Legler pointed out that the global ocean has large societal impacts and ocean observing, collection, of ocean data, and provision of ocean data are essential to NOAA's missions. NOAA has taken a lead

internationally in global ocean observing with the Climate Program Office and its Climate Observations Division having foci on global ocean observations, Arctic observations, and climate monitoring and development of products. He explained the drivers for the Climate Observation Division and described the global in-situ ocean climate observing systems. Legler used the ARGO profiling floats as one example of the observing effort going on with international partners and then stepped through the other components of the Global Ocean Observing System (GOOS), including the tropical moored buoy arrays, volunteer observing ships, surface drifters, repeat hydrography, ocean time series sites, and expendable bathythermographs (XBTs). The international framework for ocean observing is coordinated internationally and moving ahead to quantify requirements for GOOS. Going forward, new efforts will add increased observations in the deep ocean below the 2,000m depth of current ARGO floats, and will also add increased observations of biological and biogeochemical variables.

Coastal Ocean

Qunitrell introduced the coastal observing effort, known as the Integrated Ocean Observing System or IOOS, which is multiagency and stakeholder-driven. IOOS is comprised of associations that take on regional observing and data collection. Regional associations have oversight and are undergoing a certification process that includes looking at their governance and data management centers. IOOS observing efforts include HF (high frequency) radar, ocean gliders, animal observing and telemetry, wave measurements, and biological observations. These observations are used in search and rescue efforts, oil spill management, by the Army Corp of Engineers, by the National Weather Service (NWS), and for ocean acidification studies. Illustrative of the partnerships involved, over 50% of the data used by NWS comes from non-Federal observing efforts. IOOS has paid attention to data quality and developed best-practices manuals. The IOOS Data Management and Access Center (DMAC) provides access to ocean data and also supports access to model data and model comparisons. IOOS is engaged in research-to-operations transitions and supports a coastal modeling testbed. Quintrell provided examples of IOOS involvement, including the Refugio State Beach oil spill, harmful algal bloom events, work with mid-Atlantic fisheries, and Gulf of Mexico navigation. IOOS is also involved in ocean technology transitions and has assessed the economic value of ocean industries; an IOOS/NOAA ocean enterprise study identified 410 companies in 36 states with annual revenues of \$7B.

NOAA Big Data Initiative

Discussants on NOAA's Big Data initiative included: Brian Eiler, Senior Advisor to the NOAA Administrator; Jed Sundwall (by phone), Amazon Web Services; and Mohan Ramamurthy, UNIDATA/Open Commons Consortium (OCC).

NOAA's Big Data project is already yielding exciting results by opening global access to and expanding the value of NOAA's environmental data. The project leverages elasticity, virtualization and on-demand capabilities of cloud infrastructure. NOAA is engaging 5 collaborators -- AWS, Google, IBM, Microsoft, and OCC -- in exploratory activities to host environmental data. The project's objectives are

to increase usability, understandability, and commercial growth at no additional cost to the government.

Big Data collaborators focus on bringing cloud processing to the data to optimize the speed of exploitation. Their policy is to provide data on equal access and equal terms without exclusive access to any data sets. Current and near-future data sets include NEXRAD II, GOES R, MRMS (Multi-Radar Multi-Sensor), and numerical model output. Collaborators are underway handling these large data sets. Unidata is deploying enabling tools and training to ease access and use by its university researchers of NOAA data in collaborator clouds. Amazon has streamlined the approach to access the full legacy of NEXRAD data, already yielding improved efficiencies and services.

Discussants were unanimous in seeing big data and enhanced data analytics transforming environmental information services to yield hugely positive benefits, but with uncertain consequences for public-private partnerships. Key challenges include establishing the business models and getting users to embrace the cloud and changed work flows. Accordingly, the project merits continuing emphasis and attention.

NOAA Chief Scientist Membership Perspectives

Richard Spinrad, NOAA Chief Scientist, highlighted and reiterated the unique contribution of the working groups of the NOAA Science Advisory Board to NOAA's mission. The working groups, including EISWG, provide an essential outside voice and source of feedback and advice. They are an important conduit between NOAA and its many partners and between those partners and NOAA. Within the next few months, a number of EISWG members, several of whom have served since EISWG's inception, will be rotating off the working group. Dr. Spinrad stressed the importance that the nominations EISWG sends forward to the Science Advisory Board capture, and even expand upon, the broad range of expertise and professional backgrounds of the current EISWG membership. Dr. Spinrad also recommended that, as EISWG prepares a list of candidates for consideration by the Science Advisory Board, it consider new and upcoming NOAA initiatives and developments. Alignment of the expertise of some of the candidates with these initiatives has the potential to be of particular benefit to NOAA.

NOAA Office of Operational Excellence

Kevin Werner and Andrea Bleistein briefed EISWG on the stand-up and the initial activities of the one-year-old NWS Office of Organizational Excellence (OOE). They reviewed the OOE vision (an organizationally healthy NWS capable of continuous change for maximum relevancy) and mission (helping NWS with respect to strategic thinking, challenging the status quo, enabling change, creating connections). Their presentation provided examples of OOE initial actions toward these ends – an especially impressive list given the small size of the Office (3 FTE's). EISWG members provided several suggestions, particularly with respect to the importance of addressing not just the leadership but

working across NWS at the bench-level, and building leadership capacity (and hence enthusiasm and morale) of early-career NWS employees. EISWG members offered examples of such leadership development at universities (e.g., University of Arizona: <http://ali.arizona.edu/>) and other federal agencies (e.g., NASA: http://www.nasa.gov/pdf/293237main_62657main_1_pmchallenge_daniel.pdf.)

Regional Climate Services

The regional climate services session included briefings by Tim Owen from NESDIS/NCEI, Mike Halpert from NWS Climate Prediction Center, and Wayne Higgins from OAR Climate Program Office.

Mr. Owen gave an overview of the National Centers for Environmental Information (NCEI), including the Center for Weather and Climate and the Center for Coasts, Oceans, and Geophysics. Together, the centers provide over 700 NOAA data products. The size and diversity of the data products demand tactical data management. They aim to expand and enrich uses of NCEI's environmental information with sectoral and regional engagement. They also seek to understand users and user requirements with regards to decisions on developing new data products and retiring old products. Furthermore, they look for ways to strengthen networks for developing and delivering NCEI's products and services. The recent user surveys provide a good baseline on users and user requirements and moreover for trend analyses in the future. Approximately 50 data products have been retired to date. When asked about plans for adopting Big Data and Analytics solutions for NCEI data products, Mr. Owen responded that currently there are no such. Mr. Higgins added that NOAA contributes to the development of analytics toolkits under the President's climate resilience initiative, which could lead to analytical tools for climate data products.

Mr. Halpert introduced the NOAA/NWS/NCEP Climate Prediction Center (CPC). The focus of CPC is on short-term climate (week 2 to seasonal-to-interannual), climate variability, climate prediction, and climate monitoring. In addition, experiments run for weeks 3-4 include temperature predictions over the ocean during Atlantic hurricane seasons. One of their main challenges is climate data reanalysis. The reanalysis model was established in the 1990s and parameters have not been optimized for the current climate. Instead, they rely on NCAR reanalysis data. Questions were raised that CPC's reanalysis methods might be a bit dated and the need for a new reanalysis system to help understand the role of ocean on climate variability. Mr. Halpert emphasized that CPC data products are for large-scale climate forecasts, not for local climate effects. Regarding annual climate assessments, Mr. Halpert indicated that NCEI is the lead organization but with substantial support from CPC. Beyond NOAA, CPC works with the Department of Agriculture on a joint agriculture-weather facility to support briefings on global weather and crop production. CPC also works with USAID on addressing droughts in Africa. For example, in 2015, CPC offered training for 12 students from Africa. Major collaborations are underway with academia on climate model ensembles and seasonal outlooks for North America. Mr. Halpert concluded his overview with near-term challenges and planning for the future. With an overall emphasis on better meeting user's needs, CPC plans to improve product displays (especially regarding information on probabilistic forecasts) and make user interfaces more friendly with enhanced tools

(such as probability of exceedance tool for seasonal outlook). Regarding responsible for snow forecasting (especially snow depth), Mr. Halpert indicated that it would be CPC. He further elaborated that while CPC generates 2-week hazard products, they do not include snow products. Quality snow data are lacking because of several difficulties, including snow measurements. Furthermore, CPC is working with FEMA on limited snow forecasts.

Dr. Higgins gave an update on activities to better engage NOAA partners on delivering climate services at regional and local levels. The goal is to produce cost-effective and efficient regional climate services with multiple entry points. NOAA climate engagement entities include regional climate centers, river forecasts centers, and regional integrated science and assessment (RISA) centers. The NOAA Climate Board provides the leadership to engage these NOAA partners. The Climate Board consists of representatives from five line offices and looks at climate issues across NOAA, including budgeting and planning. Under the Board, Dr. Higgins chairs a climate coordination team (formerly climate goal team) with executive-level members. In 2015, the team was tasked to look at how information is provided to different NOAA line offices and whether the dissemination is cost effective and efficient. They conducted four case studies (California drought/El Nino, climate impacts on marine resources in the NE region, recurrent coastal flooding in the SE, and Alaska terrestrial and marine issues). Each case study produced a 2-page summary. Together, the case studies concluded with three areas for improvements: 1) stronger coordination between NOAA HQ and regional entities; 2) more integrated weather and climate information with analytical tools; and 3) better components of messaging through public-private partnerships to multiple sectors and levels of users. Follow-up actions include: investing in climate resilience toolkits for service- and application-oriented users; building a “find an expert” page for users to find experts and services available by location; establishing a NOAA climate help desk to direct users on information/data search; and establishing open lines of communication on issues like regional climate services and visions across NOAA and opportunities like NOAA engagement entities summit, including USAID, DOA, and FEMA etc. An EISWG member asked about (1) connections to the NOAA Big Data Project so that users don’t need to navigate through three line offices to find climate data, and (2) plans to include analytics tools in the cloud for climate studies. Dr. Higgins responded with a slide introducing <http://www.data.gov/climate/>, which provides a single point of entry to climate data for analysts, developers, and data innovators and <http://toolkit.climate.gov>, which provides summary level information useful for decision makers as well as case studies and tools. During the discussion, EISWG members re-emphasized the need for terms of equal access, meta data in digital forms, semantics and ontological information for usage and links across data sets, and balance between the science and forecast skills.

National Water Center

Dr. Tom Graziano, Director of the NWS/National Water Center (NWC), provided an update and overview. There is a profound impetus for change: multiple threats due to population growth, economic development, changing climate (see “Stationarity is Dead: Whither Water Management” http://aquadoc.typepad.com/waterwired/files/milly_et_al.pdf), aging water infrastructure, escalating

socioeconomic risks of droughts and floods, and recent increases in significant rainfall events. These yield interrelated grand challenges: water extremes, water security, water quality. The Mississippi River flooding and drought, and Hurricane Sandy are two examples. Over 100M people in the U.S live near the coasts that do not have adequate river/water forecasts today.

Congress appropriated \$25M to build the National Water Center in Tuscaloosa, AL, with initial operating capability (IOC) in May 26, 2015. The NWC includes 7 USGS employees. The NWC is on the President's budget line. NWS expects to be able to hire 12 FTEs to stand up the operations center for water resources common operating picture (Earth system modeling and geo-intelligence for water prediction.) They expect to become operational June 21, 2016 for operational water forecasting using the new Weather & Climate Operational Supercomputing System (WCOS). The NWC uses a three-pronged information dissemination approach: using the NOAA Operational Model Archive and Distribution System (NOMADS), a public-facing website, and direct access to the RFCs. The NWC has four modes of modeling operations:

- Assimilation mode from -3 hours to real time
- Hourly out to 18h
- GFS (Global Forecast System) out through 10 days
- 16-member ensemble out to 30 days

NWC stakeholder priorities include flooding, water quality, water availability, drought, and climate change; these lead to the need for actionable water intelligence through high-resolution integrated water analyses, predictions, and data. The NWC transforms information into intelligence by linking hydrologic, infrastructural, economic, demographic, environmental, and political data. The NWC is highly constrained by available high performance computing cluster (HPCC) capabilities. Their greatest source of uncertainty is quantitative precipitation forecasting. Needs include water model, infrastructure location, and other data (e.g., demographic, economic, environmental, political), which need to be combined. The NWC operational model needs to be coupled with the water model and the estuary model from NOS. There are five priorities in NWC forecasting: flooding, water quality, availability, drought, and climate change. We need to consider the anthropogenic components (e.g. dams, reservoirs). It was noted that the state of water modeling and forecasting today is where weather forecasting was more than ten years ago—the progress and prospects are exciting. A concern was raised that NWC needs to consider what has already been done by the private sector.

Glen Anderson, Economist with Abt Associates discussed the value chain associated with water services. It is difficult to keep providing climate services (versus other expenditures). The primer "Valuing Weather and Climate" is available at <https://www.gfdrr.org/sites/default/files/publication/SEB%20HYDROMET.pdf>. Anderson works with the International Research Institute for Climate and Society (IRI) to predict monthly/seasonal temperature and precipitation for wheat planning for Kazakhstan, and has observed the difficulty and complexity in farmers' decision-making. For example: business pays more for information on unfavorable conditions, and benefits depend on the divergence between forecasted states and normal state.

EISWG Strategic Work Plan & New Member Nominations

Twenty-two individuals were considered for nomination to EISWG based on:

- The EISWG Terms of Reference
- The proposed EISWG Work Plan
- The intellectual and cultural diversity of current EISWG members

It was agreed that the full membership would be polled to determine which individuals' names should be brought to the SAB as EISWG's nominations to fill as many as eight vacancies that will exist at the end of 2016.

As noted on the EISWG Terms of Reference dated 4/22/13, "The EISWG is charged to: 1) provide advice on improving communication among the sectors, 2) provide advice on incorporating scientific and technical capabilities to enhance NOAA products and services, 3) provide a sounding board regarding implementation of NOAA's Policy on Partnerships in the Provision of Environmental Information, and 4) evaluate NOAA effectiveness in responding to advice received from the EISWG, and the environmental information enterprise as a whole."

EISWG members proposed the elements of a work plan that includes:

- Examining the evolving nature of environmental information services;
- Examining the emerging value and complexity of the blue economy;
- Continued examination of the NOAA public-private partnerships;
- Examining and encouraging multidisciplinary approaches for improved environmental information;
- Assessing how best to infuse environmental information as part of decision making; and
- Examining how best to enhance, optimize, and harmonize the delivery of environmental information services across the NOAA enterprise.

End of Meeting Summary