

**Summary Minutes of the United States Environmental Protection Agency (U.S. EPA) Joint
Meeting of the Science Advisory Board (SAB) and
Board of Scientific Counselors (BOSC)
July 24-25, 2014**

Date and Time: Thursday, July 24, 2014, 10:00 a.m. - 5:30 p.m. and Friday, July 25, 2014, 8:30 a.m. - 2:30 p.m.

Location: Washington Marriott Georgetown Hotel, 1221 22nd Street NW, Washington, DC

Purpose: To discuss Office of Research and Development's (ORD's) plans to develop Strategic Research Action Plans for 2016-2019.¹

Meeting Participants:

SAB Members (See Roster²)

Dr. David T. Allen, SAB Chair	Dr. Kristina Mena
Dr. George Alexeeff	Dr. Surabi Menon
Dr. Joseph Arvai	Dr. James R. Mihelcic
Dr. Thomas Burbacher	Dr. H. Keith Moo-Young
Dr. Ingrid Burke	Dr. Eileen Murphy
Dr. Edward Carney	Dr. James Opaluch
Dr. Peter Chapman	Dr. Duncan Patten
Dr. George Daston (by telephone)	Dr. Richard Poirot
Dr. Michael Dourson	Dr. Amanda Rodewald
Dr. David Dzombak	Dr. James Sanders
Dr. Elaine Faustman	Dr. William Schlesinger
Dr. Steven Hamburg	Dr. Gina Solomon (by telephone)
Dr. Robert Johnston	Dr. Daniel Stram
Dr. Kimberly L. Jones	Dr. Peter Thorne
Dr. Catherine Karr	Dr. Jeanne VanBriesen
Dr. Nancy K. Kim	Dr. John Vena
Dr. Francine Laden (by telephone)	Dr. Peter Wilcoxon (by telephone)
Dr. Lois Lehman-McKeeman	

BOSC Executive Committee Members (See Roster³)

Dr. Katherine von Stackelberg, Chair	Dr. Kenneth Reckhow
Dr. Viney Aneja	Dr. Robert Richardson
Dr. Edward Carney (also SAB Member)	Dr. Sandra Smith (by telephone)
Mr. Shahid Chaudry	Dr. Ponisseril Somasundaran
Dr. Susan Cozzens	Dr. Paula Olsiewski
Dr. Courtney Flint	Dr. Tammy Taylor
Dr. Earthea Nance (by telephone)	Dr. John Tharakan (by telephone)
Dr. Dennis Paustenbach	

Liaisons to the SAB:

Dr. Sheela Sathyanarayana, Chair, Children's Health Advisory Committee

EPA presenters:

Mr. Lek Kadeli, Acting Assistant Administrator, ORD
Dr. Robert Kavlock, Deputy Assistant Administrator for Science, ORD
Ms. Kathy O'Brien, Director of the Office of Planning, Analysis, and Accountability,
Office of the Chief Financial Officer
Dr. Elaine Cohen-Hubal, ORD
Dr. Walt Nelson, ORD
Dr. Daniel Costa, ORD
Dr. C. Andrew Miller, ORD
Ms. Mary Manibusan, ORD
Dr. Tina Bahadori, ORD
Dr. John Vandenberg, ORD
Dr. Gregory Sayles, ORD
Dr. Suzanne van Drunick, ORD
Dr. Michael Slimak, ORD

DFOs:

Dr. Angela Nugent, SAB Staff Office, Designated Federal Officer for the Chartered SAB
Ms. Cindy Roberts, ORD, Designated Federal Officer for the BOSC Safe and Sustainable
Water Resources Subcommittee and Acting DFO for the BOSC Executive
Committee
Mr. Edward Hanlon, SAB Staff Office, Designated Federal Officer for the Homeland
Security Breakout Group
Mr. Stephanie Sanzone, SAB Staff Office, Designated Federal Officer for the Safe and
Sustainable Water Resources
Dr. Suhair Shallal, SAB Staff Office, Designated Federal Officer for the Chemical Safety
for Sustainability Breakout Group
Dr. Holly Stallworth, SAB Staff Office, Designated Federal Officer for the Sustainable
and Healthy Communities Breakout Group
Mr. Aaron Yeow, SAB Staff Office, Designated Federal Officer for the Air, Climate and
Energy Breakout Group

Other Attendees:

Attachment A lists members of the public who requested the call-in information for this meeting.

Meeting Materials:

All materials for the meeting are available on the SAB webpage at:
<http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/48ab79bc18a0ef1985257c9b005d4f8d!OpenDocument&Date=2014-07-25>

Meeting Summary July 24, 2014:

The meeting generally followed the issues and timing as presented in the agenda.⁴

Convene the meeting

Dr. Nugent and Ms. Roberts formally opened the meeting and noted that this joint federal advisory committee meeting of the SAB and BOSC had been announced in the Federal Register.⁵ They briefly described the mission of the two advisory committees and the authorities under which the committees operate. The SAB is an independent, expert federal advisory committee chartered under the authority of the Federal Advisory Committee Act (FACA). The SAB is empowered by law (the Environmental Research, Development, and Demonstration Authorization Act) to provide advice to the EPA Administrator on scientific and technical issues related to the EPA's decisions. The BOSC was established and operates at the request of ORD under authority of the Federal Advisory Committee Act. It provides advice and recommendations on both the technical and management aspects of ORD and its research programs.

Ms. Roberts noted that the Federal Register notice meeting announcement had provided the public with an opportunity to provide written and oral comment. There were three requests for oral comment and two sets of written comments submitted by the public for the meeting.

Dr. Nugent noted that the SAB and the BOSC committees consist entirely of special government employees appointed by the EPA to their positions. As government employees, all the members are subject to all applicable ethics laws and implementing regulations. She noted that the SAB Staff Office had reviewed financial disclosure forms provided by SAB members and other information related to the public statements expressed by experts on these committees related to the advisory activity under consideration.

After reviewing this material the EPA SAB Staff Office had determined that advisors participating in the meeting have no financial conflicts of interest or appearance of a loss of impartiality under ethic regulations specified in 5 CFR 2635 relating to the topic of this meeting, with one exception. After reviewing information provided by Dr. Robert Johnston, the EPA SAB Staff Office asked Dr. Johnston to be recused from any discussion of the ORD's Sustainable and Healthy Communities activity entitled "Final Ecosystem Goods and Services."

SAB members holding or pursuing competitive grants have no financial conflicts of interest or appearance of a loss of impartiality under the ethic regulations and the advisory activity before the Board and the BOSC has a broad, strategic scope. However, in an abundance of caution, the SAB Staff Office asked the following SAB members to recuse themselves from discussions of centers where they hold or are seeking competitive grants should that topic arise in conversation: Drs. David Allen, Elaine Faustman, and James Mihelcic.

Goals and agenda for the meeting

Dr. David Allen, the SAB Chair, welcomed the group. He briefly noted the purpose of the meeting, to discuss and develop advice regarding ORD's plans to develop Strategic Research Action Plans (StRAPs) for 2016-2019. Dr. Katherine von Stackelberg, the BOSC Chair, added her welcome. SAB and BOSC members introduced themselves.

ORD Overview Remarks and Introduction of National Program Directors

Mr. Lek Kadeli, ORD Acting Assistant Administrator, noted that ORD has benefited from past SAB-BOSC advice. He noted that the EPA Administrator, Ms. Gina McCarthy, has publicly affirmed the importance of science to the EPA and to achieving a “clean and prosperous future.” He briefly listed some of ORD’s recent successful scientific work products. Among them were the National Storm Water Calculator and Assessment Tool; ToxCast data for 1,800 chemicals; a dashboard giving decision makers access to ToxCast and other computational toxicology data; and the Enviro Atlas to support community decisions.

He noted that to meet a complex set of current environmental problems, EPA’s science must be able to: address socially complex questions; bring different disciplines together; consider the impacts of energy production and use; factor in information about a changing climate; and operate in an “evolving budget environment.” ORD’s scientists must devise innovative ways to address problems. He asked the SAB and BOSC to identify emerging opportunities to help ORD ensure that scientific input for decision making will be strong and respond to current challenges.

Dr. Robert Kavlock, Deputy Assistant Administrator for Science, provided a presentation entitled *SAB/BOSC Meeting on Strategic Directions for EPA Research, 2016-2019*.⁶ He explained the relationship of ORD’s research programs to the EPA’s strategic goals; how research planning is linked to research results; the breakout of ORD’s FY 2015 President’s Budget by research program projects; ORD budget trends with inflation indices; the elements of ORD’s commitment to becoming a “high-performing organization;” some recent research highlights; and the purpose of roadmaps for four cross-cutting areas. He concluded by outlining a vision for future interactions with the BOSC and the SAB, summarizing the charge questions for the meeting, and identifying future-oriented science challenges. He expressed thanks to members participating in the SAB-BOSC meeting and the planning/briefing teleconferences that had helped prepare them for the meeting.

After Dr. Kavlock concluded his presentation, SAB and BOSC members asked several questions. Mr. Kadeli and Dr. Kavlock provided the following information in response to questions.

- ORD sees international collaboration and partnerships as critical to leverage expertise and experience. Recent areas of prominent international work include computational toxicology, energy-related research, and impacts on drinking water resources.
- ORD looks to leverage scientific expertise and resources outside the agency. The extramural Science to Achieve Results (STAR) program is active, with some requests funded by other federal agencies. The Federal Technology Transfer Act is an important way to leverage expertise outside the federal government. The EPA has had modest success with such efforts and could do more.
- Dr. Peter Preuss is still ORD’s Chief Innovation Officer. ORD is “mainlining” its innovation efforts. Currently, ORD is focusing the fourth round of Pathfinder Innovation Projects on the priorities of the six national programs, given the need to make the most of reduced resources. The EPA has also issued innovation challenges for water, computational toxicology, and remote sensing technology.
- ORD held a successful remote sensing workshop this summer. This is, in part, ORD’s response to the major private sector investment in this technology so that ORD can build on this strong emerging market and technology.

- ORD selected the four cross-cutting topics (children’s environmental health, climate, environmental justice, nitrogen and co-pollutants) by convening its Executive Council. Members brainstormed topics and developed a “heat map” showing their relationship to ORD’s national programs. ORD looked for topics where the agency had priorities and ORD could make a difference. ORD capped the number of topics at four to keep the planning and coordination efforts manageable. ORD has no plans for choosing new cross-cutting topics, although cumulative risk assessment could benefit from a synthesis.
- ORD does participate in international efforts to address global science needs and engage in global partnerships. All countries have a stake in eliminating duplication, but international coordination efforts have their own costs and sometimes a country’s stake in resolving a scientific question differs from the EPA’s.
- ORD does not currently have a plan to evaluate how it is achieving goals for the cross-cutting roadmaps. There will need to be evaluation. It may be appropriate to have roadmaps report back every few years. One measure of success is the extent to which they “push the science” to leverage more integration.

Orientation to the EPA Strategic Plan

Ms. Kathy O’Brien, Director of the Office of Planning, Analysis, and Accountability, Office of the Chief Financial Officer provided a presentation entitled “FY 2014-2018 EPA Strategic Plan.”⁷ The agency’s FY 2014-2018 plan differs from the previous plan in its consistent emphasis on sustainability and in its streamlined format. It was intended to be “simplified, useful, and used.” Each goal includes a science section and each objective identifies scientific and emerging issues. Science is incorporated as well into the EPA Strategic Plan’s discussion of cross-cutting strategies (sustainability, communities, partnerships, and a high-performing organization), which focus on improving how the agency does its work.

After Ms. O’Brien concluded her presentation, SAB and BOSC members asked several questions. In response, Ms. O’Brien and Dr. Kavlock provided the following information.

- The EPA’s cross-cutting strategies focus on how the agency does its work; ORD’s cross-cutting roadmaps seek to identify opportunities for integration across existing ORD research efforts.
- EPA identifies priority goals as part of its implementation of the Government Performance Results Act. Under that act, there is now an opportunity to identify one-year goals. The EPA’s senior leadership identifies those goals to give visible leadership to help accomplish those goals.
- The EPA recognizes that there will be a challenge engaging citizen scientists with the complexity of computational toxicology. Senior leaders have identified defining “communities” and “collaboration” as a major topic for discussion. The agency will need to clarify what is meant by these terms. Within that context, however, ORD’s development of mobile tools such as the “Village Green” is an important effort to communicate with citizens and engage their input.
- The EPA does not budget directly for its cross-cutting strategies, such as communities. By law, the agency’s goals must align with its statutes; goals and objectives must track with those goals; and budgeting follows accordingly. In a challenging budget environment however, EPA must work in collaborative, cross-cutting ways to achieve its environmental goals.
- In response to member comments that the budget provides a “fantastic opportunity” to communicate about the EPA’s work, Dr. Kavlock and Ms. O’Brien responded that the

EPA provides information to congressional committees and staff by invitation. The agency seeks opportunities to communicate about the breadth and nature of the EPA's scientific work.

Public comment

Dr. Nugent called on the three registered speakers⁸ in turn.

The first public speaker was Dr. Angela Malin Lynch, American Chemistry Council (ACC). She spoke from her written comments.⁹ She stated that ORD should recognize the EPA's recently released *Human Health Risk Assessment (HHRA) Framework* in planning HHRA outputs. She summarized ACC's recommendations to help the EPA develop what she described as "more efficient and scientifically relevant hazard, exposure and risk estimations, and to more accurately determine the probability of adverse health outcomes at environmentally relevant exposure levels." She encouraged continued improvement of the EPA's Integrated Risk Information System (IRIS), including institution of an independent monitor to "ensure that comments from reviewers have been appropriately and sufficiently addressed."

After Dr. Lynch completed her comments, she asked her ACC colleague, Dr. Richard Becker, to respond to a clarifying question from an SAB member. ACC does support funding for the EPA, where ACC feels it can actively support those efforts.

The second public speaker on the List of Registered Speakers, Ms. Diane D'Arrigo, was called for her comment but was not present.

The third public speaker was Dr. Richard A. Becker from ACC. He spoke from his written comments¹⁰ addressing ORD's draft *Chemical Safety for Sustainability Strategic Action Plan (2016-2019)*. He reiterated ACC's support for new tools to assess potential risks associated with chemicals, but called for a strong program of validation for those tools and continued stakeholder engagement on their use. He referred members to a recently published evaluation¹¹ of a high throughput EPA study of endocrine effects.

After Dr. Becker completed his remarks, he responded to a question from an SAB member. Dr. Becker noted that ORD is participating actively in Organization for Economic Cooperation and Development efforts focusing on molecular screening and testing. Those efforts bring together industry and governments worldwide.

Instructions for Breakout Groups¹²

Dr. David Allen and Katherine von Stackelberg provided guidance for the breakout groups. They asked each breakout group to address the charge questions¹³ posed by ORD and to be ready to report back on July 25, 2014.

After the Plenary session concluded, the five breakout groups (Air, Climate, and Energy; Chemical Safety for Sustainability and Human Health Risk Assessment; Safe and Sustainable Water Resources; Homeland Security; Sustainable and Healthy Communities) met from 2:00 p.m. to 5:30 p.m. with the assistance of the DFOs noted on page 3. Attachment B lists the members of the public attending breakout groups.

Meeting Summary July 25, 2014:

The DFOs opened the second day of the meeting. Dr. Nugent noted that Dr. Susan Cozzens would be serving as the Acting BOSC Chair, since Dr. von Stackelberg was not able to be present for the second day of the meeting.

Program Integration Road Maps - ORD Presentations and SAB/BOSC Discussion

Dr. Robert Kavlock provided a brief introduction to the program integration roadmaps. He noted that ORD-wide teams developed the draft documents, which were the product of a group effort.

Dr. David Allen asked SAB and BOSC members to focus their discussions on the ORD charge question: “How effective is each Draft Roadmap in presenting a problem statement, elucidating key research topics, capturing relevant research in each of the six programs, and identifying any important scientific gaps?”

Children's Environmental Health

Dr. Elaine Cohen-Hubal provided a presentation entitled *Children's Environmental Health Cross-cutting Research Roadmap*.¹⁴

Drs. Catherine Karr and John Vena provided comments as lead discussants and a general discussion followed. Dr. Karr stated that the roadmap provides a big picture of the unique niche that the EPA brings to children's health. The range of topics, from molecules and mechanisms to the basic science underpinning indicators for well-being, is ambitious and aspirational, and “not covered in this connected way” by other research organizations. She commended the EPA for its problem statement and summary of research, including the presentation of drivers, framework, and figures. The importance of cumulative impacts, including chemical and non-chemical stressors, is appropriate. The roadmap mechanism appears appropriate for fostering integration across programs. She asked, however, “Who is the steward of the children's environmental health roadmap? Who implements and makes sure the research happens?” The roadmap does not have a budgetary focus to show that research programs are responsive. The success of the roadmap will depend on whether participating programs and labs respond, how research budgets are distributed and individual researchers respond. There is an issue of stewardship and oversight.

She asked how priorities would be set for this ambitious research program, given resource limitations.

Dr. Karr also noted other research that should be included. There should be more emphasis on the “mid-level spectrum” that connects foundational research (e.g., animal testing, toxicological research) to actions providing information to communities. These “middle pieces” involve implementation and translational science, surveys of proven interventions, and evaluation science. She recommended that pediatric cancer should be a priority area. The devastating impacts of pediatric cancers, their links to environmental stressors, and increasing incidence merit attention. She noted a need for research on environmental contaminant uptake data as a gap that needs to be filled, given the Centers for Disease Control's biomonitoring program. The roadmap should also provide more emphasis on the need for ongoing support for longitudinal

cohort studies that can help assess real-life exposures within the context of nonchemical stressors.

Dr. John Vena provided additional comments as a lead discussant. He called for the roadmap to characterize international research more fully so that readers could understand ORD's efforts within the context of other activities. He agreed that the roadmap should describe efforts related to translational science more clearly and specifically. Although much of the key research described in the plan is well characterized, there is a need to discuss knowledge systems, integrated systems more fully.

Dr. Vena identified additional research areas to be included or better described. He asked how adverse outcome pathways and enzyme data were to be used or formulated. He recommended that the agency address a potential research gap that may be created if the National Institute of Environment Health childrens' studies are not finished. He encouraged ORD to take a public health perspective to define the outcomes to be developed or targeted. He asked for a more detailed discussion of cumulative risk assessment and how the EPA would take components and measures related to cumulative risk assessment and relate them to life stages. He called for the roadmap to provide a better discussion of research gaps and directions. Such a discussion could draw on World Health Organization guidance. The plan should have a greater emphasis on exposures, focusing on the timing of each exposure given outputs of interest at different life stages.

After Drs. Karr and Vena finished their comments, SAB and BOSC members made additional remarks. One member recommended that each roadmap provide a clearer endpoint for the reader to consider. Another member emphasized the importance of the National Children's Study and its focus on early life-stage exposures. Another member expressed concern that priorities were not clear in this ambitious and broad roadmap. He stated that only a small percentage of chemicals are developmental toxicants. He suggested that the roadmap focus on how to more efficiently identify chemicals that are uniquely problematic for children. That focus would bring efficiency to ORD's programs. Yet another member emphasized that children are not always the most sensitive endpoint and should not be considered as such. If the EPA is studying effects on children, it should study other sensitive endpoints as well. He also recommended that the roadmap make clearer the importance of novel methods for animal testing. The next comment came from a member who suggested that the roadmap involve children and youth in research, and include a youth science component. The discussion ended with a member commenting that the roadmap should more clearly communicate that pre-conception was a life stage to be addressed.

Nitrogen and Co-Pollutants

Dr. Walt Nelson provided a presentation entitled *Nitrogen & Co-pollutant Research Roadmap Presentation*.¹⁵

Drs. Kenneth Reckhow and David Dzombak provided comments as lead discussants. Dr. Reckhow commended the agency for a clear, well-written roadmap and provided oral comments adapted from his written comments.¹⁶ He recommended that the roadmap use value-of-information analysis to guide research choices for water quality modeling. He also noted that the roadmap refers to research being "adequate." Such a reference implies the use of uncertainty analysis but the roadmap does not describe uncertainty analysis efforts. Uncertainty analysis is

critical because uncertainties associated with models need to be explicit and understandable to stakeholders and decision makers. He expressed concern because most models envisioned by the roadmap do not generate uncertainty analyses. He completed his remarks by supporting efforts to explore the relationship between nitrogen criteria and designated uses.

Dr. David Dzombak summarized SAB and BOSC comments on the roadmap. There was consensus that the roadmap was well written, well organized, and highly responsive to previous SAB input. The problem statement was well formulated and well-developed. The Nitrogen and Co-Pollutant Roadmap is the most developed of all four roadmaps and makes appropriate connections to the StRAPs, especially to the Safe and Sustainable Water Resources (SSWR) StRAP and to other roadmaps. Table 1 is helpful in identifying these relationships; additional illumination would be helpful. An example is the SSWR research activity related to management of degraded water flows, which could include capture and transformation of nutrients as waste.

Dr. Dzombak also noted several comments to strengthen the document. He recommended that linkages with agriculture be clearer in the document. A major challenge, given that agricultural runoff is a primary driver and that control of agricultural runoff does not seem to be working, is the effectiveness of voluntary approaches. The roadmap should include more discussion of engaging the U.S. Department of Agriculture (USDA) and leveraging resources. Such points were mentioned in Dr. Nelson's presentation but not discussed clearly in the roadmap. Similarly, the roadmap should discuss the Mississippi Basin Healthy Waterside Initiative, an effort in which ORD should be engaged. He called for the roadmap to provide discussion of the Chesapeake Bay Program, which he called the "key national experiment on nutrient release to water." He also noted that the report does not discuss the approach for implementing the research described in the roadmap.

After Drs. Reckhow and Dzombak finished their comments, SAB and BOSC members made additional remarks. One member noted that the Nitrogen and Co-Pollutant Roadmap did not draw distinctions between agronomic impacts at different scales and with different flexibility. He noted that "not all farmers and agronomic stressors have same impact." He also called for more attention to suboptimal responses to waste water treatment. Another member recommended that the roadmap take an ecosystem approach to evaluating the "balance sheet" associated with the use of nitrogen in the environment. Nitrogen is beneficial in some cases and bad in others. A designated-use approach would make sense. Such an approach would link to sustainable communities and the need to educate people to make best use of resources. Other members asked for the roadmap to: (1) more clearly communicate the need for research to reduce aggregate introductions into the atmosphere; (2) provide more attention to the nitrogen feedbacks to the carbon cycle; (3) include more on the impacts of nitrogen and co-pollutants on microbial communities; and address the evolution in water quality technology to address nutrients.

Climate Change

Dr. C. Andrew Miller provided a presentation entitled *ORD Climate Research Roadmap - Presentation by Andy Miller*.¹⁷ He emphasized that the EPA's resources devoted to climate change are a very small percentage of the federal climate change budget. ORD can best develop this roadmap by focusing its resources on "actionable science" that relates to how the climate influences air and water quality in ways that the EPA can help address.

Drs. William Schlesinger and Surabi Menon provided comments as lead discussants. Dr. Schlesinger noted that despite the small amount of resources devoted to the climate research program, it is the most politically charged research topic. He advised that the roadmap focus on what the EPA can do to assess the consequences of defining carbon dioxide as a pollutant and the impacts of Corporate Average Fuel Economy (CAFE) standards and power plant reductions and to identify and evaluate future actions that could be taken in a similar vein. He advised that the plan include lifecycle analysis of renewable energy, including solar farms, tidal power, biochar, sequestration and storage. The EPA needs real-time field studies, information beyond laboratory experiments. This should be the direction of EPA research, given budget limitations. The EPA should rely on the Centers for Disease Control for research on disease effects and on USDA for research on agricultural impacts. It is valuable for the EPA to study the relationship of air pollution and human health and to better understand the widespread impact of nitrogen emissions on climate change. In his view, these priorities are much more important to pursue, rather than the EPA's cookstoves research.

Dr. Menon summarized the common themes from members' comments on the climate roadmap. Members called for the roadmap to provide more details on the goals, factors affecting integration, resources and associated implementation plan. Members called for milestones for evaluating its usefulness. There was a call for a more systematic approach in describing how the roadmap was developed and was to be implemented. Members called for more discussion about integration with other federal agencies and international organizations and how that research will be leveraged. One example is water and climate relationships. What is the role of other federal agencies and international organizations in research on the impacts of water on climate and climate on water? Some comments indicate that the climate roadmap does not communicate clear priorities for different ORD research programs. The roadmap discusses a need for expansion of social science research, but it is not clear how such research results would be used in the climate roadmap and what research program would undertake it. In pre-meeting comments, members noted a need to look at positives and negatives associated with different energy choices, including impacts on invasive species, which one member viewed as a priority theme. Finally, the roadmap refers to "tipping points," but this term is not defined, and an appropriate research focus would be on management strategies to avoid them.

After Drs. Schlesinger and Menon finished their comments, SAB and BOSC members made additional remarks. One member recommended that the climate roadmap clearly discuss its relationship to the EPA's climate change adaptation plan. Another member highlighted the opportunity in the climate change roadmap to clearly identify what is meant by social science research supporting the EPA's mission and how would be used. It would be important to "unpack" the heterogeneity of social sciences and to learn what is most needed for the agency. Yet another member suggested that this roadmap, like all the other roadmaps, should describe more clearly the unique role and capability of the EPA's ORD. There are a few places where this is briefly mentioned, but it is not explicitly discussed.

Environmental Justice

Ms. Mary Manibusan provided a presentation entitled *Environmental Justice Cross-Cutting Research Roadmap - Presentation by Mary Manibusan*.¹⁸ Drs. Kristina Mena and H. Keith Moo-Young provided comments as lead discussants. Dr. Mena began her comments by noting that the roadmap provided a great starting point with a problem statement that defines the goal well. The roadmap demonstrates a need for environmental justice questions to be addressed by all ORD

programs and identifies synergies. The draft roadmap, however, is in an early stage of development. Research priorities are not identified; the data gap section is not completed; and the roadmap lacks specific details about how environmental justice issues can be addressed. Although Appendix A to the roadmap lists research projects, there is a need for text to describe the significant research, methodologies and environmental justice questions. She called for the roadmap to describe how individuals in communities will be involved throughout the process. Involving individuals in communities is critical to achieving highly relevant and responsive research.

Dr. H. Keith Moo-Young thanked the EPA for developing the roadmap, which will bring clarity to environmental justice research needs. He provided brief remarks that summarized his impressions of recent meetings of the SAB Environmental Justice Technical Advisory Committee as related to the draft roadmap. He used a slide presentation to accompany his remarks.¹⁹ He noted that there is a need for both qualitative and quantitative data of high quality to be used for community science. There are needs for economic analysis on disproportional impacts of risks and regulations, as well as social and behavioral research on social and cultural dimensions of disproportional risks. It will be a challenge for the EPA to address cumulative risks, including economic and social co-stressors, since EPA risk assessments do not examine these factors. Finally, there is the need for large-scale pilot studies of disproportionate impacts, with results maintained in a database of case studies. With these needs, there will be new human resource demands on EPA science, so any strategic plan will need to map these priorities to the human resource needs of the future.

After Drs. Mena and Moo-Young finished their comments, SAB and BOSC members made additional remarks. One member recommended that ORD could learn much about engaging individual community members from a patient and community-centered research model. Another member noted that environmental justice research requires an interdisciplinary background and asked if ORD has any proposal to develop expertise or human capital in this area. Dr. Kavlock responded that ORD is considering this. Another member asked whether ORD is considering impacts of new approaches such as alternative energy strategies or water reuse on communities with environmental justice concerns. Another member asked whether the EPA is considering land-use decisions and impact on such communities. Ms. Manibusan responded that the EPA will be undertaking a full inventory of activities across ORD programs and will be looking at risk/risk tradeoffs.

A member suggested that ORD broaden the problem statement to include not only considering information and developing tools and understanding but also scientific challenges related to implementing solutions. Yet another member asked how many social scientists are in ORD. Dr. Kavlock responded that the number is difficult to quantify. Only two percent of ORD's work force are social scientists by job category, although many staff have social science training and do that kind of work.

After discussion of the individual roadmaps concluded, the SAB and BOSC Chairs asked if there were any additional pressing comments.

The Board's Liaison to the Children's Health Environmental Protection Advisory Committee (CHPAC), Dr. Sathyanarayana, made several comments related to the children's environmental health roadmap. She found it well-written and well-organized and made several suggestions to strengthen it: (1) although modeling and development of adverse outcome pathways are

important innovations, it will be important to continue human research to address gaps related to early life-stage susceptibility; (2) translating or transferring research findings to communities in understandable ways is a priority emphasized by the EPA Administrator at a recent meeting of the Children's Health Environmental Protection Advisory Committee; (3) CHPAC encourages support for the Children's Research Centers, which provide unique longitudinal data; and (4) the roadmap would benefit from more specific discussion of research gaps, especially of biomonitoring under age six. Other members agreed with the importance of the research of the Children's Health Centers.

Dr. Sathyanarayana also noted that the CHPAC had provided a letter to the Administrator²⁰ in 2013 regarding the social determinants of children's health, which may be useful both for the children's environmental health roadmap and the environmental justice roadmap.

Members then spoke of the significance of the roadmaps more generally. One member emphasized that the cross-cutting roadmaps were an important step forward for ORD and EPA. They framed research on questions that previously had not been addressed directly and were investments well justified. Other members supported this view and added concern about the implementation of these roadmaps. It will be important for the roadmaps to identify where EPA can and will lead. Stewardship should be clear. The SAB and the BOSC have the challenge to give the EPA advice on the overall lifecycle of these cross-cutting roadmaps in a way that encourages a useful number of them but prevents a proliferation of such efforts.

Other members spoke about the significance of the StRAPs and roadmaps as communication tools and science communication more generally. One member noted that it is ORD's job to explain EPA's science so that "regular people" can understand it.

The SAB and BOSC Members recessed and reconvened after lunch.

Air, Climate, and Energy Breakout Group Report

Dr. Ingrid Burke, rapporteur for the Breakout Group on Air, Climate, and Energy (ACE), provided a summary of her group's discussion.²¹ Dr. Peter Thorne served as facilitator for the group. There were no comments or questions from members of the SAB and the BOSC.

Safe and Sustainable Water Resources, Homeland Security Research Breakout Group Report

Dr. James Opaluch, rapporteur for the Breakout Group on Safe and Sustainable Water (SSWR), provided a summary of his group's discussion.²² Dr. Kimberly Jones served as facilitator for the group. After Dr. Opaluch's presentation, one group member noted that the group supported the agency's choice of priority topics but asked the agency to make priorities clearer in the StRAP. Another member stated that a framework for making decisions needs to be stated clearly. Another member addressed the need for social science research. She noted the need to study the role of knowledge, perception and values tied to behaviors. Such research is needed to understand how EPA can effectively roll out programs. The final comments called for inclusion of discussions of invasive species and secondary transport and of EPA's leadership role in the transformation of wastewater to a resource.

Chemical Safety for Sustainability and Human Health Risk Assessment Breakout Group Report

Dr. Edward Carney, rapporteur for the Breakout Group on Chemical Safety for Sustainability (CSS) and Human Health Risk Assessment Breakout Group provided a summary of his group's discussion.²³ He noted that the "honeymoon period" for the CSS program was coming to a close. Dr. Elaine Faustman, facilitator for the group, added that EPA expects that it will be conducting pilot tests and these will be important for the future of the program. After their remarks, SAB and BOSC members asked several questions. One member asked whether CSS tools had been used to analyze contaminated water in West Virginia. The response was that the tools had not been used for that emergency, but had been used for the Deep Horizon oil spill. Another member noted that there is a need to prioritize and triage tools based on what works and what doesn't work, so that the EPA can terminate research if it does not work to advance the mission. Yet another member called for international cooperation related to CSS research.

Sustainable and Healthy Communities Breakout Group Report

Dr. Joseph Arvai, rapporteur for the Sustainable and Healthy Communities (SHC) Breakout Group, provided a summary of his group's discussion.²⁴ Dr. Duncan Patten, facilitator for the group, remarked that it was challenging to provide advice to help the program address potential future problems, i.e., the "known unknowns." One group member added that he and others were concerned by the "excessive independence" the EPA's approach to quantifying and characterizing "well-being." The StRAP should make reference to the huge body of literature existing on this topic. He also expressed concern that ORD might be seeking transdisciplinary scientists who might not have the depth of expertise needed to "dive into complexity." The group was uneasy about the balance being achieved.

Homeland Security Breakout Group Report

Dr. Daniel Stram, rapporteur for the Homeland Security Group, provided a summary of his group's discussion.²⁵ Dr. Paula Olsiewski, facilitator for the group, provided her additional comments. She noted that the Homeland Security program was transitioning to an all-hazards approach, but still needs to accomplish its core work. After they completed their comments members of the SAB and the BOSC asked several questions and made comments. One member asked about the niche for ORD's Homeland Security program, given the efforts of other federal agencies. Dr. Stram noted that the EPA has a specific mission to protect water supplies and clean up acute threats (e.g., identifying chemicals for first responders); other agencies do not do that. Members discussed a need for the StRAP to discuss climate change adaptation and how that might affect Homeland Security research, perhaps by introducing changes to drinking water systems that may make it less secure. Members also identified a need to note integration with the Sustainable and Healthy Communities and Safe and Sustainable Water Resources programs in the area of community participatory involvement and social media. Members noted that the program has a small budget of \$20 million, but that limited budget underscores the need for integration with other agencies.

Action Items/Next Steps

Dr. David Allen thanked the lead discussants, rapporteurs, facilitators, and breakout group members. He asked Dr. Nugent to discuss next steps for developing an SAB-BOSC report.

Dr. Nugent asked lead discussants, rapporteurs and facilitators to provide draft text for their topics to her by August 8, 2014. She noted that the Air, Climate and Energy group had prepared initial draft text,²⁶ posted on the SAB webpage for the meeting. This text offers a model in terms of format, depth, and brevity for other groups to follow. Dr. Nugent stated that she will work with the BOSC DFO and the SAB and BOSC Chairs to draft a report integrating text from the leads for the roadmaps and breakout groups. This draft will be the focus of SAB and BOSC discussion to be scheduled for a public teleconference in September.

The SAB and BOSC Chairs thanked participants for the successful meeting and expressed appreciation for ORD and EPA staff involvement.

The DFOs adjourned the meeting at 2:30 p.m.

Respectfully Submitted:

/Signed/

Dr. Angela Nugent
SAB DFO

/Signed/

Ms. Cindy Roberts
Acting BOSC DFO

Certified as Accurate:

/Signed/

Dr. David Allen
SAB Chair

/Signed/

Dr. Katherine von Stackelberg
BOSC Chair

/Signed/

Dr. Susan Cozzens
Acting BOSC Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Attachment A: Members of the public attending the public meeting:

Amy	Battaglia	EPA
Rick	Becker	ACC
Lisa	Bergman	EPA
Elizabeth	Blackburn	EPA
Bryan	Bloomer	EPA
Lyle	Burgoon	EPA
Richard	Callan	EPA
Dan	Costa	EPA
Kevin	Crofton	EPA
Hiba	Ernst	EPA
Peter	Evanko	EPA
Lindy	Farrar	EPA
Michael	Firestone	EPA
Lynn	Flowers	EPA
Gary	Foley	EPA
Heather	Galada	EPA
Sarah	Gallagher	EPA
Annette	Gatchett	EPA
Andrew	Geller	EPA
Susan	Glassmeyer	EPA
Jim	Goodrich	EPA
Maureen	Gwin	EPA
Belinda	Hawkins	EPA
Alan	Hecht	EPA
Deborah	Heckman	EPA
Maria	Hegstad	Inside EPA
Deborah	Holman	EPA
Julie	Hyman	EPA
Annie	Jarabek	EPA
Marjorie	Jones	EPA
Steve	Jordan	EPA
Thomas	Knudson	EPA
Dave	Kryak	EPA
Jason	Lambert	EPA
Ron	Landy	EPA
John	Lehrter	EPA
Monica	Linnenbrink	EPA
Janette	Long	EPA
Michael	Loughrun	EPA
Richard	Lowrance	EPA
Angela	Lynch	ACC
Mary	Manibusan	EPA

Sarah	Mazur	EPA
Karen	Melehe	EPA
Andy	Miller	EPA
Kevin	Minoli	EPA
Jaqueline	Myra	EPA
Walt	Nelson	EPA
Tonya	Nichols	EPA
Edward	Ohanian	EPA
Kimberly	Osbourn	ICF International
Amanda	Peterbek	E&E
Kathleen	Raffaele	EPA
Santhini	Ramasany	EPA
Mary	Riley	EPA
Kelly	Rimer	EPA
Gaul	Robarge	EPA
John	Rogers	EPA
Faith	Rogers	EPA
Bill	Russo	EPA
Shawn	Ryan	EPA
Stephanie	Sanzone	EPA
Katherine	Saterson	EPA
Sue	Shallal	EPA
Mya	Sjegreen	EPA
Michael	Slimak	EPA
Thomas	Speth	EPA
James	Summers	EPA
Greg	Susanke	EPA
Emily	Synder	EPA
Lila	Thornton	EPA
Joe	Tietge	EPA
Mike	Troyer	EPA
John	Vandenberg	EPA
Alan	Vette	EPA
Randy	Waite	EPA
Barb	Walton	EPA
Ed	Washburn	EPA
Joe	Williams	EPA
Jennifer	Zaialem	EPA
Valerie	Zartarian	EPA
Hal	Zenick	EPA

Attachment B

Members of the Public Attending Breakout Groups

Tina	Bahadori	EPA
Tom	Brennan	EPA
Kirkley	Cain	EPA
Elaine	Cohen-Hubal	EPA
Hiba	Ernst	EPA
Andrew	Geller	EPA
Susan	Glassmeyer	EPA
Jim	Goodrich	EPA
Maureen	Gwin	EPA
Scot	Hagerthoi	EPA
Alan	Hecht	EPA
Annie	Jarabek	EPA
Marjorie	Jones	EPA
Peter	Jutro	EPA
Robert	Kavlock	EPA
David	Kryak	EPA
Monica	Linnenbrink	EPA
Mary	Manibusan	EPA
Andy	Miller	EPA
Walt	Nelson	EPA
Tonya	Nichols	EPA
Bridget	O'Brien	EPA
Ed	Ohanian	EPA
Amanda	Peterka	E&E
Kathleen	Raffaele	EPA
Mary	Raly	EPA
Andy	Ries	EPA
Cindy	Roberts	EPA
Shawn	Ryan	EPA
Greg	Sayles	EPA
Maya	Sjogren	EPA
Mike	Slimak	EPA
Emily	Snyder	EPA
Lindy	Tana	EPA
Joe	Tietge	EPA
Michael	Troyer	EPA
Suzanne	Van Drunick	EPA
John	Vandenberg	EPA
Alan	Vette	EPA
Barb	Walton	EPA

Ed	Washburn	EPA
Chris	Zarba	EPA
Valerie	Zartanan	EPA

Materials Cited

The following meeting materials are available on the SAB Web site, <http://www.epa.gov/sab>, at the page for the [July 24-25, 2015](http://www.epa.gov/sab) meeting: <http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/48ab79bc18a0ef1985257c9b005d4f8d!OpenDocument&Date=2014-07-25>

¹ ORD's plans for its six research programs and roadmaps for four cross-cutting issues:

- *Air, Climate, and Energy Strategic Research Action Plan, 2016-2019 (Preliminary Draft, July 2, 2014)*
- *Chemical Safety for Sustainability Strategic Research Action Plan, 2016-2019 (Preliminary Draft, July 2, 2014)*
- *Homeland Security Strategic Research Action Plan, 2016-2019 (Preliminary Draft, July 2, 2014)*
- *Human Health Risk Assessment Strategic Research Action Plan, 2016-2019 (Preliminary Draft, July 2, 2014)*
- *Safe and Sustainable Water Resources Strategic Research Action Plan, 2016-2019 (Preliminary Draft, July 2, 2014)*
- *Sustainable and Healthy Communities Strategic Research Action Plan, 2016-2019 Preliminary Draft (July 2, 2014, with corrected formatting)*
- *Children's Environmental Health Cross-cutting Roadmap, Preliminary Draft – July 2, 2014 (with corrected formatting)*
- *Climate Change Research Roadmap-Cross-cutting Roadmap, Preliminary Draft - July 2, 2014*
- *Environmental Justice Cross-cutting Research Roadmap, Preliminary Draft, July 2, 2014*
- *Nitrogen & Co-pollutants Cross-cutting Research Roadmap, Draft – July 2, 2014*

² Roster of SAB members

³ Roster of BOSC Members

⁴ Agenda

⁵ Federal Register Notice Announcing the Meeting, published June 18, 2014 (79 FR Pages 34738-34739)

⁶ SAB/BOSC Meeting on Strategic Directions for EPA Research, 2016-2019 - Presentation by Robert Kavlock

⁷ Kathy O'Brien presentation - FY 2014-2018 EPA Strategic Plan

⁸ List of registered speakers.

⁹ Public Statement from Angela Lynch on behalf of the American Chemistry Council

¹⁰ Public Statement from Richard Becker of the American Chemistry Council .

¹¹ T. Cox et al., Developing scientific confidence in HTS-derived prediction models: Lessons learned from an endocrine case study, *Regulatory Toxicology and Pharmacology* 69 (2014) 443–450

¹² Tentative Breakout Group Assignments.

¹³ Charge for Strategic Research Directions for EPA's Office of Research and Development (ORD) 2016-2019

¹⁴ *Children's Environmental Health Cross-cutting Research Roadmap - Presentation by Elaine A Cohen Hubal.*

¹⁵ *Nitrogen & Co-pollutant Research Roadmap Presentation.*

¹⁶ Kenneth Reckhow Review of Nitrogen & Co-Pollutants Draft Roadmap.

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- ¹⁷ *ORD Climate Research Roadmap - Presentation by Andy Miller.*
- ¹⁸ *Environmental Justice Cross-Cutting Research Roadmap - Presentation by Mary Manibusan.*
- ¹⁹ EJ Roadmap Lead Discussant Slides from H. Keith Moo-Young
- ²⁰ 2013 Letter from Pamela Shubat, Ph.D. and Sheela Sathyanarayana, M.D., M.P.H. to Administrator Gina McCarthy Regarding the Importance of Social Determinants of Health for Children (Letter text available at <http://www2.epa.gov/sites/production/files/2014-05/documents/chpac-sdh-letter-nov-2013-final.pdf>; appendices available at <http://www2.epa.gov/sites/production/files/2014-05/documents/chpac-sdh-appendices-final.pdf>)
- ²¹ Report from the Air, Climate and Energy Break-out Group
- ²² Report from the Safe and Sustainable Water Resources Breakout Group.
- ²³ Report from the Human Health Risk Assessment Breakout Group.
- ²⁴ Report from the Sustainable and Healthy Communities Breakout Group
- ²⁵ Report from the Homeland Security Breakout Group.
- ²⁶ ACE Breakout Draft Report Text