

Summary Minutes of the United States Environmental Protection Agency (U.S. EPA) Science
Advisory Board (SAB) Meeting
April 5-6, 2010

Chartered SAB Members: See Roster provided in Attachment A.

Date and Time: April 5, 2010, 8:30 a.m. to 5:30 p.m.; April 6, 2010, 8:00 a.m. - 12:00 p.m.
Eastern Time

Location: St Regis Hotel, 923 16th Street, NW, Washington DC 20006

Purpose: To continue the Science Advisory Board's (SAB's) discussions with the Office of Research and Development (ORD) concerning ORD's strategic research directions and to develop advice on ORD research areas for increased and decreased emphasis over the next five years.

SAB Members and Liaison Participants:

Dr. Deborah Swackhamer, Chair	Dr. Bernd Kahn
Dr. David Allen,	Dr. Nancy K Kim.
Dr. Timothy Buckley	Dr. Catherine Kling (Part of April 5,
Dr. Thomas Burke	2010 by telephone)
Dr. Deborah Cory-Slechta (April 6,	Dr. Kai Lee
2010 only)	Dr. Floyd Malveaux
Dr. Terry Daniel	Dr. Judith L. Meyer
Dr. George Daston	Dr. Christine Moe
Dr. Costel Denson	Dr. Eileen Murphy
Dr. Taylor Eighmy,	Dr. Duncan Patten
Dr. Elaine Faustman	Dr. Stephen M. Roberts
Dr. John P. Giesy	Dr. James Sanders
Dr. Jeffrey Griffiths	Dr. Gary Sayler (April 5, 2010 only)
Dr. Rogene Henderson	(Liaison with the Board of
Dr. James Johnson (Liaison with the	Scientific Counselors
National Advisory Council on	Dr. Paige Tolbert
Environmental Policy and	Dr. Robert Watts
Technology)	

EPA presenters and representatives

Dr. Paul Anastas, Assistant Administrator, EPA/ORD
Dr. Kevin Teichman, Deputy Assistant Administrator for Science, EPA/ORD
Dr. Dan Costa, National Program Director, Clean Air:
Dr. Audrey Levine, National Program Director, Drinking Water:
Dr. Chuck Noss, National Program Director, Water Quality:
Dr. Randy Wentsel, National Program Director, Land
Dr. Gregory Sayles, National Program Director, Homeland Security:

Dr. Sally Darney (Acting) National Program Director, Human Health:
Dr. Stan Barone (Acting) National Program Director, Human Health Risk Assessment:
Dr. Elaine Francis, National Program Director, Endocrine Disruptors and Safe Pesticides
and Products:
Dr. Darrell Winner (Acting) National Program Director, Global Change:
Dr. Rick Linthurst, National Program Director, Ecosystem Services:
Dr. Jeff Morris, National Program Director, Nanotechnology:
Dr. Alan Hecht, National Program Director, Sustainability:
Dr. Anne Grambsch, Global Change Research program
Dr. Michael Slimak, National Center for Environmental Assessment
Dr. William Sanders, National Center for Environmental Research
Dr. Fred Hauchman, Office of Science Policy

SAB Staff Office Participants

Dr. Angela Nugent, Designated Federal Officer (DFO)
Dr. Vanessa Vu, Director

Meeting Summary - April 5, 2010:

The discussion at the meeting followed the issues and timing as presented in the agenda (Attachment B).

1. Convene the meeting

Dr. Angela Nugent, SAB DFO, convened the advisory meeting and welcomed the group. She noted that two written public comments were received and that there had been no requests for oral public comment. Dr. Vanessa Vu, SAB Staff Office Director, expressed appreciation for members' preparations for the meeting. She also thanked ORD leadership for its willingness to provide opening presentations giving their perspectives on ORD research and thanked ORD's leadership and National Program Directors for their willingness to respond to chartered members' questions about ORD strategic research directions. She noted the SAB had provided advice on ORD's strategic research vision since 2007 and that the current meeting focused on research linked to the Administrator's priorities followed up on the chartered SAB's discussion of ORD's strategic research vision in November 2009.

2. Purpose of meeting and review of the agenda

Dr. Deborah Swackhamer, the SAB Chair, reviewed the goals for the meeting: to continue SAB discussions with ORD to develop SAB recommendations concerning ORD's strategic research directions and to develop advice on areas for increased and decreased emphasis over the next five years. She noted that the agenda was organized by Administrator Jackson's key priorities and was designed to provide time for SAB members to ask probing questions about how current and future ORD research supports decisions linked to those priorities. Since the agenda listed only two presentations from ORD representatives and the remainder of the agenda was reserved for discussion between SAB members and ORD, Dr.

Swackhamer challenged SAB members to ask questions and elicit information that would help them develop an advisory letter on EPA's strategic research directions. She noted that this interactive format was a new approach for the SAB to use in learning about and addressing EPA's strategic research needs.

Dr. Swackhamer noted that the SAB would hear presentations from the ORD Assistant Administrator, Dr. Paul Anastas and from Dr. Kevin Teichman, the Deputy Assistant Administrator for Science. Before their presentations, however, members would receive a briefing from Dr. Thomas Burke, Chair of the SAB Committee on Science Integration for Decision Making, about an original SAB study underway.

3. Update on SAB Committee on Science Integration for Decision Making

Dr. Thomas Burke provided a slide presentation (Attachment E) summarizing the activities of the committee he chairs. EPA's Administrator charged the committee to

- evaluate the extent to which EPA's scientific assessment practices are integrated into environmental decision-making practices, as recommended by the NRC and SAB
- identify barriers to implementing recommendations
- suggest immediate and future actions to promote integration, considering scientific leadership, scientific practices, collaboration across disciplines, scientific expertise, and workforce.

He described committee activities to date. The committee conducted 73 fact-finding interviews with senior leaders in EPA programs and regions, managers, and scientific staff. He noted several emerging key themes: 1) decisions requiring science occur at all levels of EPA; 2) science integration practices vary widely; 3) much of EPA's scientific workforce is outside ORD and there are challenges and opportunities in working with EPA's entire scientific workforce to enhance science integration; 4) EPA regions would like more input into ORD research planning and more technical support to improve science integration; and 5) ORD's transformation process holds promise of improving science integration and will need to be complemented by a shared vision of science integration across EPA. The committee is planning a workshop in Fall 2009 to obtain EPA and stakeholder input on initial findings and preliminary recommendations.

Chartered SAB members then followed up with comments and questions. A member endorsed Dr. Burke's comment that a "SWAT team" might be useful to provide nimble science or research planning support on a priority regional topic. Members noted the importance of integrating such activities into EPA's annual performance system and addressing the need for incentives. Chartered SAB members noted the importance of mentoring for scientists across the agency.

Breaking down institutional stovepipes was another topic of conversation. An SAB member asked whether the integration committee envisioned an alternative to a "stovepiped system." Dr. Burke responded that the committee had the image of a "functional farm" that retained silos, but also involved an interactive system with a long-term goal. The key integrating factors would be problem identification and problem formulation that span disciplines and EPA programs. Currently, institutional stovepipes and politics are barriers to formation of transdisciplinary teams. The committee wants to provide practical

recommendations to make those teams happen and help them work. Another SAB member emphasized the importance of informing researchers about practical problems and policy questions. Dr. Burke responded that regional scientists and managers request research and technical support for their issues and translation of research results to their needs, but problems will also arise if ORD is too reactive to regions' many needs.

Dr. Burke observed that the committee will address leadership and management issues related to science integration. Encouragement and leadership from the top is important to effective science integration.

Several SAB members suggested that the Committee on Science Integration avoid false dichotomies between "applied vs. non-applied" research or "pure vs. not pure," which advance one kind of science as better than another. One spoke of the value of community-based participatory research in framing questions that matter and that allow for meaningful science integration. Another SAB member asked whether Agency interviewees indicated whether they had time to think strategically and consider science integration, given the special pressures from lawsuits, regulatory deadlines, and political stresses that surround Agency science. Dr. Burke responded that although interviewees acknowledged time pressures, many Agency interviewees thought broadly about the science issues they faced. He was encouraged by their willingness to take a broad view of science.

Another member noted that global forces, sustainability issues, and uncertainty analysis require EPA to use science generated by other organizations in an intelligent way. EPA must address how to intelligently use different kinds of science, developed by other organizations.

4. Future Directions for Environmental Science- Presentation and Discussion

Dr. Paul Anastas, ORD Assistant Administrator, provided informal remarks as a basis for discussion with SAB members. First he recognized the SAB's historical role in giving EPA "gentle nudges when needed and harsh blunt criticism when required." He provided comments on ORD goals and the process for meeting its goals.

He noted that ORD should focus on sustainability as a goal in addition to ORD's historical goals of supporting protection of human health and the environment. ORD's past research has focused on science for risk reduction and risk management that resulted in some risk reduction and risk management strategies that have not been sustainable. Invoking the Brundtland Commission's definition of sustainability, i.e., "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," he noted that systems thinking was necessary for EPA to meet the complex environmental challenges presented by global change, energy, agriculture, toxics, and public health. ORD's research must involve sustainability science that connects science in different disciplines and connects different environmental issues. "Just as mortar provides a structure for connecting bricks, sustainability science must connect traditional, discipline-specific analyses. Traditional reductionist approaches to science have brought insights, depth of understanding and revolutionized our world, but have unintended consequences." Water disinfection has introduced toxic substances; energy-efficient light bulbs have introduced new uses of persistent bio-

accumulative toxicants. A sustainability or systems-science approach to problem definition will allow a transdisciplinary approach, across ORD's portfolio to problem solving and increase EPA's "degrees of freedom."

Dr. Anastas also noted that Administrator Jackson gave a presentation on innovation at the National Press Club on March 8, 2010. She reviewed EPA's record in addressing environmental challenges and noted that technological innovation offers the opportunity to achieve both environmental protection and economic growth. ORD can take advantage of this opportunity to consider both sustainability and the power of innovation in structuring its programs, developing Requests for Proposals (RFPs), and planning future research. The computational toxicology program, for example, can be used to "inform the design of next generation chemicals" that pose fewer problems for human health and the environment. ORD research can inform and empower design by considering sustainable systems and looking across product life cycles.

Sustainability provides a framework and a process for ORD to meet the Administrator's key priorities. ORD's research influences all of Administrator Jackson's priorities in an interactive way. ORD supported the Administrator's priority to expand dialogue on environmentalism and environmental justice through a Symposium to Strengthen Research and Policy on Environmental Justice held March 17-19, 2010. ORD is considering research beyond past efforts to understand the impact of individual chemicals on an individual to address approaches for cumulative risk assessment, collective risk assessment, and population centered risk assessment.

To transition to a focus on systems and sustainability science, ORD will build on its traditional leadership and also use Title 42 authority to engage cutting-edge thinkers and science leaders to stimulate this new approach. ORD plans to improve how it tracks the impact of its research on program offices and science. ORD will also improve how it communicates its science and how ORD science is applied, so the public develops a better understanding of ORD contributions to environmental protection. Dr. Anastas noted that this transition to systems/sustainability science and a transdisciplinary approach is new for ORD. It is essential, however, to help EPA address complex environmental challenges more effectively. "With innovation, EPA can succeed. Without it, there is no path forward for success."

SAB members followed up with questions and comments on Dr. Anastas's presentation. Their questions, comments, and Dr. Anastas' responses are summarized below.

- Anticipatory research is important. *Response:* there should be a continuum from basic research to technical support. Anticipatory approach cuts across all research programs and can help EPA address root causes of environmental problems. How can problem formulation happen at the highest level so that problems are not "boxed-in" by narrow problem definitions that may relate to a single EPA program or environmental concern? *Response:* The goal is to have a high-level problem definition that spans EPA programs and to have subsequent problem definitions that happen at "different layers" of a problem relate to the high-level process.

- Some companies have embraced sustainability as part of their missions (e.g., Proctor and Gamble, 3M). *Response:* There are possibilities for public-private partnerships and learning from private industry, given the Administrator's emphasis on innovation.
- Is ORD considering pilot projects to transition from silo approach to a systems approach and does it have plans to roll out those projects and capture lessons learned? Has ORD considered how the SAB can assist? *Response:* ORD believes success depends on building relationships with programs and regions to identify where the real needs are and to frame the most appropriate research. Pilots have already been considered and worked on (e.g., assuring chemical safety, one hydrosphere approach). ORD is considering internal seed money and is interested in SAB helping with this pilot effort.
- How do we sustain STAR grants and fellowships at a sufficiently high level to provide needed research and future hires? *Response:* ORD has made STAR grants and fellowships a high priority. Newly trained scientists will bring systems thinking to EPA.
- Sustainability approaches begun in the 1990's were not strongly established. What will be different with EPA's current initiative? *Response:* EPA must continue addressing the false choice presented by viewing environmental protection as an alternative to economic growth. EPA must do better job of quantifying benefits to disprove the notion that environmental protection necessarily damages the economy.
- ORD has several important initiatives linking human programs with natural systems (e.g., green infrastructure for storm water, ecosystem program areas) but not a lot of in-house expertise or STAR investment. How is ORD going to build its expertise in these areas? *Response:* ORD can either create dedicated discrete focus areas with expertise in social-behavior sciences or economics or "sprinkle the expertise" through ORD's entire portfolio.
- How is ORD making use of scientific resources in other federal agencies? Is there a strategic plan? *Response:* ORD has formed partnerships in different research areas. There are examples of effective collaboration and examples of how it could be done better.
- Other federal agencies are considering transdisciplinary research. Are there opportunities for interaction and discussion among agencies? *Response:* There have been informal interactions with the National Aeronautics and Space Administration, National Science Foundation, Department of Defense, and Department of Energy and opportunities for more collaboration. The Office of Science Policy is rejuvenating the National Science and Technology Council, which could provide an important forum for such discussions.

5. ORD's Strategic Planning and the Administrator's Priorities - Presentation and Discussion

Dr. Kevin Teichman, ORD Deputy Assistant Administrator for Science, provided a presentation (Attachment E) describing:

- the Administrator's guiding principles and key priorities;
- recent exemplary EPA accomplishments related to the Administrator's key priorities and supported by ORD research;
- some over arching considerations for the SAB;

- current ORD research activities and strategic directions cross-walked with the Administrator's priorities. Each section presented a "vision," a list of suggested strategic directions / examples of anticipated accomplishments; and current ORD activities
- the charge to the SAB

He noted that the Administrator's guiding principles and priorities are that science must be the backbone for EPA programs; EPA must follow the rule of law; and EPA's actions must be transparent. The Administrator's key priorities are:

- Improving air quality
- Assuring the safety of chemicals
- Cleaning up our communities
- Protecting America's waters
- Taking action on climate change
- Building strong state and tribal partnerships
- Expanding the conversation on environmentalism and working for environmental justice

On slide 13, he pointed out that research, the "creation of new knowledge," was only one component of science at EPA. He also emphasized that environmental policy was broader than EPA's regulatory programs. EPA has no regulatory authority for indoor air, for example, but has implemented important policies resulting in major improvements to public health. Dr. Teichman also noted that science provides only one input to decision making. Benefits, costs, state/tribal/local implementation issues, environmental statutes, public values and perceptions, and "other" factors also are inputs to decision making. He noted that SAB advice on research strategy provides an opportunity to consider major changes and redirections in ORD research. The exercise of mapping ORD research programs to Administrator priorities in preparation for the SSAB meeting helped ORD realize more fully how its research contributes to those key priorities and the potential for collaboration across ORD research programs.

Dr. Teichman identified the following topics and questions for advice from the chartered SAB:

1. The extent to which ORD's suggested strategic research directions address the Administrator's Priorities by providing the scientific information needed to inform environmental decision-making, especially decisions made by EPA's Program and Regional Offices
2. Suggestions for key areas that ORD should leverage by working with other (non-ORD) science programs across EPA and with the science programs of other Federal agencies
3. Areas for increased emphasis in ORD's research program over the next five years; areas for decreased emphasis over the next five years
4. Are there strategic research directions that ORD should pursue differently or undertake as it draws upon its unique expertise to conduct integrated, transdisciplinary research (ITR)?
5. Where can research on socio-economics best contribute to ORD's ITR efforts?
6. Where can we apply lessons learned from environmental research to protect human health and from human health research to protect the environment?

He noted that the first three topics were sent to the SAB before the meeting. He included the last three in the hope of receiving advice on those topics also.

SAB members followed up with questions and comments on Dr. Teichman's presentation. Their questions, comments, and responses from Dr. Teichman and ORD representatives are summarized below.

- What is the mechanism used to send individuals to other organizations to work on an interdisciplinary team? Personal experience in other organizations could help with leveraging other expertise. *Response:* ORD does not make frequent use of Intergovernmental Personnel Agreements to place scientists in other governmental organizations. ORD sponsors a Regional Research Partnership Program ("R2P2"), which frequently sponsors regional details to ORD laboratories, but ORD scientists rarely take details in Regional offices.
- Has ORD considered the possibility of charting the genome of every child as part of the National Children's Study? Advances in technology make it very inexpensive. Such an approach could change the way EPA addresses susceptible and vulnerable populations. *Response:* ORD is very involved in the exposure component of the National Children's Study (NCS) and has not considered genomics. The NCE lacks capability for exposure assessment. ORD hopes to pursue examples with impacts on high priority areas.
- Slide 13 shows an arrow from research to policy, but no returning arrow. Shouldn't the arrow have a feedback loop? *Response:* Yes! The recommendations of the Silver Book apply to research as well as risk assessment.
- Socio-economic analysis can help ORD evaluate how it conducts integrated transdisciplinary research and how it can improve how such research is conducted.
- Where did the "vision" presented for each of the ORD slides addressing the Administrator's priorities start from? Did National Program Directors (NPDs) solicit information from others? *Response:* NPDs talked with counterparts in program offices, not necessarily with managers in those offices.
- Why did ORD frame the fourth charge question in terms of ORD's existing experience? Why not start with Agency needs?
- How does outside input flow into research to get public perceptions, public values into the research issues?
- Why is ORD currently focusing on ITR and Agency policy? *Response:* There were past examples where ORD developed research but program offices said it wasn't needed. ITR helps ORD to think of users and environmental decision makers as partners.
- How does ORD address the bias of engineers (and other scientists) to focus on narrowly defined problems? *Response:* ORD is looking for opportunities to reward applied transdisciplinary research, through use of technical qualifications boards that give EPA scientists credit for working on teams and contributing to problem solving.
- Dr. Anastas talked about sustainability but the SAB has not heard the Administrator emphasize sustainability in the same way. Is there a disconnect? Should sustainability be reflected across all the priorities? *Response:* Administrator believes sustainability is important.
- Slide 13 seems to indicate that socio-economic expertise is outside the sphere of science. Shouldn't it already be considered?

6. Improving Air Quality - Discussion

NPDs began the discussion by commenting on the potential for ITR related to this Administrator's priority. In general, the NPDs have Agency "stakeholders" who pull them towards program-specific work and resist reallocation of resources to trans-disciplinary priorities. The major focus of the Office of Air and Radiation has been on meeting a five-year review cycle for National Ambient Air Quality Standards (NAAQS). There may be opportunities for a multi-pollutant focus, if ORD can address both single pollutant needs along with a multi-pollutant approach. One NPD noted that ORD research was at "an asymptote with the NAAQS," i.e., at a point where additional complexity will no longer add meaning. One area for ITR involves expansion of work on secondary (welfare-based) NAAQS standards. The National Program Directors for the Air Program and Ecological Services Research Program have consulted; there may be opportunities to involve research on biofuels as well. ORD has no master plan for ITR in this area; NPDs are exploring opportunities for collaboration across research programs. Another potential area for ITR involves some consideration of cumulative risk. ORD's work producing an Integrated Science Assessment of secondary effects of nitrogen and sulfur oxides provide an incremental multi-pollutant approach. ORD is not ready to undertake multipollutant approaches for ozone and particulate matter. It may be ready to undertake assessments for chemicals with common adverse health outcomes in the future.

An NPD made a different kind of point related to research on biofuels. Because the SAB strongly recommended that ORD focus its sustainability research program in a well-defined area and develop metrics and decision support tools, ORD was prepared with an ITR approach for biofuels that has been successful in advancing a cross- program, lifecycle approach that recognizes a biofuel supply chain. ORD has successfully argued that biofuels presented an integrated problem, not limited to air, water, or land. ORD has generous funding from Congress for biofuels and because of this, systems approach taken is close to operationalizing a sustainability research approach towards the biofuel problem. The Ecological Services Research Program complements this effort with research on biofuels and nitrogen inputs, as well as climate change, in five places in its program.

SAB members followed up with questions and comments on this discussion. Their questions, comments, and responses from ORD representatives are summarized below.

- What are obstacles to working on cross-cutting issues? *Response(s):*
 - One opportunity for integration is to look at human behaviors and problems that arise through human behavior (e.g., relationship to technology, land use, personal choices related to stewardship), but ORD has barriers in terms organizational and disciplinary expertise that inhibits it from taking that approach.
 - ORD has only three or four life cycle assessors and could use many more.
- How does ORD's current organization foster or frustrate ITR? *Response(s):* Any organizational structure causes a barrier. Generally, NPDs "don't take no for an answer." The NPD position was created to cross silos.
- What are the highest priority areas for research related to climate and air? *Response(s):*
 - Impacts of climate change on ozone from natural and anthropogenic missions
 - Climate change impacts on human health effects along with the need to monetize human health benefits of controlling for these effects

- Potential impacts of on air quality from biofuels,
- Decision support tools for incredibly complex systems addressing air quality and climate change alternatives
- Impact of dust clouds on climate change

7. Assuring the Safety of Chemicals - Discussion

SAB members began the session with questions and comments for ORD representatives. Their questions, comments, and responses from ORD representatives are summarized below.

- Although national program offices must deal with individual pollutants, the multiple stressor issue comes up in the context of water quality, drinking water, ecosystems, and air quality. How is the approach to multiple pollutants different in the air program, as compared to the water program? *Response(s)*: ORD recognizes that humans are the receptor of multiple chemicals. ORD has a partnership with the National Institute of Environmental Health Science involving Children's Health Centers. Children may be exposed to different stressors in their indoor environment, schools, and playgrounds. A big challenge for EPA is to chart exposure scenarios. This challenge may be addressed by the National Children's Study. ORD is also seeking ways to work with communities where there are higher exposures.
- Half of ORD's research programs involve multiple pollutants. What is the mechanism for talking across research program areas? *Response(s)*:
 - NPDs interact often and closely and exchange ideas.
 - Sometimes, however, NPDs get absorbed in meeting narrower program needs.
 - There are six multi-year plans related to chemical safety and ORD has discussed integrating those components. Chemical safety will be an ITR pilot.
 - The computational toxicology program now focuses on individual chemicals and high throughput screening and bioactivity profiling. It may in the future focus on multiple pathways and offer an opportunity to deal with mixtures.
- Many air quality issues concern decisions made by individuals that are highly individualized and behavioral. Personal decisions relate to many of the Administrator's priorities. Many health issues can be seen as a behavioral educational issue, similar to indoor air quality issues. Does ORD share this view and, if so, is it operationalized in terms of ORD research? *Response(s)*:
 - One NPD agreed but noted "How we get there is different story." He compared integration of social and behavioral scientists into ORD's work with integration of cardiologists into the domain of the particulate matter research centers. It will take time.
 - Another NPD noted that EPA has only a few social behavioral scientists on staff
 - ORD lost its economics and decision science program in the National Center for Environmental Research. This loss makes it difficult to pursue ITR initiatives fully.
 - It is sometimes difficult to foster successful cross-disciplinary collaborations.
- What is the "bar for scientific evidence" to inform decisions that may affect behavior change related to personal decisions affecting health. Is the "bar/weight of evidence" the same or different than for regulatory criterion for single pollutants? *Response(s)*:

- EPA recognizes that risk perception may differ from risk assessment and that it is important for experts in risk perception/risk communication to be involved in decisions
- In the radon arena, EPA has given municipalities approval to redirect resources from municipal water treatment to indoor air to address a more significant risk. How can ORD and EPA provide information to industry, the private sector, and affected groups to make sound environmental decisions?
- The Administrator's new Drinking Water Strategy shows a willingness to look outside the box to solve problems.
- Some organizations allow the organizers of multi-disciplinary research approach to control the funding. Would a shift in control of funding help in fostering ITR?

Response(s):

 - ORD has a hybrid system. National program managers use a variety of strategies to influence the direction and type of research, but do not control allocation of resources, which is the responsibility of ORD laboratory and center directors. There are tensions when decisions are made about allocation of resources.
- How does EPA collaborate with the Centers for Disease Control (CDC)? EPA may be able to take advantage of CDC's biomonitoring expertise and more use of CDC National Health and Nutrition Examination Survey (NHANES) data. *Response(s):*
 - EPA works with CDC pediatric environmental health specialty units.
 - EPA is exploring other opportunities to collaborate with CDC. The Federal government is starting a new taskforce on environmental health to explore collaboration among federal agencies (EPA, Housing and Urban Development, and CDC)
 - ORD has a Memorandum of Understanding with CDC regarding leveraging resources
 - ORD recently met with CDC about its public health tracking system to address asthma issues
 - Dr. Howard Frumkin, director of the CDC National Center for Environmental Health initiated a successful "national conversation on chemical exposures in public health" in 2009 involving community groups, state groups, other federal agencies, and industry.
- Would it be helpful for NPDs to have resources to control? Would such a system work? What benefits and problems are associated with it?
- Should there be an NPD for systems science with responsibility of encouraging ORD researchers to use a systems approach? *Response(s):*
 - ORD's sustainability program already plays that role. The original vision was to have "laboratories" for sustainability across ORD with pilot projects
 - One NPD responded that "one of the last things I need is someone else telling me something else to do." NPD burdens are great. He would, instead prefer some "connectivity support" to help him connect to areas where he should have input.
 - Sustained leadership from the Assistant Administrator would be more helpful than creating a new NPD
 - Demonstrating major success using systems science related to an Administrator priority will be a "game changer." Ensuring chemical safety by moving into lifecycle analysis or green chemicals could have major impact on EPA

- Reform of the Toxic Substances Control Act may help to bring systems thinking to program offices
- There is a need for a center of expertise and energy in systems thinking and decision-analysis. Such a center could be a hybrid organization that "straddles ORD and program offices" where real decision needs are identified
 - The need for systems expertise should be addressed through workforce planning
- A new focus on chemical safety reaches beyond current risk assessment programs to envision a future that reduces physical inventories of toxics, but also changes choices about transportation and commerce. Related research programs will need to be interwoven with changes in international trade. How is ORD planning to respond to this new vision? *Response(s)*:
 - EPA's policy office has been reorganized to provide a focus on the green economy and pollution prevention
 - The Office of Solid Waste and Emergency Response and Office of Pesticide Programs have issued the report *Vision 2020*, which focuses on material flow. One of the case studies involves safe product initiatives, material flow, and product development.
 - ORD has historically looked at legacy chemicals and is now generating predictive tools to help with chemical design.
 - ORD has negotiated with the European Commission Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) program to share chemical data.
- Does ORD have assigned clear responsibility for integrating ORD research involving large climate models (e.g., global change models of rainfall, demands on urban infrastructure, large complex ecosystems, and regional effects)? Is there accountability for integrating all pieces of large inter-connected models?
 - ORD works with national program offices on such large models. Sometimes ORD has the lead; sometimes program offices have the lead.
 - ORD's National Center for Environmental Assessment has responsibility for synthesis and assessment projects and the National Program Director works with NCEA.
 - EPA depends on climate models managed separately by other federal agencies. Individual federal agencies maintain independent control over the models they develop and maintain.

8. Protecting America's waters and cleaning up our communities

SAB members began the session with questions and comments for ORD representatives. The SAB Chair then facilitated discussion with ORD representatives on those topics, given the time allotted on the agenda for addressing "Protecting America's Waters." and "Cleaning up our communities." The SAB members' questions and comments are identified below, followed by a summary of the discussion that followed.

- Within the "one hydrosphere approach," how does ORD interpret that water quality or water quantity issues of concern to states? Is the ecosystem services approach helpful?

- How would we get to goal of a systems approach?
- The "one hydrosphere approach" involves the relationship of ground water to source water and the relationship of water quality and water quantity. Does ORD integrate research in these areas and pursue them in a related way?
- Why are related research topics divided up among NPDs? How does integration happen across research stove pipes?
- Environmental justice, cumulative risk, air and water have social components. How does ORD research address zoning and planning?
- Can environmental justice be considered an experiment for ITR that incorporates technology?
- What is going to change in the water research program?
- How does EPA work with CDC? CDC could work more effectively with EPA; partnerships could be directed to advance EPA's mission.
- Has ORD considered innovations in water re-use? ITR could offer the opportunity to promote more intelligent water use. There is need for study of public perceptions about water re-use.
- What are the plans for ITR in addressing the water-energy nexus?
- Small drinking water suppliers have problems with risk and capacity. There is a need for socio-economic research; what are ORD's plans?
- What has been ORD's experience working with other agencies that have addressed the socio-economic questions SAB members have been posing? Interagency collaboration [e.g., with the U.S. Geological Survey (USGS) and U.S. Army Corps of Engineers] may be especially fruitful in the water area,
- How will EPA research address engineered environments to address climate change, especially impacts of global carbon?
- It is important for researchers in water program to listen to stakeholders.
- Should SAB hear from ORD laboratory and center directors at future SAB meetings because of their importance in managing ORD's research budget?
- To make ITR work, ORD will need to invest in education and training to develop shared understanding of vocabulary, definitions, and assumptions. A journal club can be very useful. Has ORD invested in these kinds of approaches?
- To implement ITR, it will be important to capture lessons learned and examine what didn't work.
- In thinking about implementing ITR, ORD should "play to its strength," where EPA is the leader in research and others follow EPA's methods. Sustainability and green product design seems a big area for development. Computational toxicology can help with models and simulations.
- Is there a systematic way of partnering between ORD and regions, so benefits will flow to regions?

Regarding the "one hydrosphere" approach, ORD representatives noted that they find it useful to relate this concept to a problem. Integrating water quantity and water quality is important and will be a starting point for discussions with the Office of Water (OW) to chart priorities and to leverage ORD, OW, and outside scientific resources. Currently, ORD collaborates with the USGS on projects but hasn't held a discussion with USGS on strategic

research directions. Similarly ORD has many small agreements with other agencies, (e.g., U.S. Army Corps of Engineers and Bureau of Reclamation). The "one hydrosphere" concept may create "larger opportunities" for collaborative work.

Changing the water research program will involve communicating the "NPD view of the world," which embraces the "one hydrosphere" concept, to others to be sure that it is shared Agency wide. The Administrator's new drinking water strategy opens up opportunities to think of environmental issues and research in new ways and provides a good context for ITR.

To make change happen, ORD will be implementing Dr. Anastas's "Path Forward" memorandum. NPDs and the Office of Science Policy will work with program offices and regions. The "one hydrosphere" concept is one of two ITR pilots. ORD is working initially with internal partners and then will work with external partners on problem formulation, identification of science questions, identification of major themes, and on implementation of a transformed program. ORD is investing time in training and education so that researchers are prepared for transdisciplinary work. Webinar technology makes a big difference in linking scientists with grantees, outside stakeholders, and participants in ORD's tribal program. The computational toxicology program has used Webinars to educate ORD scientists and others and build a community of practice. The Ecological Services Research Program has used the approach. The water research program has offered a Webinar series with Association of State Water Pollution Control Agencies (ASWPCA) and may broaden the approach.

ORD is exploring linkages between the water research program and research on ecological services. ORD is considering developing formal relationships with three cities where it might site research projects exploring green infrastructure, land use, and ecosystem service research. ORD may also work with the regions on a fourth related project. ORD is also exploring an IRIS project that would take a receptor- and community-based approach to human health assessment. The ecological services research program is planning a research project in Tampa Bay focused on a community interested in ecosystem services and the potential to attract or build a population that might avert land use changes that would have adverse impacts on water quality and quantity.

Dr. Teichman noted that ORD budget changes from year to year are marginal, generally no more than \$50 million. It is difficult to evolve a program, given a fairly static budget. NPDs make recommendations to the ORD Executive Council, composed of laboratory and center directors, which makes decisions about the distribution of ORD's budget.

It is difficult to develop meaningful metrics for assessing ITR's success. ORD will know if ITR is successful when program and regional partners feel their needs have been met better and when research results result in better decisions. Bibliometric measures (e.g., more interdisciplinary publications, more ORD publications cited in EPA decision documents, more ORD publications cited in the papers of other federal agencies) offer only a limited measure of impact. It will be important to evaluate ITR efforts as they evolve and to allow for consideration of long-term impacts of anticipatory research. Another metric may be leveraging the funds of other organizations in EPA or organizations outside EPA for ORD's ITR plans.

ORD has also considered technology as part of its environmental justice research. ORD has worked on technologies that can be used in small water distribution centers in Bangladesh and cook stoves that would be efficient and effective to use in communities with restricted access to fuels. ORD might build on this experience to bring clean technologies and green jobs to communities facing environmental justice issues.

The SAB Chair asked chartered SAB members bullets summarizing their major observations related to discussions during the meeting and responses to the charge questions identified by Dr. Teichman to provide to the DFO by 10:00 p.m.

The meeting recessed at 5:00 p.m.

Meeting Summary - April 6, 2010

The DFO opened the second day of the meeting and distributed to SAB members a compilation of written comments received the previous evening (Attachment F)

Dr. Swackhamer began the day's discussions by providing Dr. Teichman with time to make some remarks. Dr. Teichman asked SAB members to focus their attention on whether ORD was "doing the 'right science,'" rather than whether "ORD was doing the science right." Dr. Teichman explained that the latter question was usually the province of ORD's Board of Scientific Counselors, a separate federal advisory committee. He asked them to focus attention on the first three charge questions presented yesterday:

1. The extent to which ORD's suggested strategic research directions address the Administrator's Priorities by providing the scientific information needed to inform environmental decision-making, especially decisions made by EPA's Program and Regional Offices
2. Suggestions for key areas that ORD should leverage by working with other (non-ORD) science programs across EPA and with the science programs of other Federal agencies
3. Areas for increased emphasis in ORD's research program over the next five years; areas for decreased emphasis over the next five years

He asked SAB members to review the strategic research directions proposed for each of the Administrator's priority areas and ask "are these the right strategic directions for ORD to be pursuing to be 'doing the right science.'" He also asked SAB members to look at the totality of ORD's current activities and proposed strategic directions and as whether there are emerging environmental research issues that ORD is missing.

9. Taking action on climate change and building strong state and tribal partnerships

SAB members began the session with questions and comments for ORD representatives. The SAB Chair then facilitated discussion with ORD representatives on those topics. The SAB members' questions and comments are identified below, followed by a summary of the discussion that followed.

- How is ORD addressing one of the most contentious aspects of climate change, the consequences of indirect land use related to production of biofuels?
- Given EPA's limited funding for climate change research, compared to other federal agencies, what is EPA's distinctive role relative to other agencies in this area?
- How will ORD research help EPA deal with sulfates and how NAAQS regulation of sulfates may exacerbate climate issues?
- Climate change raises concern about uncertainty, which involves both science and policy. Clear distinction between science and policy would help characterize and communicate uncertainty - how is EPA planning to handle that
- Climate change involves two different kinds of questions: What are we doing that's exacerbating climate change? And as climate change happens, what are the effects on ecosystems? Where does ORD place its emphasis?
- How are EPA research and policy related to research and policy in other federal agencies?
- How does EPA leverage interagency relationships to engage climate change?
- How will EPA engage with state agencies related to climate change science?
- Has EPA clearly defined what it is protecting in terms of human health and the environment through its climate change authority? Other Agencies have monitoring capabilities but not environmental protection mandates.
- Are there structural barriers to effective climate change partnerships?
- Does EPA's work on integrated nitrogen provide lessons useful for integrating climate change research?
- What kinds of "next generation decision support tools" are being developed? What levels of support? And what kinds of scenario data are used? What kinds of strategic thinking are the tools feeding into?
- Does ORD consider itself providing scientific leadership globally for climate change? Has ORD considered research on land use, sulfates, and drinking water linked to climate change
- There have been investments in Small Business Innovation Research. Have there been any tools developed to address climate change?

ORD's Global Change research program began in the 1980's. It initially focused on climate change impacts. The program has historically focused on adaptation, i.e., to prepare for expected climate change impacts. ORD has recently begun consideration of mitigation technologies, but is "still trying to find a niche for mitigation."

Sulfates do pose a difficult problem for climate change scientists, because evidence shows that sulfates endanger public health. Considered globally, however, sulfates mask the effects of green house gases and some scientists argue that sulfates should be left in the atmospheres. An SAB member suggested that ORD consider developing the science that would help monetize the global warming potential of sulfates. The Advisory Council on Clean Air Compliance advises EPA on a major study of the costs and benefits of the Clean Air Act. The Council or the Office of Air and Radiation may be able to advise ORD on the relative benefits of the global warming potential of sulfates vs. the public health benefits of controlling sulfates.

ORD is actively exploring linkages between climate change and other research areas. ORD's National Risk Management Research Laboratory is working on a set of case studies related to water quality and sustainable green infrastructure that explores mitigating the adverse effects of climate change. The National Center for Environmental Assessment (NCEA) is developing data on 20 watersheds from multiple sources to support analyses of integrated climate change/land use scenarios. The research looks at economic and ecological variables, population predictions, land use, and housing density. NCEA is working with regions and states to develop mapping tools that will support people making decisions in their own watersheds. Maps draw attention, involving people in looking potential in their own watersheds. ORD is participating in OW workshops on water utilities, green infrastructure, and sustainable infrastructure to develop close working relationships with states and water resource managers. ORD is also developing climate change assessment tools to help water resource managers develop their own scenarios and perform a variety of analyses (e.g., break even analyses, vulnerability analyses). An SAB member asked how the last research activity related to the USGS National Water-Quality Assessment (NAWQA) and expressed concern that there may be duplication of effort. ORD responded that it uses NAWQA data, but had not explicitly conferred with USGS to determine if there was duplication of effort.

An ORD representative reported that ORD is addressing indirect effects of land use change related to biofuels, as mandated by the Energy Independence and Security Act (EISA) of 2007. The Office of Air and Radiation (OAR) also conducted indirect land use analysis to evaluate impacts of different fuels to support the renewable fuels standard published on February 4, 2010. The issue is contentious. OAR organized modeling work on indirect land use impacts and ORD reviewed OAR's work. The OAR analyses will be reviewed by the National Research Council.

Within the federal research community, NCEA represents ORD in the Climate Change Research Program. Although EPA has 1% of the total federal research program, EPA research program has focused on assessment of climate change impacts (using other agency's models) and has a disproportionate influence on climate policy. EPA's assessment-oriented program focuses on air quality and water quality. Air quality research has focused on impacts of climate change on ground level ozone, sulfates, and particulate matter. Climate researchers are trying to work with decision makers. ORD has historically framed national climate change assessments and is beginning to frame the next national assessment due in 2013.

In the global change program, ORD addresses uncertainty by framing "What if" questions, rather than "If...then" analyses. ORD tries to ask questions like "what change would it take in your system to make a different kind of decision?" EPA's global change program aims to provide assessments and tools for decision makers. In the case of adaptation, ORD has provided assessments and decision tools for national park managers, national refuge managers, and managers of state agencies making decisions. In general, ORD wants policy "to drive the science we work on but not drive the science results." The Bipartisan Policy Center's Report offers useful guidance. Managers should be transparent about where policy ends and science begins. An SAB member noted that ORD's "what if" analyses may give the public a perception that EPA has endorsed the "if" on the table. Science policy often interjects assumptions into scientific analyses that never get adequate scrutiny. ORD representatives noted that the climate

change program is very new (EPA is "only three years away from the Supreme Court decision") and EPA hasn't set up organizational structures to determine the direction and chart the course for the climate change program. EPA is trying to sort out policy directions and needed science. The Endangerment Finding was the first step in regulating chemicals under the Clean Air Act. It is conceivable that climate change considerations will appear in future Integrated Science Assessments, but EPA has not decided how it will implement its climate change responsibilities. The Administrator will be exploring all her options under the Clean Air Act.

The global change research program is beginning to look at ecosystem health. The U.S. Global Change Research Program now has an ecosystems subgroup that is considering how to define ecosystem health and measure change. Within that group, EPA, the National Oceanic and Atmospheric Administration, Department of Energy, and Department of the Interior are focusing on ecosystem responses to climate change. The White House Committee on Environment and Natural Resources is looking at ecosystem research across federal agencies, especially the important issue of non-market values.

ORD has built on lessons learned from the integrated nitrogen effort and other research efforts primarily by sharing people. Some sites for study are the focus of multiple ORD research efforts.

In response to SAB comments that ORD is sharing information across research programs but not taking an overall systems approach to global change, ORD representatives responded that they are discussing systems analysis within EPA and across other federal agencies. With strong leadership at EPA, a systems approach can happen. Other federal agencies must work through their legacy resource management responsibilities before they can embrace a systems approach. The U.S. Fish and Wildlife Service may have responsibility for migratory waterfowl management for hunters. Sometimes such mandates are obstacles to a systems approach. ORD is providing support to the Office of International and Tribal Activities and is involved in the Intergovernmental Panel on Climate Change to work on climate change issues affecting developing countries. An NCEA representative described how its watershed models integrate a wide variety of inputs (land use changes, hydrology of watersheds, greenhouse gases, nutrient loadings, ecosystem processes), models (global climate models, regional air quality models, regional policy models), and expert perspectives (ecology, hydrology, human health science, and economics). Making connections across spatial scales involves another layer of complexity and integration and, ultimately, "the buck stops" with the NPD, the ORD Deputy Assistant Administrator for Science, and the ORD Assistant Administrator. There is no central federal agency responsible for the total integration of all federal models.

In the area of biofuels, where EPA has "huge responsibilities" to assess the environmental impacts of an expanded biofuels sector, ORD is working on an integrated report addressing environmental impacts, land use, invasive species, and other factors. ORD needs to integrate and synthesize inputs from multiple models (e.g., water quality models, air quality models, pesticide models). NCEA has developed a conceptual model that has helped bring Agency partners together. The Energy Independence and Security Act requires coordination with the Department of Energy and Department of Transportation.

The Small Business Innovation Research has made awards related to global change. Some examples involve carbon dioxide monitoring, water quality, geological sequestration, water technologies, reducing energy and water foot prints. ORD will follow up and provide more specific information for the SAB.

ORD is currently not pursuing research related to behavior change that might support the Administrator's priority "Taking action on climate change." ORD has not invested heavily in behavioral or social sciences because it has historically been controversial for a regulatory agency to undertake such research. Congressional appropriators have indicated in the past that EPA should not undertake such research.

Expanding the Conversation on Environmentalism and Working for Environmental Justice.

SAB members began the session with questions and comments for ORD representatives. The SAB Chair then facilitated discussion with ORD representatives on those topics. The SAB members' questions and comments are identified below, followed by a summary of the discussion that followed.

- How will environmental justice principles be embedded in the environmental justice priority? How will environmental justice principles be translated to other priorities?
- Has ORD considered the use of social science by public health agencies? Expanding the conversation on environmentalism opens the door to social and behavioral science. The "big levers" to achieve environmental results involve behavior change and conservation tools for protecting human health and the environment.
- What is role of epigenetics in etiology of asthma, especially through pre-natal exposures?
- Has ORD considered personal monitors as tools to monitor level of exposures?
- What efforts are underway to better understand indoor exposures and mold exposures, especially for children? Post-Katrina, 75% of children with asthma were sensitive to mold.
- ORD and SAB should be cautious in using environmental justice as a context for pursuing science underlying behavioral change, because disadvantaged populations deserve special protection. ORD should retain a balance.
- How is ORD thinking about research affecting states as state infrastructure for science disappears with state budget crises?
- Would ORD encourage more Intergovernmental Personnel Agreements with regions and states?
- As states increasingly abandon research, how will ORD meet their needs?

EPA is implementing environmental justice as a priority through EPA's Action Development Process, which requires offices to incorporate environmental justice into Agency actions. Guidance is being drafted for regulatory development work groups. The Office of Science Policy is the environmental justice lead in ORD and will examine how environmental justice affects all ORD research.

ORD research is focusing on understanding the childhood origins of obesity, neurological effects, and asthma, and will be studying epigenetic mechanisms. Initiating work in epigenetics will require capacity building in ORD laboratories to build expertise in methylation.

A major part of ORD's research linked to environmental justice involves community health research projects. ORD has undertaken participatory research over the last 10 years. One major example involved the study of pesticide workers health in the Yakima Valley. In 2009, the ORD Board of Scientific Counselors recommended that ORD "translate" more of its chemical risk assessment research into community settings. Community-based research requires that researchers look at the receptor and behaviors that are involved in health outcomes, not just chemical exposures.

ORD is pursuing behavioral science research through its extramural grant program, administered by the National Center for Environmental Research (NCER). NCER has two Requests for Applications (RFAs) in social/behavioral science in process and is recruiting to hire a behavioral and social scientist to help develop requests and evaluate them. There has been concern over EPA's possible use of social science to manipulate behavior. It may be valuable for EPA to reframe social science as knowledge that helps EPA communicate science in ways that help people better understand what their choices are and that give people options for how to change their behavior. ORD is also planning to hire social and behavioral scientists in other laboratories and centers, but is not planning an intramural program in social and behavioral science.

NCER recently organized a symposium on disproportionate health impacts that highlighted the importance of science underlying the Administrator's environmental justice priority. A list of research needs will be developed from the symposium. ORD is working with symposium attendees and affected EPA offices, such as the Office of Enforcement and Compliance Assistance.

10. Discussion of common themes and SAB charge questions

SAB members discussed how they would approach developing an advisory letter. Several expressed concern that they lacked information needed to respond to the charge questions in full.

Several members noted that they could make cogent comments about ITR implications for many of the priority areas, but lacked information to address each research area in a methodical way. Members discussed preparing a short letter report and identifying information needs and charge questions to be explored at a later date. Members discussed the need to reinforce the need for integration across disciplines and research areas and to note examples where it is being done and where more could be done. The report could highlight success stories, applaud creativity and thoughtfulness in these areas, and encourage ORD to take credit for them

Several members noted that several of the Administrator's priorities have a legacy component with massive dedicated programs that make it difficult to implement ITR. Three

priorities, however, are new (climate change, cleaning up our community, and environmental justice) and may offer the greatest opportunity for advancing ITR. The SAB could suggest that those priorities be emphasized, because they offer special opportunities to advance ITR.

SAB members noted that they were not provided with a complete description of ORD's current research activities and so cannot identify areas that do not relate to the Administrator's priorities. SAB members cannot fully address Charge #3 because it does not have the information needed to identify what should be de-emphasized.

An ORD representative acknowledged that ORD's presentations provided an exemplary listing of activities that did not attempt to provide a comprehensive overview of ORD research. Instead, it offered a list of the best examples of ORD research that fit under the Administrator's priorities. He acknowledged that the list did not constitute a strategy but that preparation for the SAB meeting had facilitated a useful exchange among NPDs.

SAB members then considered the charges they were given. They considered the first charge: *"The extent to which ORD's suggested strategic research directions address the Administrator's Priorities by providing the scientific information needed to inform environmental decision-making, especially decisions made by EPA's Program and Regional Offices."* Members made the following points

- ORD did a great job of listing research programs that supported the Administrator's priorities. ORD is conducting research related to the Administrator's priorities and the research is having an impact on how those priorities are being implemented in EPA programs and regions and in the states. The SAB could highlight examples of close alignment.
- New ORD research areas (e.g., climate change, mountain top mining, environmental justice) includes many programs "that did not exist a year and a half ago." In the context of government science, there has been enormous progress and alignment with administration priorities
- NPDs seemed informed about each others' research areas.
- There is not, however, an overall integrative approach for communicating across research areas, building a systems approach
- The ORD budget process doesn't clearly show how research funding follows priorities and so there is concern about whether the research planning process is "robust enough" to sustain an integrated approach.
- There are opportunities for more ORD ITR work related to water and air related to energy sources, transportation, and planning to address root causes of environmental problems through a systems approach.
- ORD could do more to support the priority of "Building strong state and tribal partnerships." ORD could implement state reciprocity programs with states to incorporate chemical risk assessments into IRIS. There are opportunities for better partnerships.
 - ORD responded that NCEA has a Cooperative Agreement with the State of California related to IRIS numbers
 - ORD is working with the Agency for Toxic Substances and Disease Registry and other states on additional possible agreements

- ORD is missing a strategic part of research related to many priorities (e.g., climate change, water quality, assuring chemical safety, cleaning up our communities) because it is missing critical "upstream pieces," i.e., how behaviors can be altered, and how individual choices are made

Chartered SAB members then considered the second charge: "*Suggestions for key areas that ORD should leverage by working with other (non-ORD) science programs across EPA and with the science programs of other Federal agencies.*" Members made the following points:

- ORD should use the word "leverage" more carefully and distinguish between information exchange, coordination, collaboration, and strategic planning with other agencies on scientific research
- ORD has a "good history of coordination with other agencies," but more can be done. ORD needs to be proactive, not reactive and seek partnerships in areas "outside their comfort zone."
 - Collaboration with other organizations is essential. ORD should think of collaboration as "an opportunity to accomplish tasks that you cannot accomplish in other ways"
 - ORD should reframe collaborations with other organizations by approaching them to orient their research to advance EPA's mission. ORD's leadership should say "We'd like to make case that this environmental a issue should be priority"
- ORD's collaborations should not abandon EPA's key principles.

An ORD representative asked the SAB to also consider the potential for scientific leveraging within EPA. If a region is doing routine monitoring, ORD might be able to conduct an epidemiological study of a community in that place. EPA would reap more benefits from its investment in science and research as a result. ORD needs to hear about science and research plans of EPA program and regional offices to make that happen.

Chartered SAB members considered the third charge: "*Areas for increased emphasis in ORD's research program over the next five years; areas for decreased emphasis over the next five years.*" Members made the following points

- ORD has not provided all the information needed to address this question because it did not present the SAB with a comprehensive picture of research activities.
- The SAB lacks a depth of understanding of the research conducted or the research considered and not pursued and the rationales for making research choices.
- ORD has not presented an overarching framework for how the Agency addresses priority needs and allocates resources
- ORD has a unique role to play in research on multiple stressors and multiple pollutants
- Every ORD research program should have an anticipatory research component involving workshops and interactions with the larger scientific community.

Several SAB members spoke of the need to look more in depth at one or several ORD research programs, building on the reviews conducted by ORD's Board of Scientific Counselors. They argued that a more detailed examination would give SAB members a sense of how integration and collaboration happen and whether there are missed opportunities. Other SAB members expressed the view that such an approach might lead the SAB to "micro-manage" ORD

science and divert the SAB from providing more strategic advice. The SAB should focus on the need to maintain or develop core expertise at EPA to address the next generation of emerging issues.

SAB members noted that they had addressed the fourth charge: "*Are there strategic research directions that ORD should pursue differently or undertake as it draws upon its unique expertise to conduct integrated, transdisciplinary research (ITR)?*" during much of the earlier discussions at the meeting. The SAB Chair noted that ITR encompasses systems thinking, as described by Dr. Anastas. Another SAB member noted that ITR does not just involve integration across disciplines within organizations, but integration with program and regional offices. Both vertical and horizontal connections demand attention.

SAB members briefly discussed the fifth charge: "*Where can research on socio-economics best contribute to ORD's ITR efforts?*" Members discussed how ORD's lack of expertise in social and behavioral sciences and omission of research in this area creates a major research gap. It will be important for EPA to understand the potential for behavior change because human behavior profoundly affects exposures to hazardous substances. ORD did not describe a coherent research program research in this area.

SAB members discussed the sixth question: "*Where can we apply lessons learned from environmental research to protect human health and from human health research to protect the environment?*" One member noted public health and disease prevention has drawn on social and behavioral science to understand exposure and prevent disease. EPA can build on this experience in its environmental protection research.

11. Summary and action items

The SAB Chair noted that she would work with the DFO to prepare a draft report for SAB members' review and discussion at a public teleconference to be scheduled within the next two months. The report would build on the committee's discussion during the meeting and on the minutes of and information provided to the Chartered SAB at its November 9-10, 2009 meeting. The goal will be to provide a short, coherent, and useful report. She asked members to provide any additional written comments on the charge questions to the DFO within the next week.

Dr. Vanessa Vu noted that the next meeting of the chartered SAB will be an administrative meeting, June 15-16, 2010. The SAB will also hold a quality review in June for two draft reports, a Report from the Environmental Engineering Committee Augmented for Hydraulic Fracturing Review and a Report from the Work Group of the Chartered SAB for the Arsenic Cancer Review.

The Designated Federal Officer adjourned the meeting at noon.

Respectfully Submitted:

Certified as True:

/Signed/

/Signed/

Dr. Angela Nugent
SAB DFO

Dr. Deborah L. Swackhamer
SAB Chair

ATTACHMENTS

Attachment A:	Board Roster
Attachment B:	Agenda
Attachment C:	FR Notice
Attachment D:	Members of the Public and EPA Representatives attending
Attachment E:	Presentation by Dr. Thomas Burke, Update on SAB Committee on Science Integration for Decision Making
Attachment F	Presentation by Dr. Kevin Teichman, ORD's Strategic Directions and The Administrator's Priorities
Attachment G	SAB Members' Preliminary Individual Bullets for Consideration - April 6, 2010

Attachment A
SAB Roster
U.S. Environmental Protection Agency
Science Advisory Board with SAB Liaison Members

CHAIR

Dr. Deborah L. Swackhamer, Professor and Charles M. Denny, Jr., Chair in Science, Technology and Public Policy, Hubert H. Humphrey Institute of Public Affairs, and Co-Director of the Water Resources Center, University of Minnesota, St. Paul, MN

SAB MEMBERS

Dr. David T. Allen, Professor, Department of Chemical Engineering, University of Texas, Austin, TX

Dr. Claudia Benitez-Nelson, Associate Professor, Department of Earth and Ocean Sciences and Marine Science Program, University of South Carolina, Columbia, SC

Dr. Timothy Buckley, Associate Professor and Chair, Division of Environmental Health Sciences, College of Public Health, The Ohio State University, Columbus, OH

Dr. Thomas Burke, Professor, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

Dr. Deborah Cory-Slechta, Professor, Department of Environmental Medicine, School of Medicine and Dentistry, University of Rochester, Rochester, NY

Dr. Terry Daniel, Professor of Psychology and Natural Resources, Department of Psychology, School of Natural Resources, University of Arizona, Tucson, AZ

Dr. George Daston, Victor Mills Society Research Fellow, Product Safety and Regulatory Affairs, Procter & Gamble, Cincinnati, OH

Dr. Costel Denson, Managing Member, Costech Technologies, LLC, Newark, DE

Dr. Otto C. Doering III, Professor, Department of Agricultural Economics, Purdue University, W. Lafayette, IN

Dr. David A. Dzombak, Walter J. Blenko Sr. Professor of Environmental Engineering, Department of Civil and Environmental Engineering, College of Engineering, Carnegie Mellon University, Pittsburgh, PA

Dr. T. Taylor Eighmy, Vice President for Research, Office of the Vice President for Research, Texas Tech University, Lubbock, TX

Dr. Elaine Faustman, Professor, Department of Environmental and Occupational Health Sciences, School of Public Health and Community Medicine, University of Washington, Seattle, WA

Dr. John P. Giesy, Professor and Canada Research Chair, Veterinary Biomedical Sciences and Toxicology Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

Dr. Jeffrey Griffiths, Associate Professor, Department of Public Health and Community Medicine, School of Medicine, Tufts University, Boston, MA

Dr. James K. Hammitt, Professor, Center for Risk Analysis, Harvard University, Boston, MA

Dr. Rogene Henderson, Senior Scientist Emeritus, Lovelace Respiratory Research Institute, Albuquerque, NM

Dr. Bernd Kahn, Professor Emeritus and Associate Director, Environmental Radiation Center, School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA

Dr. Agnes Kane, Professor and Chair, Department of Pathology and Laboratory Medicine, Brown University, Providence, RI

Dr. Nancy K. Kim, Senior Executive, New York State Department of Health, Troy, NY

Dr. Catherine Kling, Professor, Department of Economics, Iowa State University, Ames, IA

Dr. Kai Lee, Program Officer, Conservation and Science Program, David & Lucile Packard Foundation, Los Altos, CA

Dr. Cecil Lue-Hing, President, Cecil Lue-Hing & Assoc. Inc., Burr Ridge, IL

Dr. Floyd Malveaux, Executive Director, Merck Childhood Asthma Network, Inc., Washington, DC

Dr. Lee D. McMullen, Water Resources Practice Leader, Snyder & Associates, Inc., Ankeny, IA

Dr. Judith L. Meyer, Distinguished Research Professor Emeritus, Odum School of Ecology, University of Georgia, Lopez Island, WA

Dr. Jana Milford, Professor, Department of Mechanical Engineering, University of Colorado, Boulder, CO

Dr. Christine Moe, Eugene J. Gangarosa Professor, Hubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, GA

Dr. Eileen Murphy, Manager, Division of Water Supply, New Jersey Department of Environmental Protection, Trenton, NJ

Dr. Duncan Patten, Research Professor, Hydroecology Research Program , Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT

Dr. Stephen Polasky, Fesler-Lampert Professor of Ecological/Environmental Economics, Department of Applied Economics, University of Minnesota, St. Paul, MN

Dr. Stephen M. Roberts, Professor, Department of Physiological Sciences, Director, Center for Environmental and Human Toxicology, University of Florida, Gainesville, FL

Dr. Amanda Rodewald, Associate Professor, School of Environment and Natural Resources, The Ohio State University, Columbus, OH

Dr. Joan B. Rose, Professor and Homer Nowlin Chair for Water Research, Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI

Dr. Jonathan M. Samet, Professor and Flora L. Thornton Chair, Department of Preventive Medicine, University of Southern California, Los Angeles, CA

Dr. James Sanders, Director and Professor, Skidaway Institute of Oceanography, Savannah, GA

Dr. Jerald Schnoor, Allen S. Henry Chair Professor, Department of Civil and Environmental Engineering, Co-Director, Center for Global and Regional Environmental Research, University of Iowa, Iowa City, IA

Dr. Kathleen Segerson, Professor, Department of Economics, University of Connecticut, Storrs, CT

Dr. V. Kerry Smith, W.P. Carey Professor of Economics , Department of Economics , W.P Carey School of Business , Arizona State University, Tempe, AZ

Dr. Herman Taylor, Director, Principal Investigator, Jackson Heart Study, Jackson, MS

Dr. Barton H. (Buzz) Thompson, Jr., Robert E. Paradise Professor of Natural Resources Law at the Stanford Law School and Perry L. McCarty Director, Woods Institute for the Environment, Stanford University, Stanford, CA

Dr. Paige Tolbert, Professor and Chair, Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA

Dr. Thomas S. Wallsten, Professor and Chair, Department of Psychology, University of Maryland, College Park, MD

Dr. Robert Watts, Professor of Mechanical Engineering Emeritus, Tulane University, Annapolis, MD

LIASON MEMBERS

Board of Scientific Counselors

Dr. Gary Sayler, Beaman Distinguished Professor, Joint Institute for Biological Sciences, Oak Ridge National Laboratory, University of Tennessee, Knoxville, TN

Children's Health Protection Advisory Committee

Dr. Pamela Shubat, Supervisor , Health Risk Assessment, Minnesota Department of Health, St. Paul, MN

FIFRA Scientific Advisory Panel:

Dr. Steven Heeringa, Director, Division of Surveys and Technologies, Institute for Social Research, University of Michigan, Ann Arbor, MI

National Advisory Council for Environmental Policy and Technology

Dr. James H. Johnson, Professor and Dean, College of Engineering, Architecture & Computer Sciences, Howard University, Washington, DC

SCIENCE ADVISORY BOARD STAFF

Dr. Angela Nugent, Designated Federal Officer, 1200 Pennsylvania Avenue, NW
1400F, Washington, DC, Phone: 202-343-9981, Fax: 202-233-0643,
(nugent.angela@epa.gov)

Attachment B
Meeting Agenda

**U.S. Environmental Protection Agency
Science Advisory Board
April 5-6, 2010
St Regis Hotel, 923 16th Street, NW, Washington DC 20006**

Agenda

Purpose: to continue the Science Advisory Board's (SAB's) discussions with ORD concerning ORD's strategic research directions and to develop advice on ORD research areas for increased and decreased emphasis over the next five years.

Monday, April 5, 2010

8:30 a.m.	Convene the meeting	Dr Angela Nugent <i>Designated Federal Officer EPA Science Advisory Board</i>
	Welcome	Dr. Vanessa Vu <i>Director, EPA Science Advisory Board Staff Office</i>
8:40 a.m.	Goals and agenda for the meeting	Dr. Deborah Swackhamer <i>Chair, EPA Science Advisory Board</i>
8:50 a.m.	Update on SAB Committee on Science Integration for Decision Making	Dr. Thomas Burke <i>Chair, SAB Committee on Science Integration for Decision Making</i>
9:30 a.m.	Public comment	TBA
9:45 a.m.	Break	
10:00 a.m.	Future Directions for Environmental Science- Presentation and Discussion	Dr. Paul Anastas <i>Assistant Administrator, EPA/ORD SAB Members and ORD Representatives</i>
10:45 a.m.	ORD's Strategic Planning and the Administrator's Priorities - Presentation and Discussion	Dr. Kevin Teichman <i>Deputy Assistant Administrator for Science, EPA/ORD</i>

12:00 p.m.	Lunch	
1:15 p.m.	Improving Air Quality - Discussion	SAB Members and ORD Representatives
2:15 p.m.	Assuring the Safety of Chemicals - Discussion - Discussion	SAB Members and ORD Representatives
3:15 p.m.	Break	
3:30 p.m.	Cleaning Up Our Communities - Discussion	SAB Members and ORD Representatives
4:30 p.m.	Protecting America's Waters - Discussion	SAB Members and ORD Representatives
5:30 p.m.	Plans for April 6	Dr. Deborah Swackhamer
5:40 pm	Recess for the Day	Dr. Angela Nugent

Tuesday, April 6, 2010

8:00 am	Convene the Meeting:	Dr. Angela Nugent
8:10 a.m.	Taking Action on Climate Change - Discussion	SAB Members and ORD Representatives
9:10 a.m.	Building Strong State and Tribal Partnerships and Expanding the Conversation on Environmentalism and Working for Environmental Justice - Discussion	SAB Members and ORD Representatives
10:30 a.m.	Break	
10:30 a.m.	Discussion of common themes and SAB charge questions - Discussion	Dr. Deborah Swackhamer SAB Members
11:45 a.m.	Summary and Action Items	Dr. Deborah Swackhamer
12:00 p.m.	Adjourn the Meeting	Dr. Angela Nugent

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12:00 p.m.	Adjourn the Meeting	Dr. Angela Nugent

Attachment C
FR Announcement

[Federal Register: March 12, 2010 (Volume 75, Number 48)]
[Notices]
[Page 11883-11884]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr12mr10-60]

ENVIRONMENTAL PROTECTION AGENCY

[FRL-9126-2]

Science Advisory Board Staff Office; Notification of a Public Meeting of the Science Advisory Board (SAB)

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Environmental Protection Agency (EPA) Science Advisory Board (SAB) Staff Office announces a public meeting of the Chartered SAB to continue its discussion with EPA's Office of Research and Development (ORD) regarding ORD research programs in support of EPA's mission and priorities.

DATES: The public meeting will be held on Monday, April 5, 2010 from 8:30 a.m. to 5:30 p.m. (Eastern Time) and Tuesday, April 6, 2010 from 8 a.m. to 12 p.m. (Eastern Time).

ADDRESSES: The meeting will be held at the St. Regis Hotel, 923 16th Street, NW., Washington, DC 20006.

FOR FURTHER INFORMATION CONTACT: Any member of the public who wants further information concerning the meeting may contact Dr. Angela Nugent, Designated Federal Officer (DFO), EPA Science Advisory Board (1400F), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460; via telephone/voice mail (202) 343-9981; fax (202) 233-0643; or e-mail at nugent.angela@epa.gov. General information concerning the SAB can be found on the EPA Web site at <http://www.epa.gov/sab>.

SUPPLEMENTARY INFORMATION:

Background: Pursuant to the Federal Advisory Committee Act, 5 U.S.C., App. 2 (FACA), notice is hereby given that the EPA Science Advisory Board will hold a public meeting to review strategic research directions planned by EPA's Office of Research and Development (ORD). The SAB was established pursuant to 42 U.S.C. 4365 to provide independent scientific and technical advice to the Administrator on the technical basis for Agency positions and regulations. The SAB will

comply with the provisions of FACA and all appropriate SAB Staff Office procedural policies.

EPA's Office of Research and Development (ORD) has requested SAB advice on strategic research directions over the next five years to support EPA's mission and priorities. The chartered SAB initiated discussions on November 9-10, 2009 (74 FR 52805-52806). The SAB will continue its discussion and develop advice for EPA on this advisory topic.

Availability of Meeting Materials: A meeting agenda and other materials for the meeting will be placed on the SAB Web site at <http://epa.gov/sab>.

Procedures for Providing Public Input: Interested members of the public may submit relevant written or oral information for consideration on the topics included in this advisory activity. **Oral Statements:** To be placed on the public speaker list for the April 5-6, 2010 meeting, interested parties should notify Dr. Angela Nugent, DFO, by e-mail no later than March 31, 2010. Individuals making oral statements will be limited to five minutes per speaker. **Written Statements:** Written statements for the April 5-6, 2010 meeting should be received in the SAB Staff Office by March 31, 2010, so that the information may be made available to the SAB for its consideration prior to this meeting. Written statements should be supplied to the DFO in the following formats: One hard copy with original signature and one electronic copy via e-mail (acceptable file format: Adobe Acrobat PDF, MS Word, WordPerfect, MS PowerPoint, or Rich Text files in IBM-PC/Windows 98/2000/XP format). Submitters are asked to provide electronic versions of each document submitted with and without signatures, because the SAB Staff Office does not

[[Page 11884]]

publish documents with signatures on its Web sites.

Accessibility: For information on access or services for individuals with disabilities, please contact Dr. Nugent at the phone number or e-mail address noted above, preferably at least ten days prior to the meeting, to give EPA as much time as possible to process your request.

Dated: March 5, 2010.

Anthony F. Maciorowski,
Deputy Director, EPA Science Advisory Board Staff Office.
[FR Doc. 2010-5477 Filed 3-11-10; 8:45 am]
BILLING CODE 6560-50-P

Attachment D: Members of the Public and EPA Representatives attending

Rick Linthurst
Ron Hunter
Bob Hetes
Chuck Noss
Greg Susanke
Jeff Morris
Rachel Longe
Darell Winner
Rich Melchionno
Lynn Flores
Bryan Blumer
Elaine Francis
Anne Grambsch
Steve Cook
Vicki Ellis
Devon Payne-Sturges
Shelley Fudge
William Sanders
Khanna Johnston
Marian Gimbel
Ruth Lee
S. Campleman

Attachment E: Presentation by Dr. Thomas Burke, Update on SAB Committee on Science
Integration for Decision Making

Update on SAB Committee on
Science
Integration for Decision Making

Chartered SAB Meeting

April 5, 2010

Background

- October 2008 – Administrator Johnson requested study “to develop independent advice on how EPA can strengthen scientific assessments for decision making”
 - To build on SAB 2000 report, *Toward Integrated Environmental Decision Making*
- January 2009 – release of the NRC “Silver Book,” *Science and Decisions; Advancing Risk Assessment*
- Spring 2009 – Administrator Jackson reaffirmed support for the SAB Science Integration for Decision Making study

Charge

- To evaluate the extent to which EPA's scientific assessment practices are integrated into environmental decision-making practices as recommended by the NRC and SAB
- To identify barriers to implementing recommendations
- To suggest immediate and future actions to promote integration, considering
 - Scientific leadership
 - Scientific practices
 - Collaboration across disciplines
 - Scientific expertise
 - Workforce

Activities to date

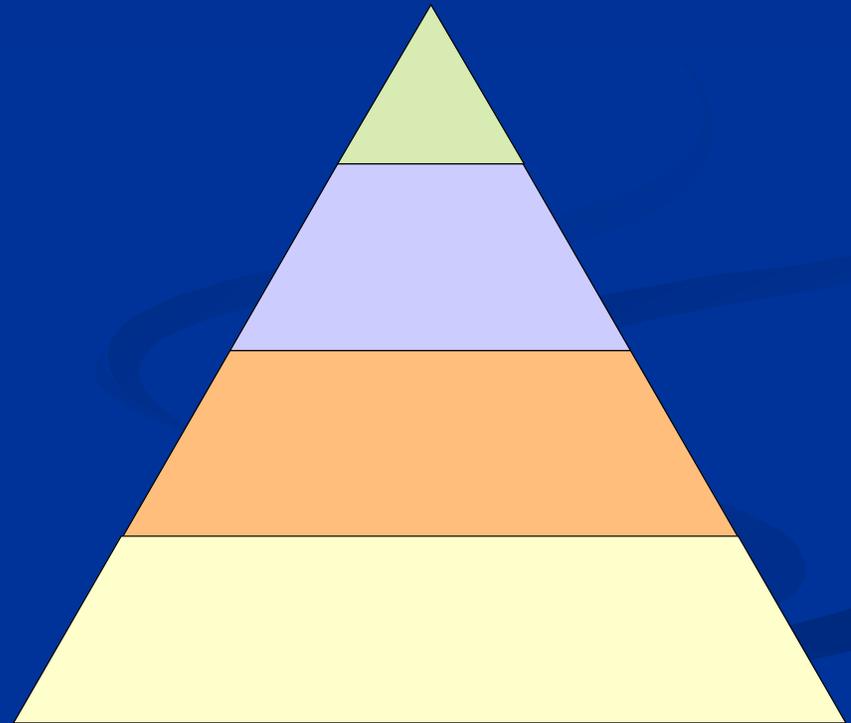
- July 2009 meeting to discuss the charge and receive briefings on decision making at the national program and regional office levels
- September 2009 teleconference to develop a Preliminary Study Plan
- Initial fact-finding interviews (October 28 - February 4)
- March 30-31st meeting to discuss preliminary findings and next steps

Fact-finding interviews

- 73 interviews conducted by committee members
 - Multi-level interviews: leaders, managers and scientific staff
 - Ten regions
 - National Program Offices
 - ORD and other offices supporting decision makers
 - Over 450 interviewees
- Interviews focused on the **practice** of science integration to support decision making
 - Consideration of public, stakeholder, external scientific, and other input in science assessment
 - Drivers and impediments to implementing past recommendations for science integration
 - Ways program receives feedback on how science is used in decision-making
 - Workforce to support science integration for decision making

Key themes emerging (1)

- Decisions requiring science occur at all levels of EPA
 - From the Administrator
 - To mid-level managers
 - To branch chiefs in Program Offices and permit writers at the regions



Key themes emerging (2)

- Science integration practices vary widely
 - Some programs and types of decisions have well-developed processes to integrate science and explicitly use a problem formulation process
 - Others lack clear processes and resources for science integration
 - Some leaders/managers actively promote science integration
 - Much of EPA's science to support decisions, especially in the regions, comes from outside ORD

Key themes emerging (3)

- EPA's scientific workforce estimated at 6,000; only 1,200 in ORD
 - Questions raised about the capacity and roles of regional and program staff in science integration and available resources and technical support for them
 - Challenges and opportunities presented by impending retirement of large numbers of EPA scientists – need for strategic workforce planning

Key themes emerging (4)

Consistent messages from regions:

- Interest in more effective engagement in ORD research planning
- Interest in more IRIS assessments and more assessment of scientific knowledge that would evaluate external literature and address "how do you apply it to a practical problem?"
- Interest in more technical assistance from ORD

Key themes emerging (5)

- ORD's Transformation Process holds promise of promoting science integration by emphasizing customer focus and teamwork
 - Success of ORD's Vision may depend on a shared vision of science integration across all of EPA

Next steps

- Additional limited fact-finding
- Committee teleconferences to develop draft white papers on key findings and key recommendations
- Workshop in Fall 2009 to obtain EPA and stakeholder input on the committee's initial findings and preliminary recommendations.

Attachment F Presentation by Dr. Kevin Teichman, ORD's Strategic Directions and The Administrator's Priorities

ORD's Strategic Directions and The Administrator's Priorities

Kevin Y. Teichman, Ph.D.
Deputy Assistant Administrator for Science
EPA Office of Research and Development





The Administrator's Guiding Principles and Priorities

Guiding Principles

- Science must be the backbone for EPA programs.
- EPA must follow the rule of law.
- EPA's actions must be transparent.

Priorities

- Improving Air Quality
- Assuring the Safety of Chemicals
- Cleaning Up Our Communities
- Protecting America's Waters
- Taking Action on Climate Change
- Building Strong State and Tribal Partnerships
- Expanding the Conversation on Environmentalism and Working for Environmental Justice



Recent Exemplary EPA Accomplishments

EPA Accomplishments

Improving Air Quality

- New NAAQS Process: In May 2009, EPA reintroduced the development of staff-level documents describing its NAAQS policy assessments. These documents lay out the policy-relevant science from ORD's Integrated Science Assessments, the results of the OAR's Risk and Exposure Assessments, and staff recommendations for whether and how to revise the NAAQS. CASAC reviews these document before their final publication.
 - ORD Contributions:
 - ORD develops the Integrated Science Assessments, which address both health (primary) and welfare (secondary) NAAQS.
 - ORD supports much of the research informing these assessments, e.g., the finding that smaller air particles affect the cardiovascular system, while larger air particles impact on the lungs. We also supported research showing that reductions of ambient particulate matter lead to increased life expectancy.
 - This month, we announced the Health and Environmental Research Online (HERO) database.

EPA Accomplishments (2)

Assuring the Safety of Chemicals

- Toxic Substances Control Act (TSCA) Reform: In September 2009, Administrator Jackson announced a set of principles to guide reform of TSCA, resulting in the application of a risk-based standard for chemical reviews, strengthening EPA's ability to collect data and take action once risks are identified, and promoting "green" innovations and sustainability.
 - ORD Contributions:
 - Last June, ORD launched Phase II of ToxCast to screen 700 additional chemicals, including 100 chemicals provided by the pharmaceutical industry to EPA that were shown to be toxic in clinical trials.
 - ORD is leveraging interagency and international research on the implications of nanomaterials (e.g., carbon nanotubes, silver, fullerenes, cerium oxide, iron, and titanium oxide).
 - A compendium of EPA and others' studies on perfluoroalkyl acids (PFAAs) was published in a special issue of *Reproductive Toxicology*.

EPA Accomplishments (3)

Assuring the Safety of Chemicals, cont.

- New Integrated Risk Information System (IRIS) Process: In May 2009, EPA announced reforms to the IRIS assessment process to ensure its scientific quality, integrity, transparency, and timeliness. For example, written interagency comments are now made available to the public. All IRIS assessments continue to undergo public comment and subsequent independent, external peer review.
 - ORD Contributions:
 - ORD leads the IRIS program. By the end of FY10, we expect to have released 21 assessments for external peer review / public comment and posted 24 completed assessments on the IRIS database under the new process.
 - For example, ORD has released, or is expected to release, several major health assessments either for external review / public comment (TCE, methanol, formaldehyde) or posting on the database (acrylamide, carbon tetrachloride) during this time period.
 - ORD has also focused on the human health risks from exposures to dioxin. EPA's Science Plan for Activities Related to Dioxins in the Environment (2009) details an estimated timeline for completion of the Agency's dioxin reassessment by the end of 2010.

EPA Accomplishments (4)

Cleaning Up Our Communities

- Managing Coal Ash: The Administrator has committed to publishing a proposed rule that will address the management of coal combustion residuals (CCRs) from electric utilities; it is expected to include on-site inspections and assessments of the structural integrity of CCR impoundments.
 - ORD Contributions:
 - ORD published reports on the characterization of, and metal availability in, coal combustion residue.
 - We are conducting probabilistic assessments of plausible CCR-management scenarios to illustrate how data can be used in decision-making to evaluate the range of conditions for management of CCR.
 - Our researchers are also helping OSWER identify potential beneficial uses of CCR and the associated potential risks to human health and the environment.

EPA Accomplishments (5)

Protecting America's Waters

- Drinking Water Strategy: In her recent remarks to the Association of Metropolitan Water Agencies, the Administrator announced the four elements of EPA's new Drinking Water Strategy: (1) address water contaminants in groups; (2) engage private innovators, entrepreneurs, and small businesses to improve drinking water technologies; (3) leverage all authorities—such as pesticide and chemicals laws—to confront and preempt drinking water contaminants; and (4) work closely with State, Tribal, and local partners on information-sharing, monitoring, and analysis.
 - ORD Contributions:
 - ORD received an R&D Magazine Award for a device that rapidly concentrates microbes in drinking water samples, so they can be easily and safely transported to a laboratory for further analysis.
 - ORD's technology demonstration program has enabled small systems to develop cost-effective and sustainable approaches to reduce health risks associated with waterborne contaminants such as arsenic.
 - ORD's water infrastructure research is providing tools to prevent the contamination of water supplies; our homeland security research is assisting municipalities protect their drinking water distribution systems.

EPA Accomplishments (6)

Taking Action on Climate Change

- GHG Endangerment Finding: In December 2009, EPA issued its finding that GHGs endanger public health and welfare. This finding responded to the Supreme Court's 2007 decision that EPA has the authority to regulate GHGs from motor vehicles.
 - ORD Contributions:
 - ORD studies were cited by Administrator Jackson in her finding that GHGs endanger public health, e.g., our research that demonstrated climate-change-driven changes in ozone air pollution endanger public health.
 - ORD scientists served as authors, contributors, and reviewers for the Technical Support Document that accompanied the finding decision.
 - More generally, ORD developed a nine-region MARKet ALlocation (MARKAL) model of the United States to explore future energy scenarios and produced a database to account for regional variation in resource availability, transportation costs, and end-use demands.

EPA Accomplishments (7)

Building Strong State and Tribal Partnerships

- Reducing Nutrient Impacts: Last August, EPA published a report, titled “An Urgent Call to Action: Report of the State-EPA Nutrient Innovations Task Force Group.” This report evaluates the scope of nutrient impacts and recommends innovative ways to address nutrient pollution.
 - ORD Contributions:
 - ORD is developing tools to help the EPA Office of Water, States, Tribes, and local communities select and apply green infrastructure options (e.g., rain gardens, permeable pavement, bioswales).
 - Preliminary results from our Chesapeake Bay “proof-of-concept” study for meeting phosphorus and nitrogen total maximum daily loads (TMDLs) suggest that there may be significant cost savings by combining *green* with *gray* infrastructure, plus significant ecosystem services co-benefits from carbon and water storage.
 - ORD is collaborating with the Regions, States and Tribal nations to collect and communicate information about how cultural practices influence exposure pathways to help assess any impacts on public health.

EPA Accomplishments (8)

Expanding the Conversation on Environmentalism / Environmental Justice

- Initiating the Conversation: EPA hosted a Symposium on the Science of Disproportionate Environmental Health Impacts, “Strengthening Environmental Justice and Decision Making” in Washington, DC on March 17-19, 2010.
 - ORD Contributions:
 - ORD co-organized and co-sponsored the Symposium. EPA committed to responding to proposed actions from EJ groups, including recommendations for science / research.
 - ORD collaborated closely with EPA Region 4 and the Office of Enforcement and Compliance Assurance to conduct a preliminary assessment of water quality in low-income regions of central Appalachia near mountaintop-mining operations.
 - ORD, in collaboration with Region 1 and New Haven, CT, developed predictive tools and data that informed critical risk-management decisions to promote the health in the community. Region 1 anticipates applying this model to additional EJ communities.

EPA Accomplishments (9)

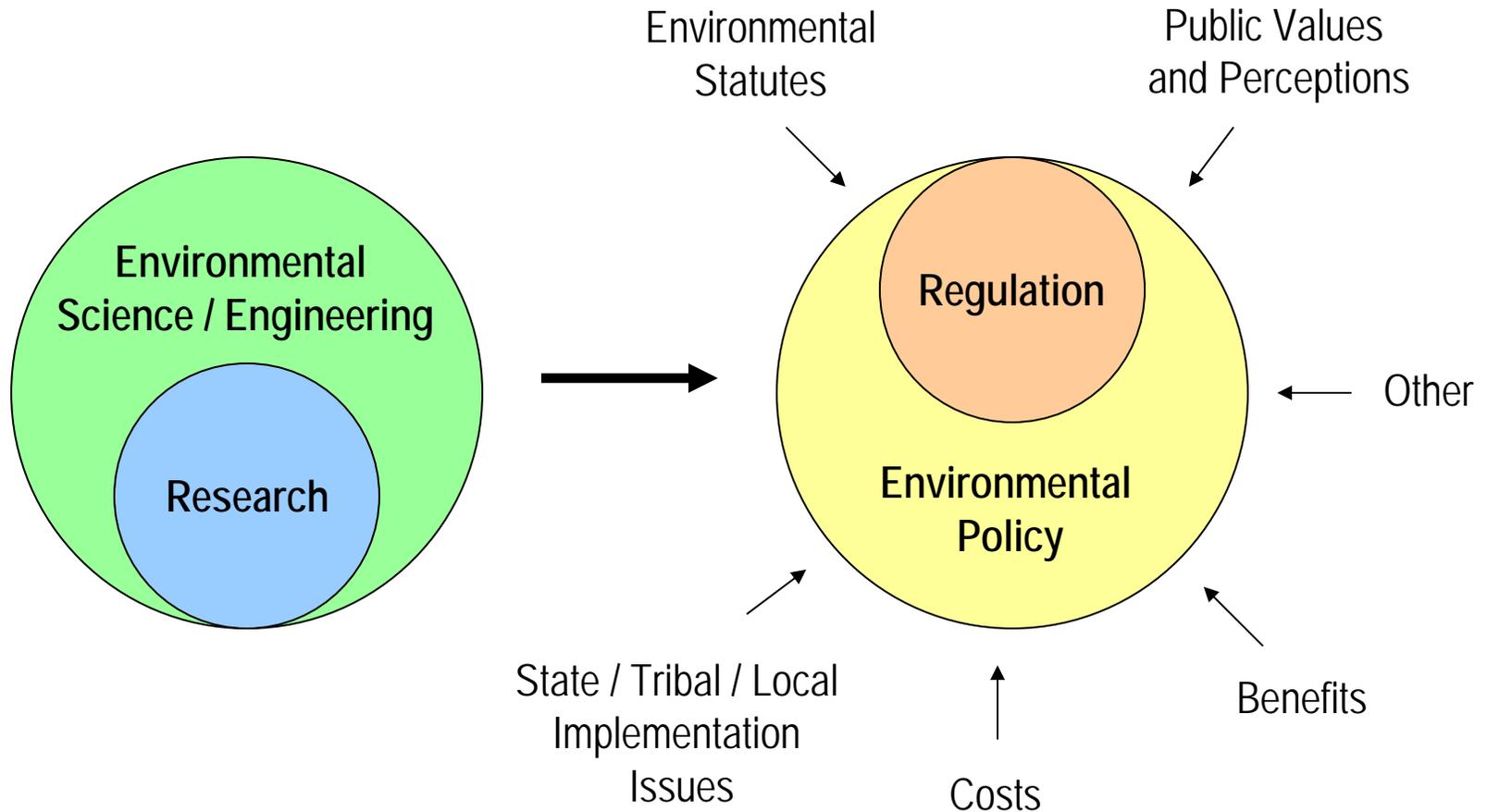
Innovation for Sustainable Growth

- Innovation: In her March 2010 speech to the National Press Club, Administrator Jackson stressed, “Well-conceived, effectively implemented environmental protection is good for economic growth.” Also, “Innovation is the ‘sweet spot’ where our economic and environmental interests meet.”
 - ORD Contributions:
 - ORD’s Small Business Innovation and Research (SBIR) Program provides incentive funding for small businesses to translate their innovative ideas into commercial products that address environmental problems.
 - Our Environmental Technology Verification (ETV) Program collaborates with public- and private-sector organizations to bring objective information to the environmental technology marketplace.
 - Our People, Prosperity, and the Planet (P3) Design Competition motivates undergraduate- and graduate-student teams to develop innovative technical solutions that address sustainability challenges in both the developed and developing world.



Thoughts from the ORD "Science Guy"

Science, Research, and Environmental Policy



ORD Research Areas and the Administrator's Priorities

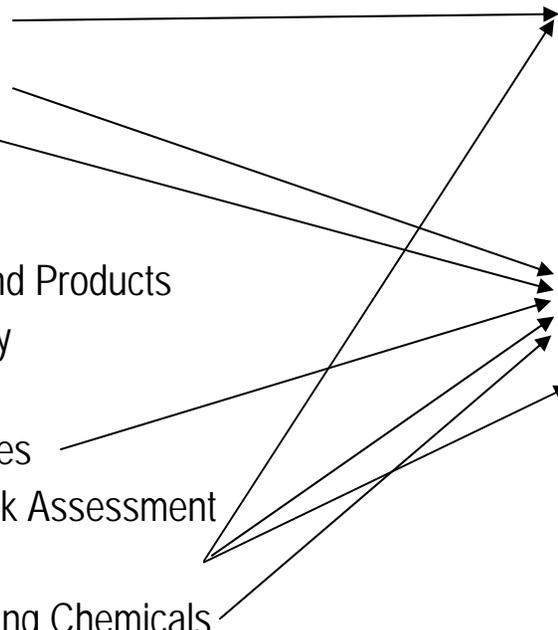
ORD Research Areas

(examples)

- Air
- Drinking Water
- Water Quality
- Land Preservation and Restoration
- Safe Pesticides and Products
- Homeland Security
- Human Health
- Ecosystem Services
- Human Health Risk Assessment
- Global Change
- Endocrine Disrupting Chemicals
- Computational Toxicology
- Nanotechnology
- Science and Technology for Sustainability

Administrator's Priorities

- Improving Air Quality
- Assuring the Safety of Chemicals
- Cleaning Up Our Communities
- Protecting America's Waters
- Taking Action on Climate Change
- Building Strong State and Tribal Partnerships
- Expanding the Conversation on Environmentalism and Working for Environmental Justice



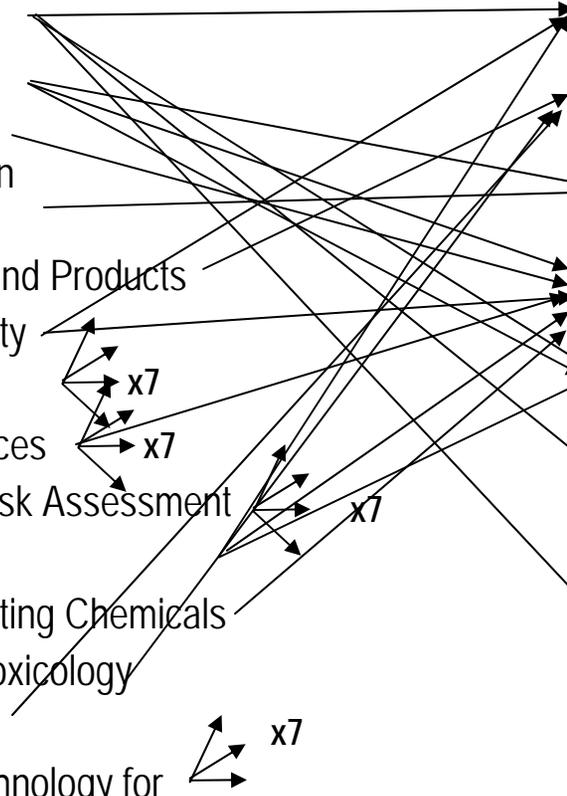
ORD Research Areas and the Administrator's Priorities

ORD Research Areas

- Air
- Drinking Water
- Water Quality
- Land Preservation and Restoration
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- Homeland Security
- Human Health
- Ecosystem Services
- Human Health Risk Assessment
- Global Change
- Endocrine Disrupting Chemicals
- Computational Toxicology
- Nanotechnology
- Science and Technology for Sustainability

Administrator's Priorities

- Improving Air Quality
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- Cleaning Up Our Communities
- Protecting America's Waters
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- Expanding the Conversation on Environmentalism and Working for Environmental Justice



≤ 7 x 14 = 98 arrows!

Touchstones for this Meeting

- This is a strategic planning meeting—not a budget meeting.
- We will be discussing strategic plans for ORD **research**, not EPA **science**.
- To get where you want to go, you need to know where you are.
- Arraying the current ORD research areas by the Administrator's Priorities is a "work in progress."



Current ORD Research Activities and Strategic Directions

Cross-Walked with the

Administrator's Priorities

Improving Air Quality

Examples of Current ORD Activity

- Providing underlying science for and developing the Integrated Science Assessments (ISAs) that support the timely review of the primary (health-based) and secondary (environmental effects-based) National Ambient Air Quality Standards (NAAQS)
- Providing IRIS assessment for several Hazardous Air Pollutants (HAPs)
- Establishing a framework to assess the impacts of the realistic, multipollutant ambient environment on human health
- Developing strategies to address climate-change impacts on air quality; analyzing reductions in other air pollutants (ozone, PM, air toxics) associated with broad-scale use of various greenhouse-gas reduction technologies and strategies
- Evaluating the extent to which vegetation can reduce the concentration of air pollutants in urban (particularly near-road) and suburban settings, and the impacts of land-use change on air quality
- Undertaking field and lab testing of different fuel blends and assessing any human health or air quality impacts resulting from the increased use of biofuels

Improving Air Quality (2)

Vision: *EPA science will provide the fundamental knowledge needed to appropriately address air-quality issues with innovative and strategic solutions.*

Suggested Strategic Directions / Examples of Anticipated Accomplishments

- **Provide the science and tools needed for sound decision-making and efficacious implementation of rules and strategies to improve air quality**
 - Develop an accountability framework to assess AQ Decisions
- **Enhance and leverage existing relationships and create new ones**
 - Develop a Multipollutant Research Program in collaboration with the Office of Air and Radiation
 - Enhance partnerships with industry, academia, and other governments to share technology advances to monitor, assess, and control air pollution
- **Complement, support, and inform ORD programs that address other Administrator priorities**
 - Promote Environmental Justice through considered inclusion in study designs and assessments specific to respective needs and concerns

Assuring the Safety of Chemicals

Examples of Current ORD Activity

- Creating virtual models of the human liver and embryo (and other organs in the future) that integrate toxicity pathways and predict chemicals risks
- Conducting research to understand which nanoparticle properties may cause risk, and how green chemistry and other approaches can be used to develop safe nanomaterials
- Developing and implementing methods for the next-generation of human health risk assessments
- Researching effects, exposures, and risk-management options related to perfluorinated chemicals and other toxic substances and pesticides
- Helping to characterize and reduce exposure to endocrine-disrupting chemicals (EDCs) by creating new exposure-assessment and risk-management tools; and developing standardized protocols to screen and test chemicals for their potential endocrine-mediated effects
- Developing ecosystem-service models for integrated pest management and pesticide fate and transport
- Developing ecological probabilistic models to assess risks (i.e., spatially-explicit, population-level) to wildlife populations and non-target plants from pesticides, toxic chemicals, and multiple stressors



Assuring the Safety of Chemicals (2)

Vision: *EPA science will lead the sustainable development, use, and assessment of chemicals.*

Suggested Strategic Directions / Examples of Anticipated Accomplishments

- **Provide smarter and more efficient testing, risk-assessment, and risk-management options**
 - Provide much higher throughput tools for the prioritization and screening of chemicals based on exposure and toxicity pathways
 - Support research into alternative product formulations using green chemistry and green engineering principles, leading to the design of safer chemicals / products
- **Enhance and leverage existing relationships and create new ones with industry, academia, NGOs, and other agencies in the United States and other countries to speed up and share data generation, life-cycle assessment, and green chemistry / safety-by-design approaches**
 - Develop new approaches for assessing risks, by integrating computational toxicology approaches into risk prediction for new and existing chemicals at the screening stage



Cleaning Up Our Communities

Examples of Current ORD Activity

- Developing technologies to treat contaminated sediments and ground water
- Applying the “Community-Focused Exposure and Risk Screening Tool” (C-FERST) to assist communities in prioritizing risks and clean-up options
- Applying multipollutant air strategies and source-to-health-outcome research to minimize exposure to pollution and to inform planning / zoning
- Producing a national atlas of ecosystem services and associated variables through an interagency project initiated by ORD; the output will be available through the web at a Nature Serve / National Geographic site focused on communities
- Promoting sustainable communities by providing decision-support tools at the neighborhood scale that integrate water supply, water quality, air quality, and food and fiber production
- Developing Provisional Peer-Reviewed Toxicity Values (PPRTVs) to support decision-making by OSWER, EPA Regions, and States on cleaning up sites
- Developing and disseminating methods to decontaminate outdoor areas and building materials impacted by homeland security emergencies



Cleaning Up Our Communities (2)

Vision: *Expand interactions between restoration, sustainable materials management, and land-use research strategies to apply scientific tools and support sustainable community decisions.*

Suggested Strategic Directions / Examples of Anticipated Accomplishments

- **Restoration**
 - Evaluate the state of the science for groundwater remediation and long-term stewardship of hazardous-waste sites
 - Develop and test decontamination methods to address wide-area anthrax and radiological contamination
- **Sustainable Materials Management**
 - Focus life-cycle assessment research to better manage materials
 - Address the compatibility of biofuels in underground storage tanks and develop protocols for emergency response
- **Land Use**
 - Improve methods of “green” accounting, so the real costs of land-use change are apparent

Protecting America's Waters

Examples of Current ORD Activity

- Crafting strategies to address the nation's aging water infrastructure, including:
 - assessing future demands
 - producing state-of-the-technology reviews
 - demonstrating the most promising technology innovations
 - establishing a "center of excellence" through a cooperative agreement with the Water Environment Research Foundation
- Assessing the ecological impacts of mountain-top mining
- Characterizing the occurrence and impacts of endocrine-active compounds in drinking water, wastewater treatment plant effluents, biosolids, and releases from concentrated animal feeding operations
- Determining the effects on water quality and ecosystem services associated with the use of forests to store carbon (e.g., carbon offsets)
- Devising strategies to protect water resources and improve the resiliency of water systems in response to land-use changes and climate change

Protecting America's Waters (2)

Vision: *ORD will develop a "one hydrosphere" approach to conducting science and technology research that leads to the development of safe, resilient, and sustainable water resources.*

Suggested Strategic Directions / Examples of Anticipated Accomplishments

- **Microbial Water Quality:** Develop tools to characterize and manage health risks associated with exposure to waterborne contaminants pertinent to urban and rural water uses
- **Chemical Water Quality:** Provide science, technology, and support for innovation to protect human health, aquatic life, and dependent wildlife
- **Integrated Resource Management:** Provide science and engineering to make accountable water resource-management decisions in watersheds and groundwater basins; integrate energy and sustainability concepts; and strengthen the protection of drinking water sources
- **Ecosystem Services:** Protect and restore the water quality and quantity necessary to replenish the water supply, and support flood and drought mitigation, outdoor recreation, and ecosystem services valuation

Taking Action on Climate Change

Examples of Current ORD Activity

- Building a database on the availability, cost, performance, and environmental implications of GHG-reduction technologies for the power generation, transportation, industrial, and waste-management sectors
- Integrating models to investigate multi-pollutant air quality management under a changing climate and linking these changes to human health assessments
- Producing advanced modeling tools to assess the radiative forcing of short-lived air pollutants (such as black carbon, ozone, and precursors) as well as their impacts on regional climate
- Developing the next generation of decision-support tools, scenario data, and approaches to enable implementation of adaptation options under uncertainty (e.g., drinking water and wastewater utilities)
- Studying the water / energy nexus and the health / environmental implications of geologic sequestration and hydraulic fracturing
- Researching the effects of climate change on the delivery of ecosystem services, such as the natural removal of greenhouse gases from the atmosphere, provision of fish and game habitats, protection of shorelines, and production / filtration of water

Taking Action on Climate Change (2)

Vision: *ORD will be a key source for Program and Regional Offices on climate change impacts, adaptation, and mitigation research.*

Suggested Strategic Directions / Examples of Anticipated Accomplishments

- **Implement next-generation climate research and assessments**
 - Reduce uncertainties with respect to climate change impacts on air quality and water quality
 - Develop holistic assessment tools to guide climate mitigation and adaptation decisions
 - Assess the effectiveness of innovative solutions to adapt to the changing climate
 - Evaluate the technological and policy options to reduce greenhouse gases
- **Expand ORD's expertise in Earth system research**
 - Identify, through transdisciplinary teams, the most sustainable solutions and minimize the unintended consequences of climate change actions, including the implications of inaction
- **Enhance and leverage interagency relationships**



Building Strong State and Tribal Partnerships

Examples of Current ORD Activity

- Facilitating and sponsoring the National EPA-Tribal Science Council, the Regional Applied Research Effort (RARE), Regional Research Partnership Program, Regional Methods, and other programs
- Developing indicators at the local scale to update the Report on the Environment (ROE) indicators of national conditions and trends in air, water, land, human health, and ecological systems
- Updating the Causal Analysis / Diagnosis Decision Information System (CADDIS) to help Regions, States and Tribes find, access, organize, use, and share information to conduct causal evaluations in aquatic systems
- Conducting workshops and providing EPA Regions, States, and Tribes with decision-support tools to evaluate co-benefits and/or unintended consequences of different GHG-reduction strategies
- Coordinating a Regional sustainability network to identify priority research and collaborate on place-based projects such as the San Luis Basin Metrics Study (Region 8) and Sustainable Puerto Rico (Region 2)
- Collaborating on several RARE and Community Action for a Renewed Environment (CARE) projects to adapt the C-FERST (Community-Focused Exposure and Risk Screening Tool) to characterize specific community conditions and address Regional / local concerns



Building Strong State and Tribal Partnerships (2)

Vision: *EPA research will support State and Tribal environmental and health decisions by illuminating the connections between environmental stressors and human health at the State, Tribal, and local levels.*

Suggested Strategic Directions

- Understand the unique geographical and cultural factors that influence the potential exposures and health risks in Tribal communities
- Provide scientifically sound tools to meet the decision-support needs among environmental managers in the States and Tribal nations
- Facilitate the exchange of information to identify the highest priorities for scientific support at the State, Tribal, and local level



Expanding the Conversation on Environmentalism and Working for Environmental Justice

Examples of Current ORD Activity

- Conducting asthma research, with an emphasis on understanding the high prevalence of the disease among socio-economically disadvantaged and minority children
- Assessing the impacts of near-roadway pollution on children both at home and school
- Understanding the environmental determinants of childhood obesity, asthma, and neuro-developmental outcomes (e.g., diet, intrauterine stressors)
- Responding to the recommendations of the participants in the March 2010 Symposium on the Science of Disproportionate Environmental Health Impacts, "Strengthening Environmental Justice Research and Decision Making"
- Collaborating with other agencies (NIH, CDC, NIEHS) on the National Children's Study, including exposure factors for children, especially the very young (0-6 yrs), in different environments (e.g., homes, child-care facilities, schools) and the role of nonchemical stressors
- Developing a framework in which environmental justice issues, human health vulnerabilities, and ecosystem services are represented spatially and temporally (e.g., maps)



Expanding the Conversation on Environmentalism and Working for Environmental Justice (2)

Vision: *EPA research will support environmental and public health decisions in communities by illuminating the connections between environmental stressors and human health, especially for disproportionately affected populations and children.*

Suggested Strategic Directions

- Respond to the research actions proposed by EJ groups at the Symposium on the Science of Disproportionate Environmental Health Impacts
- Help communities characterize cumulative risk, identify communities at risk, and evaluate the effectiveness of risk-management strategies
- Understand the exposures and health impacts that are elevated in, or unique to, specific communities
- Conduct research to more fully understand the unique vulnerabilities of children to the effects of toxic chemicals in the environment



The Charge to the Bright Brigade

The Charge to the Bright Brigade

The SAB has been asked to address the following topics:

- The extent to which ORD's suggested strategic research directions address the Administrator's Priorities by providing the scientific information needed to inform environmental decision-making, especially decisions made by EPA's Program and Regional Offices
- Suggestions for key areas that ORD should leverage by working with other (non-ORD) science programs across EPA and with the science programs of other Federal agencies
- Areas for increased emphasis in ORD's research program over the next five years; areas for decreased emphasis over the next five years

The Charge to the Bright Brigade (2)

- Are there strategic research directions that ORD should pursue differently or undertake as it draws upon its unique expertise to conduct integrated, transdisciplinary research (ITR)?
- Where can research on socio-economics best contribute to ORD's ITR efforts?
- Where can we apply lessons learned from environmental research to protect human health and from human health research to protect the environment?



Attachment G: SAB Members' Preliminary Individual Bullets for Consideration - April 6, 2010

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Input from Dr. Terry Daniel

1. The extent to which ORD's suggested strategic research directions address the Administrator's Priorities by providing the scientific information needed to inform environmental decision-making, especially decisions made by Program and Regional Offices.

Nominally, as was shown in the cross-walk diagrams, there is a very good fit. However, the Integration of Science for/with Decision Making committee has uncovered considerable concern among scientists in the Regions that, in practice, ORD research is not sufficiently responsive to their needs for science to support their decisions and actions. There are many facets to this problem (including the possibility of misconceptions in the Regions of ORD's responsibilities and of poorly framed, poorly communicated and unorganized needs being presented by the Regions), but the connections between science needs in the Regions and science products and services in ORD is clearly not optimum. Thus many "smaller" (but enormously important in the aggregate) decisions may not be as well supported by science as they should be. Part of the problem may be the distinctions between science and research (as strongly articulated by Dr. Teichman), but another problem may revolve around distinctions between science and policy (political) components of decisions. Regional scientists may feel that if their scientific methods and data had been more current, more precise, or more timely their input would have had more effect on final decisions. Of course, in many cases science is not the most important factor affecting decisions, and more/better/faster science may not actually change the outcome. A clear and consistent understanding across the Agency about the distinctions between science and policy would be helpful—and it would not hurt to share this understanding with stakeholders and the public.

Related to this charge question is the specification of the client for ORD research and science. Most of the program descriptions and goals statements indicate that their client is Program Offices, Regions, States and Tribes. If it is reasonable to assume that the ultimate "client" for all Agency decisions and actions is the citizens of the USA, then ORD must be relying on Offices/Regions/States/Tribes to accurately and faithfully represent the needs and wants of citizens. The Administrator's priorities appear to be focused on meeting needs of citizens, so it would seem important for ORD to look carefully at how well citizens needs and concerns are getting through these various filters and translators. Work on the topics of cleaning up communities and environmental justice are two areas where more direct contact between ORD research and the needs, wants and concerns of citizens would seem to be demanded, and where current conceptions could be tested and refined.

2. Suggestions for key areas that ORD should leverage by working with other (non-ORD) science programs across EPA; with the science programs of other federal agencies.

An obvious area that could benefit from working with other agencies is social and behavioral sciences. Other agencies (e.g., USDA Forest Service, Agricultural Research Service, Agricultural Extension) have longer experience and currently have greater capacity in social and behavioral sciences (especially outside of economics). In the context of the "extra" charge question regarding "where can socio-economics best contribute..." there are important

opportunities ranging from problem formulation to solution implementation. On the problem formulation end, for example, social/behavioral science provides rigorous tested methods for determining what risks communities are concerned about and how they prioritize multiple risks, how people perceive (or not) risks that ORD and other professionals are concerned about and why, and what uncertainties in science (as opposed to uncertainties in policy) people are most concerned about and how they understand the uncertainties that experts are concerned about. Social/behavioral research could be important for articulating and communicating with stakeholders and the public about an appropriate range of alternative solutions to be considered and for predicting how various stakeholders are likely to respond to those alternatives (e.g., viz. acceptance, support and compliance).

3. Areas for increased emphasis in ORD's research program over the next five years; areas for decreased emphasis over the next five years.

Assuming that making progress in the transformation toward Integrated Transdisciplinary Research approaches is both important and urgent, programs that offer opportunities to pilot, learn about and highlight this approach should be given high priority. If necessary (i.e., if you are in a zero sum game), “traditional” single stressor, single medium programs should be deemphasized.

The related “extra” charge question regarding “Strategic research directions to draw upon expertise in integrated transdisciplinary research...” also implies that programs and problems offering opportunities to advance the ITR strategy should be sought and emphasized. The Administrator’s priority areas that would seem to offer better opportunities for innovative ITR approaches include cleaning up communities, environmentalism and environmental justice, global climate change, and State and Tribal partnerships (which would presumably require substantial involvement of the Regions). These are relatively new “cross-cutting” program areas that are less entrenched in existing ways of doing business, and they each demand a transdisciplinary approach.

Another domain that could help to advance the ITR approach, and thus should be emphasized, is where protection of human health overlaps with protecting the environment (and ecosystems). That is, where there is an opportunity to pursue research that simultaneously contributes to both goals. This is consistent with the third “extra” charge question, regarding mutual learning between human health and environmental protection efforts. The “one hydrosphere” concept/project seems a good example, but other opportunities to mutually leverage research in health (ecosystems) to improve understanding in ecosystems (health) should be aggressively sought and exploited.

Input from Dr. Taylor Eighmy

I think there are ways to be responsive to Dr. Teichman’s three (or six) charges to us around ORD’s around strategic planning and aligning ORD’s vision, mission, and goals with the seven (or eight) priorities that Administrator Jackson has laid out while also getting at our concerns around integration and Dr. Anastas’ concept of ITR:

1. Make sure to map these potential cross cutting integrative themes to the seven (or eight) priorities:

- Human health and risk
- Clean and safe land, air and water
- Ecosystem services across land, air and water (including natural and adaptive)
- Sustainability (scale-dependent, from local to international)
- Climate change

2. Enhance and leverage what other federal agencies, state agencies, NGOs, the private sector, and other nations are doing with the R&D budgets within the above items for each of the seven (or eight) priorities (Dr. Teichman has laid this out for some of the priorities).

Input from Dr. Rogene Henderson

The implementation of ITR will require that funding be provided to a person in charge of a well-formulated interdisciplinary problem. That will give the manager in charge the opportunity to recruit EPA scientists with the appropriate mix of disciplinary skills to address the problem. As it is, the current program managers, the NPD's, do not have their own funding and are thus hampered in their ability to bring multi-disciplines to the table to work on the problem. The current use of NPDs seems to be effective but in an uneven way. Some NPDs are quite successful and have a lot on their plate. For example the air program is responsible for 6 criteria pollutants and 188 air toxics. However the nano particle program has only one chemical, essentially. That is an uneven use of the NPDs. Air, water and land each have their own NPD. Other NPDs are not related to media, but are related to a certain problem. I am not sure what the rationale is for setting up different programs. The rationale should be thought through.

Input from Dr. James Johnson

Question 1

- a. It is not clear that a defined robust process has been developed to assure the ITR will consistently address the Administrators priorities.
- b. The example strategic directions, in some cases, appear to perpetuate the existing stove pipe model.

Question 3

- a. The strategic directions should be defined by the needs of the Agency to satisfy the Administrators priorities and statutory requirements.
- b. Strategic directions should address better ways to carry out statutory requirements, e.g., the Administrators four elements of the new Drinking Water Strategy.

Question 4

If the socio-economic input is core to an effort, it should be a permanent part of the team. If not core to an effort, socio-economic experts should be incorporated in teams on an as needed basis.

Input from Dr. Nancy Kim

1. How does ORD coordinate/leverage with CDC to define and carry out research problems? Without people with different backgrounds and perspectives, important research problems may not be conceptualized. The following are specific examples of problems that could benefit by ORD and CDC exploring and carrying out ITR research. It isn't clear that these could happen just with conversations. Other approaches, such as having people spend time another agency may be necessary.

a. From the EPA perspective, asthma exacerbations can be caused by air pollution. From a medical perspective, asthma exacerbations can be caused by lack of access to medical care. This can be an environmental justice concern. EPA could pursue having industries that go into an environmental justice community (perhaps defined by a disproportionate impact area), even if any air discharges are not significant, assist a community in other ways, e.g. help the community by establishing an asthma clinic. Another, more research approach, would be to investigate the relationship between air pollution, asthma exacerbations and access to medical care.

b. ORD and CDC could investigate the health impacts of changing disinfection treatments. For example, health outcome research related to disinfection practices could be to determine the incidence of gastrointestinal ailments and reproductive effects (low birth weight, pre-term births, small for gestational age, sex ratio, and birth defects) for one year before and one year after (or pick a different time period) disinfection treatment changes (e.g. going from chlorine disinfection to ozonation or chloramination). Such research has the benefit of looking at relatively short term health effects (won't address carcinogenicity) and integrating a number of disinfection by-products with the community being its own control group.

c. One area that is ripe for ITR research is the impact of global climate change and vector borne diseases such as mosquito borne encephalitis and tick borne illnesses such as Lyme disease. Understanding where global climate changes could increase or decrease the habitat of arthropods, the benefits of using pesticides to control the insects versus the risks to endangered species as well as people, and how to use insect repellents with minimum risk and maximum benefit.

2. How is ORD going to bring communities into the development of research projects? How can ORD carry out research to help communities make effective risk management decisions?

3. Have the regions asked for any specific help on research questions from the Economics and Decision Sciences people.

4. Without giving resources to the people who are to move ITR forward, changes are not likely to happen. Two approaches, and perhaps others, could be tried. One is to completely revise who has control of the budget, i.e. the NPDs could be responsible for distributing resources. Another approach would to carry out a change more deliberately, e.g. have the NPDs control the resources for several pilot projects that would use ITR.

Input from Dr. Judith Meyer

1. Do suggested strategic directions respond to Administrator priorities?

Yes, but until the budgetary structure is changed, the potential of the strategic directions will never be realized. The National Program Directors must have funds under their control to be able to do the research identified under the strategic directions. The National Program Directors

need to be a part of the Executive Council when budgetary decisions are made. The Lab and Center Directors clearly control ORD's research directions because of their control over the budget. I am frustrated because it feels as though we as the SAB have been talking to the wrong people all along!

One way to increase Lab and Center Director willingness to support the strategic research directions identified by the National Program Directors would be to make contribution to National Research Programs be a significant criterion in Lab and Center review. In other words, one metric for evaluation of performance of Labs and Centers should be their contributions to progress in ITR.

2. Areas to leverage.

3. Areas for increased vs. decreased emphasis.

Decrease emphasis on research in support of a chemical-by-chemical approach to regulation. Increase research in support of regulations and policies that address mixtures of chemicals and multiple stressors because that is the world we live in. That is the type of anticipatory research in which ORD needs to be a leader.

4. Strategic research directions that should be pursued differently to do ITR?

ITR will not be accomplished given the current budgetary decision structure. Until the National Program Directors are able to set budgets that cannot be overridden by Lab and Center Directors, ITR will be empty words.

5. Where can research on socioeconomics contribute?

There is a clearly articulated need for socioeconomic expertise in the Ecosystem Services Research Program. That need has been identified in SAB reports and is clearly recognized by the National Program Director. Yet funding for those positions has not been forthcoming; in fact, the funds available for socioeconomic research and collaborators have decreased in the most recent budget.

6. Where can we apply lessons learned?

Lessons learned need to be more clearly articulated before they can be applied. The public needs to hear ORD success stories expressed in a way that the public can understand why this is a success.

Applying a lesson learned: The process recently undertaken by the Environmental Justice group should be attempted in other research areas. For example, the Water Quality Program should convene a similar group of stakeholders (e.g., environmental groups working on water issues) and listen to what those groups view as areas of needed research. I think they would find considerable support and some useful suggestions for the work they are considering on green infrastructure.

Input from Dr. Eileen Murphy

Charge Q 1: "...extent which ORD's strategic research directions address Administrator's Priorities..."

Comment: One of the Administrator's Priorities listed on slide 15 is: "Building Strong State and Tribal Partnerships." States are mostly unable to conduct or fund the research necessary to inform environmental policies that affect them. This is even more significant in instances where a state-wide issue is unique to the state or a few states. For example, human chromium exposure due to airborne distribution of chromium particles from waste sites is of concern in only two or three states. The issue is vitally important to those few states, but it is not considered a national issue, so it does not appear on priority research areas for the country. While some EPA offices maintain regular contact with regions and states (Office of Water meets twice a year with state toxicologists involved in drinking water standard setting), there is no systematic communication between ORD and states/regions. States (in addition to communities) have unique perspectives on environmental research needs and can help inform research strategies and agendas. ORD could be more proactive in encouraging ORD scientists (and managers) to participate in Interpersonnel Agreements (IPAs) and can likewise encourage IPAs from states to ORD (where a state scientist can be assigned to an ORD office for a specified period of time). This serves two purposes – 1) the person engaged in the IPA will learn from the scientists in the sister agency, and 2) contacts between the state and ORD will be made and maintained even after the IPA is over. An alternate idea is to permanently assign ORD scientists in the Regions where there are active research programs in place. These regional representatives would work with states, regional scientists and local academics toward development of interagency research projects.

Regarding whether or not ORD research areas address the administrator's priorities, I do feel that there is much overlap between the research areas and the administrator's priorities. By articulating her priorities, ORD National Program Directors can ensure that the top quality research identified in their five-year plans specifically address them.

Charge Q2: "key areas that ORD should leverage by working with other programs... federal agencies..."

Comment: It is good to hear that ORD is partnering with US Geological Survey on the national surveys of unregulated organic contaminants in raw waters (surface and ground water) and finished drinking water supplies. It is of particular importance that ORD be at the table to investigate both ecological and human health effects of these chemicals in source waters and drinking water. USGS has developed advanced analytical methods to analyze for these compounds at very low levels throughout the country (mostly in surface waters). Research from ORD is needed to complement this work – use of bioassays to determine aquatic toxicity of these compounds; development of additional methodologies to determine aquatic effects; development of analytical methods to detect more compounds at low levels; and evaluation of human toxicological information and its implications. This partnership will help advance the Administrator's new directive to pursue new approaches for dealing with multiple contaminants in drinking water. In NJ, state scientists partnered with USGS and CDC to assess the occurrence and toxicity of unregulated organic chemicals in NJ surface, ground and finished drinking water. The state policy response of the agency was to evaluate the possibility of using a new approach to regulate "unregulated" organic contaminants in drinking water. Specifically, NJ is the possibility of developing a drinking water standard that is "treatment" based rather than chemical based. That is, can drinking water treatment technologies be installed, or can existing treatment technologies be optimized, to reduce levels of multiple contaminants from drinking water. ORD

can assist states like NJ by providing the needed expertise and funding that is needed to fully evaluate such an approach (see comment to charge question 1).

Charge Q3: “Areas for increased emphasis over the next five years; ...decreased emphasis...”
Comment: None.

Charge Q4: “... directions that ORD should pursue differently...to conduct integrated, transdisciplinary research?”

Comment: The traditional research “direction” has been agency-driven, for the most part. It would be helpful to more actively involved communities as well as tribes/states/regions. The system of prioritizing research is unclear. There are National Program Directors who work with other groups to develop thoughtful research strategies. However, they do not control which projects are staffed or which projects receive funding. How are the priorities translated into actual projects, and how much authority do the NPDs have over which projects are considered priorities?

Charge Q5: “Where can research on socio-economics best contribute to ORD’s ITR efforts?”

Comment: This expertise exists in ORD but is limited. Therefore, either more staff are needed, or prioritization efforts are needed to best match the expertise with the priority. Water is a prime area and there is much good research being planned to evaluate water quality and quantity issues. Some innovative ideas about water research are being investigated. However, if the public perception is not understood, then any efforts to implement new technologies in this field will be in vain. Similarly, issues (i.e., legal, historical, agricultural, etc.) surrounding water rights needs to be understood in order for technologies to advance and be accepted by stakeholders and the public.

Charge Q6: “where apply lessons learned from environmental research to protect HUMAN HEALTH...to protect the environment?”

Comment: None.

Input from Dr. Duncan Patten

Charge dealing with where to go next five years

1. Hold a workshop of academics, industry scientists and engineers, etc. and identify several possible areas dealing with “protection of human health and the environment” that may become areas of environmental crises in the next decade and that need better understanding, and use this information to guide new anticipatory research.

Charge dealing with what might be reduced in the future.

1. Identify some research programs that have shown limited interdisciplinary success, but should be interdisciplinary, and also are not aligned with critical health and environmental issues. Either integrate these into appropriate programs so they can contribute to interdisciplinary studies, or phase them out.

Input from Dr. James Sanders

1. ORD's strategic research directions address the Administrator's priorities?

The information is probably there. But, and it's a big but—we continue to see the same programs, in the same stovepipes. The pieces get shuffled around, and get justified by working to fit them into the new programs/priorities (even when they are a poor fit). The agency would be better served if they finally took the initiative to build their activities based on what information is really needed, rather than around what they already know what to do.

Funding needs to follow the Administrator's priorities. Underfund all the programs and centers, put funding in each of the priorities, and let the various groups bid by bringing forward new, innovative ideas that are DIRECTLY focused on addressing the priorities, rather than their past efforts. Change won't happen unless the groups are forced to rethink their capabilities and expertise. This means some folks will be left behind, but will also make room and build some excitement for bringing new expertise into the agency.

2. Leverage by working with other programs?

There is good evidence that the various programs do look for ways to collaborate with other agencies. Beyond encouraging them to continue, and even enhance these efforts, I think they are working in the right direction.

3a. Areas for increased emphasis?

There are many, but none of them will be initiated until funding allocations are changed. See 1. above.

3b. Decreased emphasis?

No suggestions at this time. It will first be necessary to realign the work effort (which I believe won't happen unless the agency is really pushed). At that point, work of lesser importance will be obvious.

4. Strategic research directions pertaining to ITR?

Same as 1. above.

5. Where can socio-economic research best contribute?

No comments.

6. Lessons learned?

The ecosystems services program gives them a systems approach, that can be applied across the Administrator's priorities.

Input from Dr. Paige Tolbert

Question #1:

Multi-pollutant/cumulative risk focus described by air NPD lends itself well to systems thinking, but ISA (NAAQS) and IRIS (HAPs) approach is one-at-a-time. How is multi-pollutant strategy to be implemented?

Answer:

Will look at individual pollutants in context of other pollutants

Will do IRIS for groups of chemicals such as planning for phthalates.

Question #2:

For cross-cutting issues, e.g., life cycle analysis of energy choices, how do the NPDs work together?

Answer:

Biofuels was presented as an example of a cross-cutting issue where the NPDs worked effectively together.

When pressed on whether there were any obstacles, others said it was just a matter of communication, no major process concerns.

Input from Dr. Robert Watts

Trading problems:

Without systems thinking we constantly trade one problem for another, sometimes even worse problem.

Examples:

We capture flyash without knowing what to do with it.

Electric cars centralizes the source of CO₂ emissions. CO₂ capture raises the problem of disposal.

Etc.

The mother of all environmental problems arises from geoengineering climate. Anybody looking at this?