



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 21 2006

THE ADMINISTRATOR

Dr. M. Granger Morgan
Chair
EPA Science Advisory Board
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20004

Dear Dr. Morgan:

I would like to thank you for the Science Advisory Board's March 30, 2006 advisory report on *Science and Research Budgets for the U.S. Environmental Protection Agency for Fiscal Year 2007* (EPA-SAB-ADV-06-003). I am pleased that the Board recognizes the Office of Research and Development's commitment to high-quality scientific research conducted in an efficient manner. Such commitment is noted in areas such as computational toxicology and nanotechnology as well as EPA's strong coordination with other federal agencies.

The SAB expressed concern with the decline in funding levels for several research program areas. Funding decisions for all Agency programs are made in an environment of constrained resources. Accordingly, we must prioritize numerous Agency needs when developing the annual budget request to Congress. For the Science and Technology budget request, we are guided by the Agency's Strategic Plan goals and the decision support needs of our program and regional offices. In this way we can best support EPA's mission of protecting human health and the environment.

Thank you again for the SAB advisory on the Science and Technology component of EPA's FY 2007 Presidential Budget Request to Congress. Your input and expertise is highly valued. The Office of Research and Development has prepared a more detailed response to the Board's findings and recommendations, which is enclosed. I trust that you will find the information useful in encouraging further discussions and SAB input on EPA's science and technology priorities.

Sincerely,

A handwritten signature in black ink, appearing to read "S. L. Johnson".

Stephen L. Johnson

Enclosure

**Response to Science Advisory Board's Advisory on
*Science and Research Budgets for the U.S. Environmental Protection Agency
for Fiscal Year 2007 (EPA-SAB-ADV-06-003)***

The advisory report prepared by the Science Advisory Board, entitled *Science and Research Budgets for the U.S. Environmental Protection Agency for Fiscal Year 2007*, raises important issues concerning EPA's science and research activities. The Office of Research and Development appreciates the expertise and perspective provided by the Board members. This annual review is an instrumental component of the Agency's annual and multi-year priority setting, and is valuable guidance as ORD continues to evolve its research program. The Agency's interactions with the Board are a crucial element in EPA's ongoing efforts to inform our policies and decisions with the best available scientific information, and we remain committed to continued engagement with the Board on scientific issues and research directions.

The SAB observes that ORD's budget has declined since 2004 and that there has been a shift in the distribution between core research and problem-driven research. The SAB expresses concern that some of EPA's core research activities, such as the Ecological Protection research program, are being cut as other problem-driven research areas such as Homeland Security are increased. Because ORD's research program is mission driven and the interplay between core and problem-driven research is a key aspect of ORD's generation of scientific and technical information to meet the Agency's decision support needs, this year's response to the SAB's annual budget advisory report puts particular emphasis on the core/problem-driven framework, while addressing other key issues raised in the SAB's report.

Background on the Core and Problem-Driven Research

ORD research provides EPA with information and technologies for detecting, abating, and avoiding environmental problems. ORD classifies its applied research into two types: core and problem-driven. Core research seeks to produce a fundamental understanding of the key biological, chemical, and physical processes that underlie environmental systems along with an understanding of the mechanisms by which human health is affected by environmental stressors, thus forging basic scientific capabilities that can be applied to a wide range of environmental problems. The issues addressed in core research are those whose resolution will have broad applications and implications for multiple client offices. As stated in the National Research Council's 1997 report, *Building a Foundation for Sound Environmental Decisions*, core research also includes the development of innovative tools and methods for understanding and managing environmental problems, and long-term collection and dissemination of accurate environmental data. Core investigations address questions common to many EPA programs, and they provide the preparedness needed to confront unforeseen environmental problems. Examples of this type of research include ORD's multi-disciplinary efforts to improve human health and ecosystem protection, in which issues such as susceptibility and cross-species extrapolation of response are addressed, and the Environmental Monitoring and Assessment Program, designed to develop the science needed to describe the condition of our nation's ecological resources.

Problem-driven research, on the other hand, focuses on specific environmental problems. Studies in these areas respond to explicit Agency needs and may be motivated by regulatory

requirements or court-ordered deadlines. This type of research is exemplified by our Particulate Matter research program, in which the relationships between airborne particles and increases in morbidity and mortality are being studied to address critically important human health questions, and in the Endocrine Disruptors research program, which is leading to the development of assays for use by the Program Office to implement the Agency's mandated screening and testing program.

EPA, the SAB, and the National Academies have all described the importance of a balanced research portfolio, including problem-driven and core research, that places the Agency in a better position to meet its obligations. These organizations, and others, have also recognized that these two types of research run on different timetables and address environmental outcomes in somewhat different ways.

ORD does not view core and problem-driven research as separate research programs; rather, they are highly intertwined and symbiotic. ORD works to ensure that the programs under each are highly complementary and interactive, one informing the other. An example helps to illustrate this interaction. One of the issues under our core research program is the unique susceptibilities of infants and children to toxic chemicals, that is, how age may influence the potential for adverse health effects from exposure to environmental contaminants. This is a fundamental question in risk assessment, and the results of this research may be far-reaching, providing useful information to other studies, such as those conducted under Goal 2, *Clean and Safe Water*. In Goal 2, we are studying the reproductive and developmental effects of disinfection by-products found in drinking water and because this is an age-related susceptibility issue, results from our core program will inform this research, and vice versa. Thus, susceptibility research takes place in both areas, but the target question is different. In our core program, the question relates to the rudimentary principles of age-related differences; in Goal 2 (*Clean and Safe Water*), the question is how disinfection by-products *per se* impact an organism during its developmental stages. This demonstrates how an appropriate mix of core and problem-driven research can interact to yield a robust research portfolio focused on the mission needs of the Agency.

Response to the SAB's Comments on the Core Research Program

Ecological Research

The Ecological Protection research program addresses questions that currently are important to many EPA programs while conducting necessary forward-looking research to address future, unforeseen environmental problems. We concur with the SAB that the Agency needs to better explain the importance of our ecosystem research program. We also concur with the SAB that ecological services and restoration research is an important emerging environmental issue. The future funding trajectory for this research will expand ecological services research and link it to condition and accountability, and causation/forecasting research. This evolution of the research program will enhance regional and local assessment as well as expand status and trends monitoring research to address how regulatory programs and policies impact ecological condition and services.

Human Health Research

While strongly supporting ORD's Human Health research program, the Board did express concerns about funding for the National Children's Study. EPA remains committed to children's health research, with a proposed FY 2007 funding level of \$1.7 million. The structure of the budget proposal may have led to some confusion about this, since it shifted children's health research resources as we consolidated resources within the Human Health Research Multi-Year Plan (MYP). EPA continues to support the concept of the National Children's Study and its importance to the understanding of children's environmental health issues. In addition, EPA will continue its development of data, methods, and models to assess risks and protect children from environmental hazards and will consider susceptible life stages and populations as it carries out its mission to protect public health and the environment.

Response to Comments on the Problem-Driven Research Program

Criteria Pollutants

In addition to our ongoing research on fine particulate matter (PM), research is under way to address the question of whether there are demonstrable health effects associated with coarse PM. Additionally, initial studies are planned intramurally and through the Science to Achieve Results program's PM research centers to compare the impacts of so-called "urban" and "non-urban" PM. The five cutting-edge PM research centers will further improve our understanding of how PM affects human health and the types and sources of PM most responsible for these effects. The centers are led by Johns Hopkins University, Harvard University, the University of Rochester, the University of California at Davis, and the University of California at Los Angeles.

EPA recognizes the importance of providing a strong scientific foundation upon which we can review National Ambient Air Quality Standards (NAAQS). At the direction of Deputy Administrator Marcus Peacock, EPA's Office of Air and Radiation and ORD recently undertook a review of the process for reviewing NAAQS, describing several recommendations in a report that was issued on April 3, 2006.¹ Many of the recommendations will be implemented in the near future. Among the recommendations are changes in the way the literature is surveyed and evaluated for inclusion in criteria documents, via a continuously updated electronic database, and changes in the nature of criteria documents (or "science assessments") that will stress integration of the literature around key policy-relevant scientific questions. In addition, EPA is reexamining how to best allocate and manage resources to develop these documents in a timely but scientifically rigorous manner. While the Agency has already engaged the Clean Air Scientific Advisory Committee in the development of this report, EPA expects to involve the committee in further discussions of how best to accomplish these goals.

EPA's Air research program has been refashioned to more specifically address the relationships between emission sources and ambient pollutants. The overall strategic framework is to provide the science needed to support ongoing standard revisions and implementation while

¹ EPA, NAAQS Process Review Workgroup, *Review of the Process for Setting National Ambient Air Quality Standards (EPA: Washington) 2006*. Available online at: http://www.epa.gov/ttn/naaqs/naaqs_process_report_march2006.pdf

investing in leading-edge research to better define the contributions of specific sources to overall ambient pollutant concentrations and associated health risks. This dual approach will ensure that ORD continues to support the needs of the Agency as mandated by the Clean Air Act, while supporting the advances that may lay the foundation for the next generation of PM and ozone standards and implementation strategies. This change has already been reflected in a review of the program by ORD's Board of Scientific Counselors and a review of the Office of Management and Budget's Program Assessment Rating Tool and will be reflected in the next revision of the Air MYP.

Global Change

The SAB recommended maintaining a strong Global Change research program. ORD agrees and will continue to make significant contributions to the ongoing research activities of the U.S. Climate Change Science Program (CCSP) in FY 2007. Consistent with EPA's role within the CCSP, the ORD Global research program will continue to focus on providing timely, useful, and scientifically sound information to decision makers on the potential consequences of global change and possible adaptation strategies. The Global research program's highest priority will be to produce two of the 21 CCSP Synthesis and Assessment Products that respond to the CCSP highest priority research, observation and decision support needs. The Global research program will produce: (1) Synthesis and Assessment Product no. 4.4: *Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources*, and (2) Synthesis and Assessment Product no. 4.6: *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems*. Since these Synthesis and Assessment Products address some of the CCSP's highest priority research and decision support needs, and are required to help the CCSP meet the statutory requirements of Section 106 of the 1990 Global Change Research Act, they are being tracked in EPA's Quarterly Management Report to ensure that they are completed in a timely fashion. Also, ORD's Global research program will continue to be a leader within the CCSP in the development of decision support resources, sponsoring a major National Research Council study (*Strategies and Methods for Climate-Related Decision Support*) that is intended to develop clearer operational frameworks for implementing the CCSP decision support agenda.

Drinking Water

The Drinking Water research program plans to address several SAB comments in the process of revising the Drinking Water MYP in 2006, including reviewing the suitability of its long-term goals, articulating the relationship of drinking water research to other ORD programs, and planning studies to inform the microbial risk assessment research described in the Human Health Risk Assessment MYP. EPA agrees with the SAB that a research plan for the new water infrastructure research initiative is needed; this effort is under way. Research to support periodic review and implementation of existing drinking water regulations must continue. The Drinking Water research program should continue to seek extramural research partners to leverage funding and skills, and the program should undertake an effort to define its scientific leadership goals.

Water Quality

We concur that there are linkages between water quality research and other research programs such as Ecology, Drinking Water, Mercury, Endocrine Disruptors, and Climate Change. As the Water Quality research program revises its MYP in 2006, it will seek to clarify its research priorities relative to the activities of these other programs. As part of this process, all water quality program priorities will be re-evaluated. This is not to say that research no longer being addressed elsewhere should, or will, be conducted in the water quality program. However, the research that is identified during the Water Quality MYP revision process will reflect the current and anticipated future research priorities of the Agency.

Safe Pesticides and Safe Products, and Endocrine Disruptors

The budgets for the Safe Pesticides and Safe Products (SP2) and the Endocrine Disruptors research programs are described under the heading of Human Health research. However, placing these research areas under a "Human Health research" umbrella may obscure the fact that while the Endocrine Disruptors and SP2 research programs have elements that are related to human health, they both also have research that goes beyond human health to include ecological effects, risk assessment, and risk management approaches.

Homeland Security

As the SAB heard during the budget review meeting in March, the federal budget is faced with challenging limitations. To encourage the maximum use of ORD's research products, it is important to focus on the dual use of Homeland Security research. This research has the potential to be used broadly in environmental detection and decontamination that might occur due to natural disasters or other non-terrorist-related events. Examples of this research include:

- Technologies used to detect chemical and biological agents in water or air can also be used to detect common chemicals and pathogens. An example is a portable, laser-based instrument that could be used to detect dioxins or toxic industrial chemicals or identify spores. With respect to water quality sensors, this would be true for on-line detectors as well as handheld detectors.
- Infiltration models for airborne contaminants can aid in designing cleaner buildings and shelters for industrial chemical accidents. Models that help locate sensors in water distribution systems to detect intentional contamination (i.e., as part of WaterSentinel) can also improve the general quality of water delivered to customers. An example would be to use these models to optimize chlorine booster station locations.

We would like to clarify that ORD's National Homeland Security Research Center (NHSRC) works very closely with EPA's Office of Water and supports the WaterSentinel program by conducting research on several of the five prongs of the WaterSentinel pilot. The research also includes improving modeling components that are essential to WaterSentinel.

ORD concurs with the observation of the SAB that increased attention to behavioral science issues would improve the value of the body of work undertaken by the NHSRC. Accordingly, the NHSRC intends to pursue the development of the design of an appropriate social science research program and anticipates receiving constructive guidance from the SAB in the future.

The SAB expressed concern that EPA might be investing in developing technologies that may be used by only highly specialized laboratories. This concern may have arisen because the documents provided to the SAB regarding laboratory analysis dealt only with confirmatory laboratory analysis. It is true that this type of work reflects the greatest volume of samples following an event and is not intended for screening purposes at or near an event. However, additional work is under way to address analytical methods associated with the initial phases of a response. We recognize that significant work must still be completed to ensure that a fully functional laboratory response network is in place to address a nationally significant event. ORD would welcome the opportunity to brief the SAB on the full laboratory response system.

New and Evolving Programs: Economics, Decision Sciences, Sustainability, and Nanotechnology

The Economics and Decision Sciences research program's activities will shift toward benefit transfer in FY 2007. However, this will not be the exclusive focus of the program, and the valuation studies will continue to be funded. The plan identified in the Environmental Economics Research Strategy is to fund benefit transfer research, followed by original studies that can be used as inputs for benefit transfer studies. The program expects to return to original valuation studies in FY 2008 and evaluate the need for additional benefit transfer research in approximately FY 2010.

Recognizing the growing importance of sustainability and pursuant to a long-standing vision that was first laid out in the early days of the pollution prevention research program, ORD's senior management formally instructed the organization to begin planning the transition to a sustainability-based research program in 2004. The first step in that effort was the creation of ORD's Sustainability Research Strategy. From that document we have developed a draft multi-year plan for Science and Technology for Sustainability, which is currently undergoing SAB review.

EPA will continue its emphasis on supporting research that enhances understanding of the potential environmental implications of nanotechnology. Of the \$8.6 million requested in the FY 2007 President's Budget, approximately \$5.0 million will be devoted to extramural research funded through the Science to Achieve Results (STAR) program, supporting research in engineered nanomaterials in the areas of ecological toxicity; fate, transport, and transformation in the ecosystem; monitoring and detection techniques; and environmentally benign (pollution prevention) applications of nanotechnology.

The approximately \$3.6 million in-house research program will focus on those areas where EPA has particular expertise and can complement the activities of other research

organizations, and where Agency decision support needs are greatest. Although EPA is currently in the process of planning its research program for 2007 and beyond, potential research areas include: (1) assessing potential hazards from the use of nanomaterials-for remediation and pollution control, because some of these uses involve the direct application of free nanoparticles into the environment and therefore present near-term potential for human or ecological exposure; (2) developing risk assessment approaches; and (3) ecological assessment, including understanding the transformation, fate, and transport of nanomaterials in the environment. The in-house and extramural programs will be jointly planned and closely coordinated to ensure that they are complementary, as is done currently with other areas of research.

Conclusion

The Office of Research and Development finds the Board's annual consultation on the President's budget request to be highly valuable in identifying how to evolve our research program to best inform the Agency's decisions and advance the state of environmental science. We look forward to continuing this collaboration and, in that spirit, would welcome the opportunity to discuss with the Board and the SAB Staff Office how to continue to enhance the collaborative nature of this interaction. Thus, the Board can continue to conduct a well-informed review of the annual budget request, and the Agency can derive the most benefit from the Board's advice. In addition, we would welcome the opportunity to brief the Board or provide additional information on the programs referenced above or any other aspects of EPA's scientific and research programs.