Statement of

Dr. M. Granger Morgan, Chair

U.S. Environmental Protection Agency Science Advisory Board

Before the Subcommittee on Energy and Environment

Committee on Science and Technology

U.S. House of Representatives

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Good morning, Mr. Chairman and members of the Subcommittee on Energy and Environment. My name is Granger Morgan. I chair EPA's Science Advisory Board (SAB or Board). I am a faculty member at Carnegie Mellon University where I am a University Professor, hold the Lord Chaired Professorship in Engineering, and am Head of the Department of Engineering and Public Policy, a department in the Engineering College.

Thank you for this opportunity to present the SAB's views about the Agency's 2008 Research and Development budget request.

The mission of the Environmental Protection Agency is to protect human health and the environment. To do that in an effective and efficient way requires a deep understanding of environmental science and technology. However, between 2004 and the proposed 2008 budget, the overall support for Research and Development at EPA has declined by 25% in inflation adjusted terms.[1]

For many years the EPA Science Advisory Board (SAB) has performed detailed reviews of the Agency's Research and Development (R&D) budget. However, we have seen little noticeable effect from our annual plea to redress what we have seen as the continuing erosion of the ability to grow the knowledge base at EPA. This year, therefore, the SAB decided to take a different approach. I have submitted our final report from this review to this Subcommittee for today's Hearing record.

While we again offer some commentary about some specifics of the Agency's research budget, we have focused much of our attention on a longer term more strategic look, attempting to assess how well the EPA's current research program is likely to prepare the Agency to address four key environmental challenges over the coming decades.

[1] As reported by the AAAS R&D Budget and Policy Program at http://www.aaas.org/spp/rd/cht9508b.pdf.

While the Agency will face many challenges, the four we chose to focus on, and asked EPA to address, are:

"a) Climate change, including both impacts (for example on: natural ecosystems; water, coastal regions through sea level rise; air quality) as well as key issues such as terrestrial and deep geological sequestration that may arise as a result of future efforts in abatement.
b) Sensitive populations, both human and ecological.
c) Urban sprawl and the associated consequences for land use, stresses on ecosystems, stresses on sensitive populations, water contamination, air quality, loss of open space, and related issues.
d) Environmental disasters, both those that may arise as a result of natural causes (such as hurricanes, ice storms, drought, earthquakes and volcanism) as well as terrorist induced events…"

The full text of our request to Dr. George Gray, Assistant Administrator for Research and Development, is attached.

Agency staff made a serious attempt to respond to this request, revealing a mixed picture. While the agency can identify a variety of lines of research relevant to each problem, it is very clear that there has been far too little cross-EPA or interagency research planning on these topics. Specifically:

a) Research related to climate change was identified to us as the most coherently planned. While there is clear coherence within the domains of climate change impacts on air and water, there are large and important issues not being addressed. For example, while the Department of Energy is performing research on deep geological sequestration of CO_2, the EPA is not looking carefully at whether this research will provide the necessary basis for future science-based regulation. Similarly, land use, soil and water issues that may arise in connection with bio-mass energy production are not being seriously studied, nor, to our knowledge, are these and several similar issues being addressed elsewhere across the Federal system.
b) The agency has ongoing, though shrinking, programs to study certain human populations that are sensitive to some important environmental stressors. However, studies of sensitive ecosystems are very limited, as are studies of human populations which are dependent upon those ecosystems.
c) While there is considerable research directed at cleaning up legacy problems in land contamination (some of which remain very important), there is not yet a coherent program to systematically understand and redress the environmental problems arising from such land-use issues as shifting population distributions, urban sprawl, and development pressures on already vulnerable low-lying coastal areas which will become even more stressed in the future as a result of sea level rise and other impacts of climate change.
d) While there is limited work drawing lessons from Hurricane Katrina, we found no systematic research program to anticipate and mitigate possible future environmental disasters. Indeed the proposed budget would totally eliminate Central Basin (Mississippi-Missouri River) monitoring, and cut EPA's already

under-funded wetlands program. While the EPA has only partial regulatory and management responsibility for dealing with natural or terrorist-induced environmental disasters, this is no justification for devoting so little attention to this critical topic.

From this look at a sample of four important environmental problems, we draw the following general conclusions:

- The Agency's research programs have long faced greater demands than they have had money, time, or attention to address; the planning process has fallen into a reactive mode that is too often playing catch up.
- With a few important exceptions, the Agency's funding decisions in R&D appear to be incremental rather than strategic, leaving allocations within and across major program areas rather stable. In many cases there is an overemphasis on yesterday's problems and insufficient attention to new and emerging problems.
- On the positive side, the introduction of a new system of National Program Directors, with wide-ranging responsibility to set priorities within specific program areas (such as air, water, or human health), and across Centers and Laboratories, holds the promise of improved balance and a more strategic design of research plans *within* existing program areas.
- The agency urgently needs to develop a higher level research planning effort that can:
    - consider and adjust the balance and focus among major program areas and increase coordination and collaborations across program areas (i.e. begin to break down the "stovepipes" within which many of these program have been operating);
    - be better coordinated with, and build upon, the research programs of other Federal agencies;
    - benchmark EPA's research with other cutting edge programs in environmental research around the world; and
    - restore our national leadership in environmental science and engineering so as to assure our international competitiveness and provide the knowledge and technology that Americans will needs in the 21st Century.

However, effective high level research planning is unlikely to occur in the face of a continually eroding research budget, when so much attention must be directed at simply holding things together.

In addition to this general assessment, the SAB also reviewed the Agency's existing program structure, in each case asking:

1. Is the balance within the program appropriate? Are the most critical scientific questions receiving a high priority? Have adequate financial resources been allocated to address them? Are there important questions that have been left out?
2. Is the Agency, and particularly the Office of Research and Development (ORD), being sufficiently proactive in designing research programs that will adequately meet the Agency's likely future needs?

The Agency scientific and technical staff and managers are doing a remarkable job of sustaining high quality research in the face of a continuing erosion of financial support. However, in our examination of existing research program areas, we found three developments to be especially troubling.

The decline in funding for ecosystem research has continued (see Figure 1). One consequence of these cuts is that the Agency is largely abandoning past efforts to monitor the status of key ecosystems (e.g. terminating a long-term program tracking the impacts and benefits of reduced acid deposition on streams and lakes in the mid-Atlantic and North East). The Agency has expressed a commitment to estimate the economic value of "ecosystem services." However, as explained below, many of the financial and human resources needed to do this well, have been eliminated.

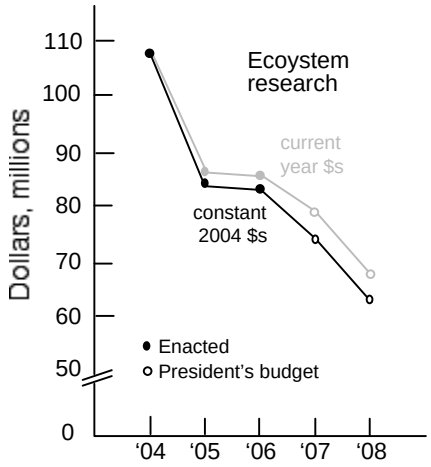

Figure 1: Recent history of EPA ecosystem research funding. Adjustment to constant dollars done with the NASA Gross Domestic Product Deflator /Inflation Calculator available at http://cost.jsc.nasa.gov/inflateGDP.html

In order to assess ecosystem services it is essential to collect the data needed to assess the health of ecosystems over time and to develop a basic scientific understanding of the complex interactions within ecosystems. For example, as climate changes, not all species will be able to respond in the same way so entire coherent ecosystems will not be able to gradually move north (or up mountains). Instead, separate species will, or will not, be able to move, new pests will emerge, etc. The current EPA ecosystem research program will not provide the science needed to understand, predict, and plan for these changes, their consequences or how they might be mitigated. As a result, EPA will fail the country in this vital mission.

One argument that has been used to justify the ongoing cuts in support for ecosystem research has been that this program has not been able to quantify the benefits that it is producing. At the same time there is a proposal to eliminate the ORD program in Economics and Decision Sciences Research. It appears seriously misguided to raise the bar for comprehensive cost-effective or benefit-cost justification for environmental science research, while simultaneously shrinking the resources devoted to the types of research needed to assess the net social benefits of the outcomes of environmental science research.

Economics and Decision Science resources at the Agency were small to start with (about $2.5 million). This budget has been reduced to about $1 million as staff from the program in ORD are relocated to the National Center for Environmental Economics (NCEE) within the Office of Policy, Economics and Innovation (OPEI). In jeopardy are the already very limited resources for extramural research. Also threatened will be Agency's tradition of partnering with other institutions to co-sponsor (at roughly $10-20,000 each) its series of recurring research workshops and conferences. These events

have long been a key forum in which to identify and explore the frontiers of environmental economics research. The transition to the NCEE also appears to almost completely eliminate other social sciences disciplines, so that the representation of essential human behavior disciplines (such as psychology, sociology, and anthropology) is decreased to near zero.

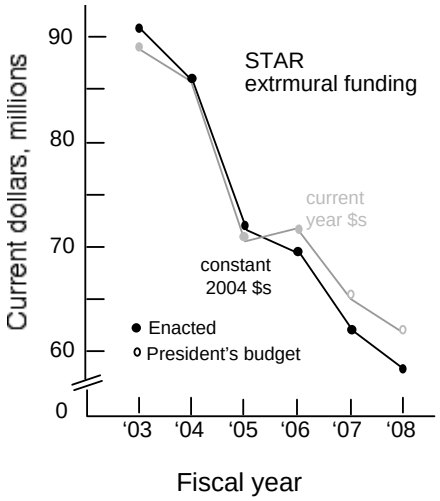

Figure 2: Recent funding history of the EPA STAR extramural program. Adjustment to constant dollars done with the NASA Gross Domestic Product Deflator /Inflation Calculator available at http://cost.jsc.nasa.gov/inflateGDP.html

An equally disturbing trend is the continuing decline in financial support for extramural research through the STAR program. Figure 2 shows this trend. A number of EPA research programs that could greatly benefit from contributions from extramural research conducted through the STAR program, are not participating.

An especially troubling part of this downward trend is the erosion of the STAR Graduate Fellowship program, down from $9.7-milion in FY 2003 to a proposed $5.9-million in 2008. This program has been critically important in educating the next generation of environmental scientists and engineers who will be needed by EPA, the States and the private sector. It has played a vital role in supporting interdisciplinary study of environmental problems. There are several changes that we found to be very positive. The current focus and modest growth in support for the program in nano-technology are both good developments, because understanding the fate and transport of nano-materials is likely to be increasingly important to the Agency in the future. It is also time to begin a modest program of research to identify possible strategies for regulation, because the classic "toxicological testing" approach is unlikely to be viable if it is applied unchanged to nano-technology evaluations.

Although very small, the new Sustainability Research Strategy and associated Multi-year Plan could provide a valuable integrating framework for EPA core and problem-driven research. These efforts support the transition from the traditional single-media approach of environmental protection to a more systems-based and fully integrative process based on life-cycle principles. ORD's sustainability research program should be developed in a way that enables the Agency to address the most challenging and multifaceted environmental issues, such as urban sprawl, climate change, the environmental consequences of biofuels production, and ecosystem degradation in interdisciplinary ways that can provide cost-effective options for reducing a range of environmental impacts. In addition to the modest progress in nano-technology and sustainability, there are other fine research programs and activities within ORD.

The SAB is concerned that, as the overall level of financial support for research in the Agency continues to decline, despite the growing number of difficult and complex environmental challenges, two dynamics will further erode the EPA's research

capabilities:

- Staff morale will suffer, resulting in an accelerated loss of outstanding people, and it will be increasingly difficult to recruit new young scientists and engineers, who will see options for more rewarding careers elsewhere.
- As budgets shrink, and the agency struggles to keep staffing size reasonably stable, a higher proportion of funds will go to salaries, and less to the other costs of research (laboratories, field studies, computers, research travel for collaboration and discussion of findings at professional conferences, etc.).

Agency staff are doing an outstanding job of nurturing and sustaining a high quality program of research in the face of very serious constraints. They must be provided far better budgetary support if they are to lead and catalyze our efforts to develop the knowledge and approaches necessary to protect the nation's human health and the environment in the face of hazards that increasingly exhibit integrated characteristics resulting from man-made behavior and natural processes.

As the House Committee on Science and Technology confers on these matters with its colleagues on the Appropriations Committee, we urge particular attention to the following needs to:

- Reverse the downward trend in support for ecosystem research so that this research program can continue its essential monitoring of the health of vital ecosystems, develop and implement new measures of the value of environmental services, and create the basic understanding that will be needed to respond to the challenges facing our ecosystems from climate change and from the "externalities" of new technologies such as biomass fuel and nanotechnology.
- Reverse the downward trend in support for the STAR extramural and Fellowship programs so that the agency can continue to benefit from fresh ideas and flexibility provided by institutions from outside EPA and continue a robust program of educating the next generation of environmental scientists and engineers.
- Reinstate the program in economics and decision sciences within ORD and add support to substantially increase its capabilities in behavioral social science. Even the best science and engineering results are useless if they are not combined with a sufficient understanding of human risk perception and behavior.
- Provide a significant increase in support for the programs in sustainability and global change, because these topics are both inherently important and provide effective vehicles for moving the agency in the direction of the innovative, cross-cutting research needed to address the critical environmental problems of the 21st century.

Thank you again for the opportunity to testify about EPA's research and development strategy and budget request for 2008. I would be pleased to answer your questions.

Attachment

January 22, 2007

MEMORANDUM

FROM: Dr. M. Granger Morgan /S/
Chair
US EPA Science Advisory Board

TO: Dr. George M. Gray
Assistant Administrator for
Research and Development
US Environmental Protection Agency

As we have in past years, the meeting of the EPA Science Advisory Board on February 22-23, 2007 will be devoted to a review of the Agency's research budget – not just the budget of ORD but of all research across the Agency. However, in contrast to years past, this year we do not want to do a detailed program-by-program review. Rather we want to try to take a somewhat longer term strategic perspective. In that regard we ask that you and your colleagues do two things that are more focused on the long term:

1. Briefly identify 3-5 issues which the agency believes will represent key environmental challenges over the coming decade or longer and explain how, whether, and to what extent, the R&D budget is designed to place the agency in a position to meet these challenges.

2. The SAB would especially like to learn about how the Agency's research plans will allow EPA to address four key problems that we believe will be of continued and growing importance over the coming decades. These are:

    a) Climate change, including both impacts (for example on: natural ecosystems; water, coastal regions through sea level rise; air quality) as well as key issues such as terrestrial and deep geological sequestration that may arise as a result of future efforts in abatement. While we realize that the agency has a modest research program that is labeled as climate change, we would actually like to hear a more cross-cutting view. That is, how have concerns about the potential impacts of climate change, and possible abatement activities, influenced a range of research plans both within ORD and elsewhere across the agency?

b) Sensitive populations, both human and ecological. We realize that ORD has specific research programs targeted at specific human populations such as children. While we'd like to hear briefly about those we'd also like a cross cutting view of how research plans will address other issues such as the immune suppressed, those with asthma, as well as a variety of other conditions. We are equally interested in learning how research across the Agency is being shaped to identify and address specific ecosystems that are at high risk and certain populations that are particularly sensitive and vulnerable to current or likely environmental stress and change.

c) Urban sprawl and the associated consequences for land use, stresses on ecosystems, stresses on sensitive populations, water contamination, air quality, loss of open space, and related issues.

d) Environmental disasters, both those that may arise as a result of natural causes (such as hurricanes, ice storms, drought, earthquakes and volcanism) as well as terrorist induced events. In the case of the latter we would be particularly interested in learning how research across the Agency is helping to prepare EPA for the possible need to clean up after widespread contamination resulting from chemical, biological or radiological attack, contamination that may result from attacks on facilities such as chemical plants and transportation systems, and contamination that may result from the interruption of key infrastructure services such as electric power (e.g. many sewer systems can not operate without electric pumps).

If some of the topics addressed in 1 above are the same as those we have identified in item 2 that would be fine with us.

3. In addition, we have two shorter term requests for information.

   a. Please identify any research program for which the proposed FY 2008 budget level will substantially differ from the budget that was proposed for FY 2007 (for example, 20% or more would be a substantial increase or decrease). We understand that in fact the Agency is running under a continuing resolution and so will use the proposed FY 2007 budget only as a benchmark. Please provide us with a brief explanation of the proposed decrease or increase.

   b. As always, the SAB must be prepared to comment to the U.S. Congress on the actual budget submission for FY 2008. Thus, we also need information on the full research program at the

level of Program Projects that are a part of the EPA research effort. We received an informative set of background descriptions last year for the FY 2007 budget review and an update of this set would be helpful as the SAB considers commenting on the 2008 research budget. However, an alternative would be to provide information on Program Projects as envisioned in the ORD December 14, 2006 discussion with the SAB on this topic. In this discussion, ORD representatives noted that it could provide background information based on NPD Key Recommendations from the ORD December and January strategic discussions on program change 2008-2012.

If in the course of addressing any of the topics listed above, you and/or your colleagues can point to any examples of ways in which the past R&D budget reviews by the SAB have influenced or shaped subsequent Agency budgetary plans, either in the short or long run, we would be most grateful if you would list them for us. To be frank, a number of members of the SAB are beginning to think that the annual budget review has little or no effect on Agency plans and they question why members should spend so much time on an annual review if in fact that impression is correct. Anything that you or your colleagues can present that would enlighten members on this point would be much appreciated.

Thanks very much to you and your staff for your assistance in these matters. We look forward to meeting with you and other agency staff on February 22-23.