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AN SAB REPORT: REVIEW OF THE FY2000 PRESIDENTIAL SCIENCE AND TECHNOLOGY BUDGET REQUEST FOR THE ENVIRONMENTAL PROTECTION AGENCY

A REVIEW BY THE RESEARCH STRATEGIES ADVISORY COMMITTEE (RSAC) OF THE SCIENCE ADVISORY BOARD

March 16, 1999

EPA-SAB-RSAC-99-012

Honorable Carol M. Browner
Administrator
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Subject: An SAB Report: Review of the FY2000 Presidential Science and Technology Budget Request for the Environmental Protection Agency

Dear Ms. Browner:

On March 3 and 4, 1999 the Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) met to review the Science and Technology component of the FY2000 Presidential Budget Request for the US Environmental Protection Agency (EPA). As in past years this report was developed in a rapid response fashion before the House Subcommittee on Energy and Environment of the Committee on Science conducted its hearing on EPA's Science and Technology budget. This year's budget hearing will be held March 18. RSAC's report was approved by SAB's Executive Committee during a public teleconference review March 8, 1999.

RSAC is made up of members from most of the other standing committees of the SAB. The Committee has reviewed the ORD budget for more than a decade. Based on an RSAC recommendation, the budget review was expanded this year to include the Science and Technology components in Agency Program Offices as well. The purpose of the review is to provide the Agency and Congress with advice and insights on the adequacy of the FY2000 budget request to implement a science program of high quality that is responsive to the Agency's needs.

The review meeting was conducted in public session under the provisions of the Federal Advisory Committee Act (FACA). The Committee was provided with background documents supplied by the Agency, supplemented by briefings from Agency senior managers during the meeting. The Committee was pleased to see the Agency continue with the changes it made in the budget presentation last year away from the media-specific format of previous years and towards an environmental goals based budget format. In addition, we were impressed with the depth of knowledge exhibited, and the level of coordination and cooperation displayed, by the

senior staff members during the full day of presentations and briefings that helped us understand the FY2000 budget more clearly.

As part of the review process, the RSAC responded to six charge questions:

a) Can the objectives of the research and development program in ORD and the broader science and technology programs in EPA be achieved at the resource levels requested?

RSAC found the funding request priorities to be appropriate based on the environmental goals established in the Agency Strategic Plan, but the Committee continues to have reservations about the adequacy of the funding level given the increasing complexity and cost of environmental problems.

RSAC was pleased to see the Agency continue to build on the changes it made in the budget presentation last year away from the media-specific format of previous years, and towards an environmental goals-based budget format. The overall form of the budget, and the manner of its presentation, were clear and well-organized around the goals established in EPA and ORD Strategic Plans. The science and technology activities in the request were selected by a priority-setting process that identifies the highest environmental risks within each environmental goal established in the EPA Strategic Plan using the sound scientific principles of the risk assessment/risk management framework. The RSAC found the funding request priorities to be appropriate to the environmental goals established in the Agency Strategic Plan.

EPA's Science and Technology Presidential request funding level for FY2000 is similar to the FY 1999 requested level. Environmental concerns are more complex, and need more scientific insights than the requested budget can likely deliver. In particular, the Committee concluded that goals need to be expanded with respect to identifying and addressing emerging environmental problems. Although RSAC understands that budget realities may not permit the funding of every proposed program, even if cost-effective, it is critically important that sufficient research is undertaken to ensure that the scientific underpinnings are being developed for the future. We recommend that the Agency make available information on high ranking programs that the Agency entertained during the budget-making process, but could not fund due to overall budget-constraints and competition with other programs. Such information would have been useful for RSAC in its evaluation of the adequacy of the proposed budget. "Drawing the line" after a prioritized list of proposed scientific activities has been compiled improves the "transparency" in the process used to set priorities.

b) Does the budget request reflect priorities identified in the EPA and ORD-Strategic Plans?

The ORD and Program Office Science and Technology budgets do set priorities aligned with the Agency and ORD strategic plans and Government Performance and Results Act

(GPRA) goals. However, we have some reservations about the decreases and some omissions in the overall priorities, because they mean that the science needed to inform decisions about these key issues will be lacking. The Agency has placed increased emphasis on children's health, particulate matter, air toxics, global change, integrated science for ecosystem challenges and coastal monitoring. RSAC supports these increases. However, RSAC concluded that the budgets proposed in several areas were not likely to be sufficient to meet the goals established by the Agency and ORD in their Strategic Plans. These areas included tropospheric ozone, endocrine disruptors, waste site remediation technologies, microbial pathogens and indoor air. The Committee does note that the Agency must set priorities and that it has taken steps to minimize some of the impact for decreases in the budget for tropospheric ozone and indoor air by incorporating certain aspects of the topics into other broader research projects. Finally, the requirements of the ?Thompson Report" to produce reports on the costs and benefits of other regulatory programs enforced by EPA will require a new program in research to address the knowledge gaps which inhibit comprehensive cost-benefit analyses.

c) Does the budget request reflect coordination between ORD and the Program Offices?

The Committee commends the Agency for significant improvements in the coordination between ORD projects and the needs of the program offices. Obviously there have been vast improvements in the level of communication and responsiveness of ORD efforts to support program offices needs. Foremost among these improvements are the Agency-wide goals and strategic plans, and the use of inter-office planning and budgeting teams. We are encouraged to learn that the ORD laboratories will each have a complementary set of goals and strategic plans. The Agency needs to continue to build on its strategic planning process for science across the Agency and across environmental goals. In briefings made to RSAC, the Agency indicated that it is in the early stages of developing an Agency-wide Science Strategic Plan as a tool for planning and coordinating EPA-wide science. RSAC strongly endorses the need for the development of this plan and has offered our support to the Agency in its development.

d) Does the budget request support a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific problem-driven topics?

The Office of Research and Development budget request does appear to provide a balance between core research and media-specific, problem-driven science needs, as recommended by the National Academy of Sciences. The balance seems to be about half and half, which is in line with the NAS "Building a Foundation for Sound Environmental Decisions" report recommendations. RSAC does note, however, the overall Science and Technology budget request is more weighted to media-specific problem driven activities. While ORD's discretionary resources in the S&T account in the Sound Science goal (Goal 8) do increase in FY2000, the overall budget represents a significant decrease in the Sound Science goal, which could lead to a less-balanced program in the future. RSAC believes that maintaining EPA's core research

capabilities is critical to ensuring the Agency is able to address the environmental problems of the future.

e) Does the budget request balance attention to near-term and to long-term research and science and technology issues?

RSAC believes that, in general, the Agency has given serious consideration to both long-term and short-term research and science and technology issues. Developing an adequate balance is difficult, but Agency goals on global climate change, coastal ecosystem research and ecosystems analysis are evidence of longer term thinking. We commend the Agency for working towards a more optimal balance, and we offer suggestions for improvement.

The 1998 RSAC review of the FY1999 budget indicated a need for providing additional effort, and funding, in the area of identifying long-term research needs and significant emerging issues. This is a continuing concern. While some of the programs emphasized in FY2000 are longer-term efforts, there is still no overall explicit approach to incorporate the requirements of longer-term research programs within the short-term budgetary process. It is important that the Agency strengthen its strategic planning processes to fund the longer-term research on critical environmental issues that transcend the year-to-year budget framework. In addition to the need to balance short-term and long-term research, we point out that it is important to establish a mechanism to identify emerging issues that is open to stakeholders and to coordination with other agencies, because emerging issues often form the basis for future research and science and technology programs.

RSAC is concerned about the decline in Exploratory Grants Program funding. The Committee believes that emerging issues need to have ongoing stable support, because EPA is the key Agency that can aggressively watch for critical new threats to human heath and the environment.

f) How can EPA use or improve upon the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes?

EPA has used the GPRA goals structure to organize its FY2000 budget request, and the RSAC welcomes such a structure as an organizing principle. It provides more clarity about how the research and science programs relate to EPA's overall mission. Most of the science milestones are process (or "output") oriented rather than results (or "outcome") oriented. For example, a program's FY2000 milestone might be the production of a mathematical pollutant transport model or the generation of five toxicity profiles, without any clear articulation of what benefits to the overall goal (e.g., Clean Air) it would provide. It is important for the Agency to move forward with evaluations of research programs by environmental outcomes rather than outputs. Moreover, the ORD and Agency process for prioritizing potential research programs is

not completely transparent. As noted in response to charge question a), RSAC recommends that the Agency make available information on high-ranking programs that the Agency entertained during the budget-making process, but could not fund due to overall budget constraints and competition with other programs to improve the "transparency" in the priority-setting process. RSAC suggests that a decision analytic approach of comparing the value of information to the cost of producing it can be used to assist in the prioritization of science activities.

We appreciate the opportunity to review and provide advice on the Science and Technology component of the FY2000 Presidential Budget for EPA. The Research Strategies Advisory Committee would be pleased to expand on any of the findings in the attached report, and we look forward to your response.

Sincerely,

/signed/

Dr. William Randall Seeker, Chair
Research Strategies Advisory Committee
Science Advisory Board

/signed/

Dr. Joan M. Daisey, Chair
Science Advisory Board

NOTICE

This report has been written as part of the activities of the Science Advisory Board, a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The Board is structured to provide balanced, expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not necessarily represent the views and policies of the Environmental Protection Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names or commercial products constitute a recommendation for use.

ABSTRACT

On March 3 and 4, 1999, the Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) met to review the FY2000 Presidential Budget Request for the US Environmental Protection Agency (EPA). The Committee responded to six charge questions. Its findings were that the science and technology activities in the request were selected by a priority-setting process that identifies the highest environmental risks within each environmental goal established in the EPA Strategic Plan using the sound scientific principles of the risk assessment/risk management framework. The RSAC also found the funding request priorities to be appropriate to the environmental goals established in the Agency Strategic Plan. The ORD strategic plan and budget were developed in concert with the Program Offices to develop goals consistent with customer needs. It was possible to examine and evaluate how the budget is allocated to various programs, to science and technology activities, and to various strategic goals. While pleased with the presentation of the budget, RSAC concluded that the budgets proposed in several areas were not likely to be sufficient to meet the goals established by the Agency and ORD in their Strategic Plans. These areas included trophospheric ozone, endocrine disruptors, ecosystem protection, waste site remediation technologies, microbial pathogens and indoor air. Also, the requirements of the **?**Thompson Report" will require a new program in research to address the knowledge gaps which inhibit comprehensive cost-benefit analyses. Because environmental concerns are becoming ever more complex, and need more scientific insights than the requested budget can likely deliver, the Committee concluded that goals need to be expanded with respect to identifying and addressing emerging environmental problems. Although RSAC understands that budget realities may not permit the funding of every proposed program, even if cost-effective, it recommends that the Agency make available information on high ranking programs that the Agency entertained during the budget-making process, but could not fund due to overall budget-constraints and competition with other programs.

Keywords: GPRA, budget, research, strategic planning, Thompson Report

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1. EXECUTIVE SUMMARY

On March 3 and 4, 1999, the Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) reviewed the FY2000 Presidential Budget Request for the US Environmental Protection Agency. RSAC was very pleased to see a continuation of the significant improvement in the quality of the review materials begun last year. In addition, the Committee was impressed with the depth of knowledge exhibited, and the level of coordination and cooperation displayed, by the Agency staff during the full day of presentations and briefings that helped the Committee members understand the FY2000 budget more clearly.

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2. INTRODUCTION

2.1 Background and Schedule

The Science Advisory Board (SAB) review of the proposed budget for the Office of Research and Development is normally an annual event. Based on a previous RSAC recommendation, the budget review was expanded this year to include the Science and Technology components in Agency Program Offices as well. The timing associated with the public availability of the budget materials often makes scheduling of a formal review difficult. Reviews completed by RSAC also require formal public review and approval of the SAB's Executive Committee. This year, the budget materials were released in early February, with the review materials made available to the Committee on or about February 18th. The Committee then met on March 3 and 4, with formal review and approval by the Executive Committee completed on March 8, 1999.

Generally, the Chair or another Member of the RSAC provides expert testimony to the House Committee on Science during its annual budget hearings, which are normally scheduled shortly after the release of the proposed budget. This year's budget hearing will be held on March 18, 1999, with Dr. Seeker testifying on behalf of RSAC.

2.2 Charge to the Committee

During the review meeting, the Committee considered how well the proposed Science and Technology budget request for FY2000: a) allows the objectives of the Science and Technology programs in ORD and EPA to be met; b) reflects the priorities identified in the EPA and ORD strategic plans; c) reflects coordination between ORD and the Program Offices; d) supports a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific problem-driven topics; e) balances attention to near-term and to long-term research and science and technology issues. The Committee was also asked to comment on: f) how can EPA use or improve on the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes.

Responses to these questions, and others the Committee wishes to address, are provided to both the Agency and the Congress.

2.3 Format of this Report

Following the Executive Summary and this Introduction, this report contains two principal sections which cover the observations and conclusions of the Committee. Chapter 3 discusses the Committee's overall observations on the budget process and review, and offers some general comments. The specific responses to the questions in the Charge to the Committee are included in Chapter 4.

3. OVERVIEW OBSERVATIONS AND COMMENTS

The RSAC commends EPA management and staff members for the uniformly high caliber of their briefings on the FY2000 President's budget, Science and Technology in general and ORD specifically. It was clear that they made significant investments in time in preparing their visual aids and oral presentations, and that they were well prepared for the free and open discussions that followed the presentations. Special thanks are due to Sallyanne Harper, the Chief Financial Officer (CFO) and to Norine Noonan, Assistant Administrator (AA) of the Office of Research and Development (ORD) for their presentations, and for remaining throughout the briefing to provide supporting information and data during the discussions that followed briefings by the representatives of the Office of Air and Radiation (OAR), Office of Water (OW), Office of Policy (OP), Office of Pollution Prevention, Pesticides and Toxic Substances (OPPTS), and Office of Solid Waste and Emergency Response (OSWER).

As a result of these briefings on the components of the ORD budget, the Program Office components of the S&T budget, and the scientific program activities outside the S&T budget, the RSAC has a much clearer understanding of EPA's science needs and activities in relation to the overall Agency Strategic Plan and ORD Strategic Plan. The RSAC also gained a clearer understanding of some of the factors that influenced ORD's selection of program areas for both increased and decreased emphasis in FY2000, as well as ways in which ORD folds some of the most productive activities of the de-emphasized programs into new or expanding programs with broader and complementary objectives.

The RSAC envisions that its increasing interactions with the CFO, Program Office representatives, and the AA-ORD and her staff will continue to be helpful for budgetary planning and prioritization, and enhancing the benefit/cost ratio for investments in science in EPA in future years as well as for FY2000. The RSAC would like to continue to assist EPA in its selection of program priorities for future years, as well as recognizing emerging issues that warrant exploratory research and/or a longer-term risk assessment perspective.

This is the first RSAC review that covered the broader Agency-wide Science and Technology budget and not just the ORD budget. There are key ongoing science activities in other parts of the Agency that are not captured in the Science and Technology budget numbers. In briefings provided by Program Offices, each representative provided a list of activities that they considered to be science related. A tabular list of these elements are provided in Appendix A. We recognize that this is a partial list of the science activities in the Program Offices. The Science and Technology budget was developed so that it combined the ORD budget with Program Office laboratories. However, this does not account for the Program Office activities that are directed at science based components of the development of regulatory programs. The "science for compliance" in Program Offices also needs to be counted in a true measure of the Agency's science and technology budget. Overall there is some concern, both in EPA and in RSAC, regarding the adequate recognition and accounting for the key research, science, and technology activities being conducted in EPA outside of EPA's ORD and Program Office laboratories. In briefings made to RSAC, the Agency indicated that it is the early stages of developing an Agency-

wide Science Strategic Plan as a tool for coordinating EPA science. The Framework for this plan is currently under development and should be available in September 1999. RSAC strongly endorses the need for this plan and offers support to the Agency in its development.

4. RESPONSE TO THE CHARGE

4.1 Can the objectives of the research and development program in ORD and the broader science and technology programs in EPA be achieved at the resource levels requested?

<u>Charge Question</u>: Provide advice on whether the objectives of the research and development program in ORD and the broader science and technology programs in EPA can be achieved at the resource levels requested

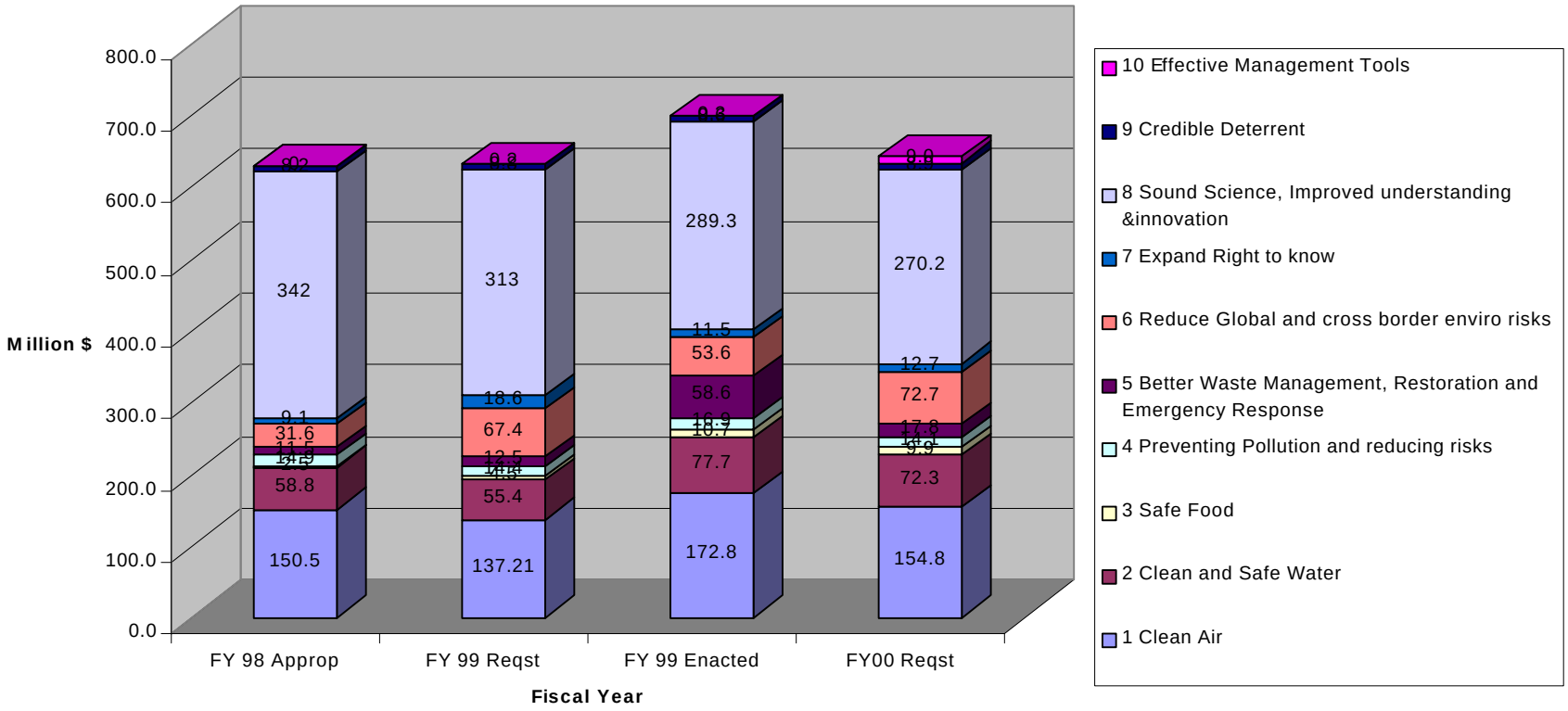
RSAC found the funding request priorities to be appropriate based on the environmental goals established in the Agency Strategic Plan, but the Committee continues to have reservations about the adequacy of the funding level given the increasing complexity and cost of environmental problems.

RSAC was pleased to see the Agency continue to build on the changes it made in the budget presentation last year away from the media-specific format of previous years, and towards an environmental goals-based budget format. The overall form of the budget and the manner of its presentation were clear and well-organized around the goals established in EPA and ORD Strategic Plans. The science and technology activities in the request were selected by a priority-setting process that identifies the highest environmental risks within each environmental goal established in the EPA Strategic Plan using the sound scientific principles of the risk assessment/risk management framework. The RSAC found the funding request priorities to be appropriate to the environmental goals established in the Agency Strategic Plan.

Figure 1 shows a comparison of the FY1998 enacted, FY1999 request and enacted, and FY2000 requested budget broken down by EPA strategic goals. The FY2000 EPA Presidential Science and Technology budget request is similar in magnitude to the FY1999 budget request. The FY1999 Presidential S&T budget request was $634 million and the FY2000 Presidential S&T budget request was $643 million. A comparison of the FY2000 S&T budget with FY1999 enacted S&T budget is difficult to make due to the policy decision by the Agency not to include earmarks placed in its FY1999 budget by Congress in its FY2000 budget request, and the fact that Superfund dollars budgeted for scientific activities are not included in the S&T request. The Presidential S&T budget request for the Office of Research and Development in FY2000 is $496 million as compared to a request of $486 million for FY1999. (Note - neither includes transfer of funds from other EPA accounts such as the Superfund account.) ORD's enacted budget in FY1999 was $562 million which includes $66 million in earmarks and Superfund account transfers.

The RSAC recognizes that the ORD budget for FY2000 was prepared under the limitations imposed by the ongoing balanced budget agreement adopted by Congress. As such it represents a program that recognized many, but not all, of the highest priority research needs identified by EPA and SAB in support of EPA's mission of risk reduction for environmental hazards. Additional investments in ORD research are highly likely to produce new knowledge

FIGURE 1. Science and Technology Budget Trends



that could permit EPA and others to conduct additional, and more well-documented, risk assessments, and to develop more technologically and cost-effective means of risk reduction by pollution prevention and source control.

The Section 812 study of the Costs and Benefits of the Clean Air Act: 1970-1990, which was reviewed and endorsed by the Clean Air Council of the SAB, suggested that control of air pollution, while quite costly to society, had a benefit/cost ratio (42:1) that was quite high in terms of reduced mortality and morbidity. The analyses recognized that air pollution control also produced numerous benefits that could not be quantified and/or monetized because of inadequate knowledge. These included not only additional human health effects, welfare effects, such as improved visibility, reduced soiling, recreational site quality, etc., but also the ecological impacts of air pollution on natural systems. Additional investments in research could establish realistic exposure-response relationships for such impacts, providing a basis for a more comprehensive benefit-cost analysis for air pollution control.

Furthermore, the lessons learned in the pioneering Section 812 analyses will also prove valuable to EPA and the Congress in meeting the mandates established for the future **?**Thompson" reports on the costs and benefits of other regulatory programs enforced by EPA. A new program in research on knowledge gaps inhibiting comprehensive cost-benefit analyses will not only help the performance of such studies, it will also likely demonstrate that many programs are, in fact, cost-effective. Furthermore, the knowledge gained will provide an improved information base for future risk assessments and risk management decisions.

EPA's Science and Technology Presidential request funding level for FY2000 is similar to the FY1999 requested level. In the review of the FY1999 budget, RSAC expressed concerns that the agency had not adequately demonstrated that the proposed ORD budget was sufficient in a number of areas to sustain the appropriate level of science and technology developments that the Agency needs to meet its mission to protect human health and to safeguard the natural environment. Because environmental concerns are more complex, and need more scientific insights than the requested budget can likely deliver, the Committee concluded that goals need to be expanded with respect to identifying and addressing emerging environmental problems. Although RSAC understands that budget realities may not permit the funding of every proposed program, even if cost-effective, it is critically important that sufficient research is undertaken to ensure that the scientific underpinnings are being developed for the future. We recommend that the Agency make available information on high ranking programs that the Agency entertained during the budget-making process, but could not fund due to overall budget-constraints and competition with other programs. Such information would have been useful for RSAC in its evaluation of the adequacy of the proposed budget. "Drawing the line" after a prioritized list of proposed scientific activities has been compiled improves the "transparency" in the process used to set priorities.

In presentations made to RSAC, Program Office representatives indicated that the majority of their program activities were science related. Nonetheless the use of science by EPA in decisions is continuing to be challenged by critics of the Agency. RSAC concludes that it is critical for ORD to continue to expand its research and development to support the underlying

science informing regulatory decisions. EPA's use of science in decision-making will continue to be challenged, and it is critical for the Agency to further invest in scientific research in order to bolster its credibility. EPA must ensure that it is making the proper investments in research and development, both near-term and long-term, to support the use of science in decision-making.

4.2 Reflects priorities identified in the EPA and ORD Strategic Plans

<u>Charge question</u>: How well does the budget request reflect priorities identified in the EPA and ORD strategic plans?

The ORD and Program Office Science and Technology budgets do set priorities aligned with the Agency and ORD strategic plans and Government Performance and Results Act (GPRA) goals. However, RSAC has some reservations about the decreases and some omissions in the overall priorities, because they mean that the science needed to inform decisions about these key issues will be lacking. The Agency has placed increased emphasis on children's health, particulate matter, air toxics, global change, integrated science for ecosystem challenges and coastal monitoring. RSAC supports these increases. However, RSAC concluded that the budgets proposed in several areas were not likely to be sufficient to meet the goals established by the Agency and ORD in their Strategic Plans. These areas included tropospheric ozone, endocrine disruptors, waste site remediation technologies, microbial pathogens and indoor air.

The Committee notes that the Agency has taken steps to minimize the impact of decreases in the budget for trophospheric ozone research, and the extent to which tropospheric ozone is to be addressed in combination with particulate matter is to be commended. These issues are strongly coupled through atmospheric chemistry processes that lead to the formation of ozone and fine particles; the commonality of sources leading to oxidant and particulate increases; and possible synergies of oxidants, particulates and other air toxics in contributing to human health and ecological impacts. Research strategies that attempt to address the multi-pollutant and multiple pathway complexity of environmental issues are to be encouraged.

However, we are concerned that important information gaps remain concerning the health and ecological effects of ozone, and we caution that inattention or lack of timeliness in defining the most important gaps and resolving them can only increase the difficulty the Agency faces at the next review of the National Ambient Air Quality Standard for ozone. The failure to adequately address the ozone research needs will mean that the uncertainties related to both ozone, and probably PM, will not be addressed to the extent that they could and should be (SAB, 1999).

A broader vision also is manifest in EPA's plans for addressing indoor air in conjunction with outdoor air effects in the planned expansion of the air toxics programs. We note that the extent to which this is being done is another commendable indication of the Agency's progress toward more holistic approaches to research on complex systems. However, we caution EPA to make sure that other critical gaps in understanding of indoor air pollution are not overlooked by the decrease in emphasis in indoor air quality suggested by the lack of any proposed FY2000 budget allocation.

The use of exploratory grants is one mechanism for addressing the need to identify critical new threats to human health and the environment. In that sense, we are concerned about the planned decrease in support for this activity. The Committee believes that emerging issues need to have ongoing stable support, because EPA is the key Agency that can aggressively watch for critical new threats to human heath and the environment. It will be important to have an appropriate interdisciplinary review mechanism to ensure that research to address emerging issues is properly recognized and evaluated.

Support for research on environmental risk assessment and improved technologies for effective remediation to reduce or eliminate risks is not funded through the EPA S&T budget request. The Superfund appropriation is a vehicle for funding some of the needed Superfund technology research. We believe that very difficult issues are to be tackled in dealing with contaminated sites and that additional research and development will be critically needed.

RSAC notes that OPPTS passed a milestone this year by announcing in the Federal Register, a basic set of assays for endocrine disrupting chemicals to meet the first Congressional deadline in the mandates. This was a major accomplishment. However, to fully meet the mandate, EPA must be prepared to use these assays in FY1999 and report back to Congress in FY2000 about the effectiveness of the program they have developed. It is essential that these tests be standardized and validated before they can be used to test the thousands of chemicals found in food and drinking water. EPA's FY1999 budget did not anticipate the need for standardization and validation of these assays, nor does the FY2000 budget. Furthermore, the allocation of funds for building capacity to meet the policy and regulatory activities that will follow the implementation of the screens is not apparent in the FY2000 budget.

The issue of endocrine disruption has evolved from an emerging issue to a programmatic issue that bridges almost all media and core and mission-oriented research. However, as emerging issues develop into programs, there appears to be no mechanism within the Agency budgeting process to handle such a transition. RSAC recommends that the FY2001 budget provide a strategy to deal with the cross-cutting nature of the endocrine disruption research program. In the case of activities that have been under way for years, it is important to provide explanations for budget cuts that do not necessarily reflect discontinuance of a research effort, and include in the narrative where this effort is now being budgeted.

4.3 Reflects coordination between ORD and the Program Offices

<u>Charge question</u>: How well does the budget request reflect coordination between ORD and the Program Offices?

The Committee commends the Agency for significant improvements in the coordination between ORD projects and the needs of the Program Offices. Obviously there have been vast improvements in the level of communication and responsiveness of ORD to Program Office needs. Foremost among these improvements are the Agency-wide goals and strategic plans and the use of inter-office planning and budgeting teams. We are encouraged to learn that the ORD laboratories will each have a complementary set of goals and strategic plans. This

should further enhance communication between ORD research and Program Offices, if properly coordinated. While RSAC endorses these improvements, we also recognize there is room for further improved coordination to ensure that ORD efforts are targeted to key Program Office needs and that new regulatory initiatives from the Program Offices benefit from well-targeted and sound ORD science.

For instance, briefings by Program Office and ORD managers and staff made it obvious that there is more interaction and coordination among ORD and the various Program Offices than the FY2000 budget proposal reveals. For example, the line item expenditure for indoor air research was zero dollars, suggesting that indoor air would no longer be funded. However, the ensuing discussion revealed that indoor air research was included under other categories, and was an important component of the air toxics and pollution prevention programs.

The budget proposal did not clearly articulate the new approaches to some of the most important issues that the Agency confronts. These include: a) the ability to deal with mixtures; b) cumulative exposure; c) chemicals that have no threshold; d), and the hazards of prenatal and childhood exposure to chemicals at extremely low-levels that are both physiologically and environmentally relevant. Efforts to break these traditional barriers were mentioned and are clearly a major improvement in how EPA attends to reducing risk to human and environmental health. This coordination between and among the Programs and ORD to address these challenges involves "cutting edge" science, leading to what might be called "the 21st century approach". The RSAC suggests that in the preparation for the FY2001 budget, Program Staff and ORD should more clearly define those areas in their request where these cross-cutting activities are occurring.

In a very real sense, the Program Offices are important clients, and ORD is providing sound science to move their programs ahead. A key organizing principle for this effort is the risk assessment and risk management paradigm for both human health and ecological issues. RSAC recognizes that the risk assessment and risk management paradigm has been central to many of the planned programs, and we recommend that it continue to be foremost in the Agency's planning efforts for the future. Risk assessment is more than an area of emphasis for planning, it is essential to inform decision-makers about the scientific underpinnings of their decisions, and it is central to issue definition, prioritization and subsequent planning. We urge Program Office staff and ORD researchers to continue to keep risk assessment principles and potentially effective mitigation approaches foremost in future planning efforts.

The Agency needs to continue to build on its strategic planning process for science across the Agency and across environmental goals. In briefings made to RSAC, the Agency indicated that it is in the early stages of developing an Agency-wide Science Strategic Plan as a tool for planning and coordinating EPA-wide science. RSAC strongly endorses the need for this plan and has offered our support to the Agency in its development.

4.4 Supports a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific problem-driven topics

<u>Charge Question</u>: How well does the budget request support a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific problem-driven topics?

The Office of Research and Development budget request does appear to provide a balance between core research and media-specific, problem driven science needs, as recommended by the National Academy of Sciences. The balance seems to be about half and half, which is in line with the NAS "Building a Foundation for Sound Environmental Decisions" report recommendations (NRC, 1997). RSAC does note, however, the overall Science and Technology budget request is more weighted to media-specific problem driven activities. While ORD's discretionary resources in the S&T account in the Sound Science goal (Goal 8) do increase in FY2000, the overall budget represents a significant decrease in the Sound Science goal, which could lead to a less-balanced program in the future. RSAC believes that maintaining EPA's core research capabilities is critical to ensuring the Agency's ability to address the environmental problems of the future.

EPA is now moving more toward a multi-media, multi-exposure, health and ecological end-point approach for dealing with environmental stressors. These involve functional health endpoints that have population-wide, generational effects on quality of life with vast economic implications, and ecological effects on large geographic and/or temporal scales. Not only do the problems being addressed require more sophisticated science, they also require more sophisticated budgeting strategies, such as being able to track the reassignment of dollars into other categories.

4.5 Balance attention to near-term and to long-term research and science and technology issues

<u>Charge Question</u>: How well does the budget request balances attention to near-term and to long-term research issues?

RSAC believes that, in general, the Agency has given serious consideration to both long-term and short-term research and science and technology issues. Developing an adequate balance is difficult, but Agency goals on global climate change, coastal ecosystem research and ecosystems analysis are evidence of longer-term thinking. We commend the Agency for working towards a more optimal balance, and we offer suggestions for improvement.

The 1998 RSAC review of the FY1999 budget indicated a need for providing additional effort and funding in the area of identifying long-term research needs and significant emerging issues (SAB, 1998). This is a continuing concern. While some of the programs emphasized in FY2000 are longer-term efforts, there is still no overall explicit approach to incorporate the requirements of longer-term research programs within the short-term budgetary process. It is important that the Agency strengthen its strategic planning processes to fund the

longer-term research on critical environmental issues that transcend the year-to-year budget framework. In addition to the need to balance short-term and long-term research, we point out that it is important to establish a mechanism to identify emerging issues that is open to stakeholders and to coordination with other agencies because emerging issues often form the basis for future research and science and technology programs. These programs aid in the identification of environmental problems before they become major issues with sizable impacts and remedial costs. Such efforts are necessary, even for a mission-oriented agency such as the EPA. We recommend that a formal mechanism be adopted that fosters identification of emerging issues. Future environmental concerns are difficult to anticipate and, as such, may require the assistance of both internal and external experts. Use of the Exploratory Research Grants Program is one way to assist with this need, but does not go far enough. Other mechanisms, for example, might include the use of workshops and recommendations from major professional societies as well as dedicated Agency professionals assigned to lead these efforts.

RSAC is concerned about the decline in funding for the Exploratory Grants Program. The Committee believes that emerging issues need to have ongoing stable support, because EPA is the key Agency that can aggressively watch for critical new threats to human health and the environment. Within the strategic plan and goals of the Agency there is clearly room for additional fundamental research that would benefit the overall program. We recommend that this program not be decreased, but rather increased in funding, because the Exploratory Grants program has provided real benefits to the Agency. For instance, a one year grant awarded in the first year of the program examined whether low level regional air pollutants were affecting the health of children. It showed that the average lung function of a healthy group of children was reduced in proportion to the average concentration of ozone in the ambient air, even though the ozone levels didn't reach the National Ambient Air Quality Standard (NAAQS). This was the first demonstration that such effects were occurring at such low concentrations and led to further, confirmatory field studies in other groups of children and adults in the field and in chamber studies at EPA's Clinical Studies Lab in Chapel Hill, NC. These studies provided major support for EPA's 1997 revision of the ozone NAAQS.

4.6 How can EPA use or improve upon the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes?

<u>Charge</u>: Provide advice on how can EPA use or improve upon the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes.

EPA has used the GPRA goals structure to organize its FY2000 budget requests, and the RSAC welcomes such a structure as an organizing principle. It provides more clarity about how the research and science programs relate to EPA's overall mission Most of the science milestones are process (or "output") oriented rather than results (or "outcome") oriented. For example, a program's FY2000 milestone might be the production of a mathematical pollutant transport model or the generation of five toxicity profiles, without any clear articulation of what benefits to the overall goal (e.g., Clean Air) it would provide. It is important for the Agency to

move forward with evaluations of research programs by environmental outcomes rather than outputs.

Moreover, the ORD and Agency process for prioritizing research programs is not completely transparent.

In the following subsections, the RSAC offers some suggestions for improving the analysis and its presentation, recognizing that EPA may be unable to achieve all of them all at once.

4.6.1 Using the decision-analytic value-of-information concept in research budgeting

In a world of constrained budgets, a decision-analytic approach of comparing the value of information to the cost of producing it can be used to assist in the prioritization of science activities. Where feasible, RSAC recommends that EPA use a value-of-information approach as one of the tools in setting priorities among research and other science activities. EPA's research and science programs, including the ORD core program, are intended to help the Agency make better decisions, e.g., to specify a protective level for human exposure to an environmental contaminant, to recommend a cost-effective pollution prevention or control process, to devise strategies for protection of habitat, or to determine if a previous regulatory effort is no longer needed, based on the latest understanding of risks. In any decision process, gathering information can help reduce the uncertainty about the benefits and costs of the proposed decision alternatives, thus leading to an improved decision that will minimize the possibility of substantial over-regulation or under-regulation. For any particular decision, at some point the cost of gathering additional information will outweigh its expected value in improving the decision, and the proposed research or other scientific activity should be rejected.

The value of information approach becomes less and less feasible to apply as the information-gathering activity moves from the very specific, data-gap filling variety to the more general core research or especially exploratory research. The RSAC doubts, for example, that there is any one "right" value for the fraction of the total ORD budget to be devoted to exploratory research, or that formal value of information analyses could be applied to prioritize among competing proposals in this area. Nevertheless, even a qualitative use of the value-of-information approach could help set priorities for the less program-specific research activities within the Agency.

4.6.2 Providing information about candidate programs not selected for the President's budget

The EPA has clearly linked research priorities with specific environmental goals in its FY2000 budget request. This represents a significant improvement over prior years. There is, however, a lack of transparency in the process used to set these priorities. For example, having information on high ranking programs that the Agency entertained during the budget-making process, but could not fund due to overall budget constraints and competition with other

programs would have been useful to the RSAC in its evaluation of the adequacy of the proposed budget. The nature of the process used for setting budgetary priorities is unclear, in particular which criteria were used for emphasizing or de-emphasizing programs in the proposed budget. It is recommended that the Agency develop a set of explicit criteria that can be used for setting research priorities during the budget development process. This exercise will not only improve communication and understanding of the budget process for RSAC and others outside the Agency, but will also assist EPA in making its internal decision process more efficient.

4.6.3 Moving toward evaluations of research programs by outcomes rather than outputs

The ORD Annual Performance Goals and Associated Key Annual Performance Measures constitute a useful tool for the evaluation of outputs resulting from research activities, and EPA should be commended for moving in this direction. However, this evaluation process is incomplete, and there is a need to evaluate the outcomes of research program activities, particularly addressing the question of how specific ORD's programs contribute to EPA's mission. It is recommended that the Agency develop criteria and measures for evaluating the outcomes of its research programs.

4.6.4 Meeting Thompson Report requirements

EPA, along with other government regulatory agencies, is charged under the 1998 Omnibus Appropriations Act with contributing to an OMB report (the "Thompson Report") that details the costs and benefits of rules and regulations. The requirement is intended to include the costs of research and other science activities contributing to the development of these rules and regulations. This interpretation alone would suggest that the Agency turn towards outcome measures of program performance. However, it brings with it several difficulties that will require development of economic techniques to deal with the reporting requirements. First, almost half of the ORD budget is devoted to core research that is by definition not directly related to any one specific rule or regulation, instead contributing to several or even most regulatory efforts. How to allocate the costs of core research among the rules and regulations for any one year is a daunting question. Second, the Thompson language calls for "an estimate of the total annual costs and benefits (*including quantifiable and nonquantifiable effects*) (emphasis added). How to estimate nonquantifiable effects, let alone add them to the quantifiable effects to arrive at a total, is by no means clear. EPA has a head start on this process because of its experience in meeting Section 812 of the Clean Air Act Amendments of 1990. Finally, monetizing the distribution of environmental benefits and costs is different from analyses carried out under the economic efficiency criterion implied by the cost-benefit accounting requirement.

4.6.5 Revisiting the recommendations on the FY1999 budget request

In its review of the FY1999 proposed budget, RSAC issued a set of recommendations to improve upon the GPRA structure to communicate research plans, priorities, research requirements, and planned outcomes. Three of these recommendations focused on the need for developing criteria to evaluate the quality and impact of its extramural and intramural

research program, i.e.: a) program effectiveness; b) quality of the science and relevancy of the research to policy development, regulatory decision-making, and prioritization of emerging environmental issues and concerns; and, c) value of products of short-term and long-term problem-focused research. EPA has made some progress towards these recommendations, but they remain largely unfulfilled. The RSAC urges EPA to reconsider these recommendations as they may be very helpful in its budget development process and research priority-setting.

4.6.6 Communicating with the public

The major goal of citizen's right to know is integral, and key, to all of the research programs. An enhanced crosscutting outreach function needs to be made more explicit. Such a function would be focused on explanation of program goals and outcomes; explanation of uncertainties and their impacts on decision making; and the integrated nature of environmental issues. The clearly defined communication activity would be very helpful for gaining support for EPA actions from the public, decision makers and other stakeholders.

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APPENDIX A - Additional Information Provided at the Meeting Regarding Science & Technology Activities in Non-ORD EPA Offices

This Appendix highlights the types of Science and Technology activities ongoing in EPA Program Offices. It is not an comprehensive listing, but rather a summary of the information presented to RSAC during the March 3-4, 1999 review of the Science & Technology components of the FY2000 President's Budget request to identify the types of work underway and their relationship to the GPRA goals.

Program Office	GPRA Goals	Types of Science Conducted	Selected Science Activities
A. Office of Air & Radiation	Goal 1 - Clean Air Goal 4- Preventing Pollution Goal 5 - Better Waste Mgmt. Goal 6 - Global Risks	1. Regulation 2. Technical Assistance 3. Implementation Support 4. Program Assessment 5. Economic Analyses	1. Exposure /Risk Assessment a. Monitoring b. Emissions characterization/factors c. Risk assessment for air toxics d. Model development (MOBILE 6) e. Support for radiation program 2. Modeling a. Options/impacts 3. Costs/Benefits Assessment a. Section 812 CAAA 4. Technology Development a. Clean car 5. Laboratories a. Ann Arbor, MI b. Las Vegas, NV c. Montgomery, AL

Program Office	GPRA Goals	Types of Science Conducted	Selected Science Activities
B. Office of Pollution Prevention, Pesticides & Toxic Substances	Goal 3 - Safe Food Goal 4 - Preventing Pollution Goal 6 - Global Risks Goal 7 - Right to Know	1. Regulation 2. Technical Assistance 3. Right to Know 4. Design for the Environment 5. Economic Analysis 6. Environmental Accounting 7. Green Chemistry	1 Exposure/Risk Assessment a. Dietary exposure estimates b. Drinking water exposure estimates c. Assessing residential exposure d. Aggregating exposures e. Asbestos, Lead, PCBs, Biotechology, Endocrine Disruptors 2. Evaluate Industry Data a. Screening information data sets 3. Test Methods & Guidelines a. FQPA 10-fold safety factor b. Dietary exposure assessment c. Cumulative risk 4. Chemical right-to-know a. Toxic release inventory 5. Community based environmental programs 6. Consumer labeling
C. Office of Policy		1. Economics 2. Climate Research 3. Transportation Research 4. Environmental Information 5. Regulatory Management	1. Economics Research a. Pollution Abatement Control Expenditures (PACE) Survey b. Recreation & the Environment Survey c. Municipal Solid Waste Disposal Data 2. Climate Research a. Physical effects models b. Economic impact models c. Workshops d. Relative costs/benefits of options e. Treatment of uncertainty in C/B analysis f. Institutional competitiveness g. Stock turnover & fuel switching capacity h. Electricity deregulation & climate mitigation policies i. Carbon sequestration policies 3. Transportation Impacts a. Highway infrastructure impacts b. Regional travel demand modeling c. Alternative transportation & land use

Program Office	GPRA Goals	Types of Science Conducted	Selected Science Activities
D. Office of Solid Waste & Emergency Response	Goal 4 - Preventing Pollution Goal 5 - Better Waste Mgmt.	1. Regulation 2. Technical Assistance 3. Implementation Support 4. Program Assessment 5. Pollution Prevention 6. Economic Analyses	1. Risk Assessment a. HWIR Multmedia Risk Assessment Strategy b. Products of Hazardous Waste Treatment c. Consensus Toxicity Information d. Ecological Soil Screening Levels e. Human exposure distributions 2. Cost/Benefit Assessment 3. Technical Assistance a. Remediation technologies development b. Long-term performance & stability of continuous monitors 4. Program Assessment a. Brownfields redevelopment 5. Pollution Prevention a. Waste minimization prioritization tool
E. Office of Water	Goal 2 - Clean Water Goal 4 - Preventing Pollution	1. Regulation 2. Technical Assistance 3. Implementation Support 4. Program Assessment 5. Pollution Prevention 6. Economic Analyses	1. Risk Assessment a. Microbials/disinfectants & by-products b. Arsenic 2. Health & Ecological Criteria Development a. Mercury b. Wildlife impacts c. Coral reef protection 3. Regulation a. Water quality biocriteria b. Nutrient standards c. TMDLS d. Wet weather flows 4. Fate & Transport Models 5. Laboratories a. Cincinnati, OH b. Washington, DC

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