XXXX XX, 2012

EPA-SAB-12-xxx

The Honorable Lisa P. Jackson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: Science Advisory Board Comments on the President's Requested FY 2013 Research Budget

Dear Administrator Jackson:

The Science Advisory Board (SAB) has a long history of reviewing the President's budget request for the EPA Office of Research and Development (ORD) and for EPA's National Center for Environmental Economics (NCEE). An SAB Research Budget Work Group held an initial public teleconference on March 2, 2012, to receive briefings from the Office of the Chief Financial Officer, ORD, and NCEE. Public teleconferences hosted by the Research Budget Work Group were held on March 3 and March 8, 2012 to discuss this report. Agency personnel provided important clarifications during these subsequent teleconferences. The SAB budget review was facilitated by ORD's strategic research action plans, issued in February 2012 for each of the six research programs. Information in these plans supplemented information provided in the President's budget and effectively communicated key information. Those plans that contained clear connectivity between mission, programs and budgets were most helpful.Throughout this very compressed schedule, the SAB greatly appreciated the quality of the presentations made and input provided by EPA budget experts and senior staff.

The SAB remains highly supportive of the EPA's 2011 realignment of ORD research programs into four transdisciplinary, systems- and sustainability-oriented programs (Air, Climate and Energy; Safe and Sustainable Water Resources; Sustainable and Healthy Communities; and Chemical Safety for Sustainability) related to your major priorities and the continuation of two existing ORD programs, Human Health Risk Assessment and Homeland Security. The SAB supports aligning the FY 2013 President's budget with these six programs.

The SAB greatly appreciates that in a time of budget declines, the President's Budget calls for a modest increase in the ORD's budget despite a budget reduction for EPA as a whole. Although the President's FY13 budget request calls for a 1.2 percent reduction from the FY12 enacted budget for EPA, there is a 1.7 percent increase in the Science and Technology programs within the agency, and a 1.4 percent increase for ORD. ORD's percentage of the agency's budget authority (6.9 percent) is slightly increased relative to recent years. Although these small requested increases recognize the importance of research to EPA's mission in a time of reduced budgets, funding for ORD in real dollars has declined 28.5 percent (in Gross Domestic Product-indexed dollars) from a high in 2004. This long-term decline limits the research that can be conducted to support the agency's effort to protect human health and the environment.

The enclosed report provides detailed comment on each of the six ORD research programs and the NCEE's Economics and Decision Sciences program. We highlight some major comments and overarching findings in this letter.

- For Air, Climate and Energy, the SAB supports the 7.2 percent increase in total resources from the FY 2012 enacted budget to $105.9M in the FY 2013 President's budget request. These resources will support important multi-pollutant research, advanced monitoring initiatives, research to understanding the potential for air emissions related to hydraulic fracturing, and climate change adaptation tools. Areas underfunded are climate change mitigation, full lifecycle analysis for energy options and research in the economic, social and decision sciences that will help ensure the success of the Air, Climate and Energy Program.

- For Safe and Sustainable Water, the SAB finds the 6.8 percent increase in total resources from the FY 2012 enacted budget to $121.2M in the FY 2013 President's budget request appropriate for funding research on hydraulic fracturing, sustainable water resources and sustainable water infrastructure systems. Additional resources, however, will be needed to fully explore the public health implication of water reuse and the water-energy nexus.

- For Safe and Healthy Communities, the Board notes the requested FY 2013 budget reduction of 2.5 percent from the FY 2012 enacted budget to $184.1M. This research program will be able to achieve its ambitious goals only if it is able effectively to integrate work with the other ORD programs in the many areas where their goals and tasks are interdependent. The SAB also notes a dramatic long-term downward trend since 2004 when the EPA ORD ecosystems budget was almost double ($107M) the President's request for FY 2013. As the SAB has noted in past years, the EPA should be cognizant of the potential impact of these reductions in research funding on the future direction of the Safe and Healthy Communities program.

- For Chemical Safety for Sustainability, the SAB finds the requested 2.7 percent increase from the FY 2012 enacted budget to $94.2M in FY 2013 reasonable. This research program is critical to the EPA's core mission, which requires evaluation of the potential impacts on human health and the environment of thousands of chemicals in existence and being developed. This research program can also advance two other priorities: cumulative risk assessment (through better understanding of the properties of mixtures of chemicals) and sustainability (through identifying chemicals with safer or more sustainable properties). The SAB supports, however, additional funding for EPA research on the fate of nanomaterials in the environment, an important niche for EPA given that other federal agencies are funding development of nanotechnology applications.

- For the Human Health Research Assessment, the SAB supports the President's budget request for a 2 percent increase from the FY 2012 enacted budget to $43.8M in FY 2013. Although this small increase in the requested 2013 budget will allow ORD to maintain its strategic directions, it will not allow ORD to address upcoming issues. Additional resources will be needed for this program to incorporate expected outputs from the Chemical Safety and Sustainability Program.

- For the Homeland Security program, the SAB is troubled by the President's budget request, which identifies a 0.1 percent reduction from the FY 2012 enacted budget to $26.4M. This represents a decrease in extramural funding for this program two years in a row. The requested budget will permit the EPA to advance much of the strategic research identified in the strategic plan, but will not allow the program to reposition its research towards developing science to support resilient infrastructure and allow communities to better adapt to extreme perturbations caused by disasters.

- Finally, the SAB finds that the modest level of funding ($3 million) requested for economics and decision sciences research in the EPA's NCEE is not adequate to advance understanding of the many important research questions faced by the EPA. The President's request, however, is a significant improvement over funding levels in recent years. The SAB recommends an increased commitment across all ORD programs to research in social, economic and decision sciences and improved coordination between ORD and NCEE in strategic research planning. ORD will need to invest in social, behavioral and decision sciences to assure the success of its programs; an enhanced partnership with NCEE would be an important step in this direction.

It is appropriate that the resource decisions for FY 2013 ORD programs were strategic, investing in some research programs while decreasing resources to others, rather than level across the board. Based on the information ORD provided, however, the SAB is concerned about the apparent decreased or absent support for research noted above. A decrease in or an absence of support in these areas will jeopardize the EPA's ability to meet your environmental priorities. The SAB generally supports the requested budget allocations across the six programs and is interested to learn more in future years about re-allocations across ORD programs as ORD's restructured programs mature. The SAB is highly supportive of the increased investment in extra-mural Science to Achieve Results (STAR) Grants and calls for an increase in the STAR Fellowships as well. These extramural programs represent strategic investments that will benefit future environmental research.

Because ORD's restructured research programs are so new and ambitious, the FY 2013 budget does not contain a great amount of detail describing research activities and the breakout of funding within programs. As the SAB provides additional advice to ORD on these new research programs, the SAB will be interested in better understanding: the relative allocation of resources among the six programs; the process by which budgets are reallocated as multi-year research activities are ended or initiated; the role of lead programs for cross-program activities; and specific examples of activities that integrate the six programs from an implementation and resource allocation perspective.

At EPA's request, the SAB plans to hold a joint public advisory meeting with ORD's Board of Scientific Counselors (on July 10-11, 2012) to provide additional advice on strategic research planning. At that time the SAB may have additional advice that may be useful to the Agency in budget planning for FY 2014 and beyond.

The SAB is pleased to have again reviewed the EPA research budget and looks forward to continued work with you to strengthen the agency's vital research base that supports your

priorities. We look forward to receiving your response to this review and continuing our interactions with EPA to develop future advice on the agency's science program.

Sincerely,

Dr. Deborah L. Swackhamer
Chair
Science Advisory Board

Dr. Taylor Eighmy
Chair
SAB Research Budget Work Group

Enclosure

NOTICE

This report has been written as part of the activities of the EPA Science Advisory Board (SAB), a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The SAB 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. Mention of trade names of commercial products does not constitute a recommendation for use. Reports of the SAB are posted on the EPA website at http://www.epa.gov/sab.

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Research Budget Work Group

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Table of Contents

Table of Acronyms and Abbreviations

ACE	Air, Climate and Energy
CSS	Chemical Safety for Sustainability
FTEs	Full-time Equivalents
HHRA	Human Health Risk Assessment
HSR	Homeland Security
IRIS	Integrated Risk Information System
NCEE	National Center for Environmental Economics
ORD	Office of Research and Development
SHC	Sustainable and Healthy Communities
SSWR	Safe and Sustainable Water Resources

Science Advisory Board Comments on the President's Requested FY 2013 Research Budget

1. Background

Historically, the Science Advisory Board (SAB) has reviewed the President's annual research budget request for the EPA. The annuals reviews have focused on research programs in the Office of Research and Development (ORD) and on the Economics and Decision Sciences program within the Office of Policy. Since 2007, in parallel with the budget reviews, the SAB also has advised ORD on strategic research directions. The Board provided advice on this topic most recently in a report developed jointly with ORD's Board of Scientific Counselors (U.S. EPA SAB 2011a). The review of the President's FY 2013 request is informed by, but is separate from, ongoing efforts to provide strategic advice to ORD. It focuses on the adequacy of the President's FY 2013 budget for advancing the EPA's strategic research directions and achieving the priority science outputs identified in the President's Budget. These ORD priority science outputs support EPA's decision making.

For this report, the SAB reviewed the *FY 2013 EPA Budget in Brief* and the President's FY 2013 budget request for each of ORD's six research areas (Air, Climate and Energy; Safe and Sustainable Water Resources; Sustainable and Healthy Communities; Chemical Safety for Sustainability; Human Health Risk Assessment; and Homeland Security). The SAB also reviewed the President's FY 2013 request for a seventh research area, Economics and Decision Sciences, directed by the National Center for Environmental Economics (NCEE) in the EPA's Office of Policy.

ORD supplemented the President's budget request with strategic research action plans released in February 2012 to provide an overview for all of ORD's research programs (U.S. EPA 2012f) and more detailed information for each of the six programs (U.S. EPA 2012a, 2012b, 2012c, 2012d, 2012e, and 2012g). ORD's program-specific research action plans provide a problem statement for each of the research areas and identify the research vision. The plans describe the statutory and policy context, major partnerships, research themes, and priority science questions within each theme. Most important for this budget review, the strategic research plans provide tables identifying expected ORD outputs by upcoming fiscal years. The SAB also reviewed the President's FY 2013 request for the Economics and Decision Sciences research program and a short Program Overview for that research program. The SAB received briefings from representatives of the EPA's Office of the Chief Financial Officer, ORD and NCEE and received supplementary information on budget trends from ORD. All these review materials are available on the SAB website.[1]

[1]Review and background materials for ths review are available at: http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/ad9f4d64737919c285257966004b53e1!OpenDocument&Date=2012-03-01 (accessed 03/03/12)

Table 1 provides an overview of the President's requested FY 2013 ORD budget by Program/Project. Section 3.7 of this report provides the President's requested FY 2013 budget for the Economics and Decision Sciences research program.

Table 1: Overview of the ORD Budget by Program/Project

Totals may not add exactly due to rounding

	FY 2011 Enacted		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
Program/Project	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Air, Climate & Energy Research	$106.3	311.2	$98.8	306.6	$105.9	308.4	$7.0	1.8
Safe & Sustainable Water Resources Research	$117.3	435.7	$113.5	436.3	$121.2	443.5	$7.7	7.2
Sustainable & Healthy Communities Research	$195.1	633.4	$188.9	612.7	$184.1	620.9	-$4.8	8.2
Chemical Safety for Sustainability Research	$89.2	284.1	$91.7	291.2	$94.2	293.5	$2.5	2.3
Human Health Risk Assessment	$47.1	196.6	$42.9	193.4	$43.8	195.9	$0.9	2.5
Homeland Security Research	$26.7	64.3	$26.6	64.1	$26.4	64.7	-$0.2	0.6
National Priorities	$0.0	0.0	$5.0	0.0	$0.0	0.0	-$5.0	0.0
Total	$581.7	1925.3	$567.5	1904.3	$575.6	1926.9	$8.1	22.6

For this review, the SAB addressed four questions for each program area:

- How well will the requested budget permit the EPA to advance its strategic research directions as reflected in the Strategic Research Action Plan for the ORD program area (or the NCEE Economics and Decision Sciences research program overview) and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

- Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, full-time equivalents (FTEs), and intramural and extramural resources?

- Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

- Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

2. Overarching findings and observations

The President's Fiscal Year (FY) 2013 budget request calls for a 1.2 percent reduction from the FY 2012 enacted budget for the EPA as a whole, a 1.7 percent increase in Science and Technology programs within the agency and a 1.4 percent increase for ORD. ORD's percentage of the EPA budget authority (6.9 percent) is slightly increased relative to recent years and there is a requested small increase in ORD full-time equivalent (FTE) employees (an increase of 1.1 percent from the FY 2012 enacted budget to 1926.9 FTEs in the FY 2013 President's budget request). Although the small increases requested for ORD recognize the importance of research to the EPA's mission, funding for ORD in real dollars has declined 28.5 percent (in GDP indexed dollars) from the high in 2004 to the President's FY 2013 budget request for ORD in 2013 (a total of $575.6 or $422.3 in GDP-indexed dollars). The President's budget request, in light of inflation, supports ORD in a time of budget deficits but limits the research that can be conducted to support the EPA's efforts to protect human health and the environment.

In general, the SAB finds that the President's FY 2013 budget request will allow ORD to meet many but not all of the priorities identified in the strategic research action plans and the outputs noted in the President's Budget request. The SAB identifies the following research priorities as under-funded and discusses them in more detail in this report: climate change mitigation, study of the full- lifecycle analysis of energy options; water reuse and the water-energy nexus; funding for community-based interactions within the Sustainable and Health Community Program; the fate and transport of nanomaterials in the environment; research that will enable the Human Health Risk Assessment program to integrate the science products to be generated by the Chemical Safety for Sustainability program into assessments; research on resiliency as a key component of Homeland Security; and social, behavioral and decision sciences. The SAB underscores that all of ORD's research programs identify a sustainability focus, and this sustainability focus requires consideration of the human dimension. The President's research budget request for FY 2013 does not identify resources for the needed integration of the social, behavioral, and decision sciences in the EPA's research programs. Research on human behavior, institutions, markets and trading mechanisms are critical to the success of ORD's research programs as they relate to the EPA's regulatory and strategic goals. Social, behavioral and decision sciences need to be developed and more explicitly represented and integrated into ORD research. In the near term, closer collaboration with the EPA's NCEE, with mutual leveraging of resources can provide ORD with access to expertise in economics, filling some of these needs, while helping to strengthen the NCEE program as well.

The SAB welcomes the President's continued support for the Science to Achieve Results (STAR) grants and STAR fellowship programs. There is an 8 percent increase in STAR grants from the FY 2012 enacted budget to $67.0M in the FY 2013 President's budget request and STAR Fellowships are held constant at $14.0M. These programs, which foster ORD interactions with the wider scientific community, are important for stimulating innovation and cross-program integration. The SAB considers it a priority to increase STAR fellowships, if possible, because support for environmental scientists at an early stage in their careers is a cost-effective way to advance ORD's strategic goals.

In 2011, ORD restructured its thirteen research programs into six consolidated research programs with a commitment to a transdisciplinary, systems- and sustainability-oriented approach to research. Figure 1 shows the distribution of funds identified for ORD in the President's FY 2013 requested budget. The SAB understands that the distribution of funds is, in great part, a result of the 2011 restructuring of research programs. The SAB generally supports the requested budget allocations across the six programs and is interested to learn more in future years about re-allocations across ORD programs as ORD's restructured research programs mature.

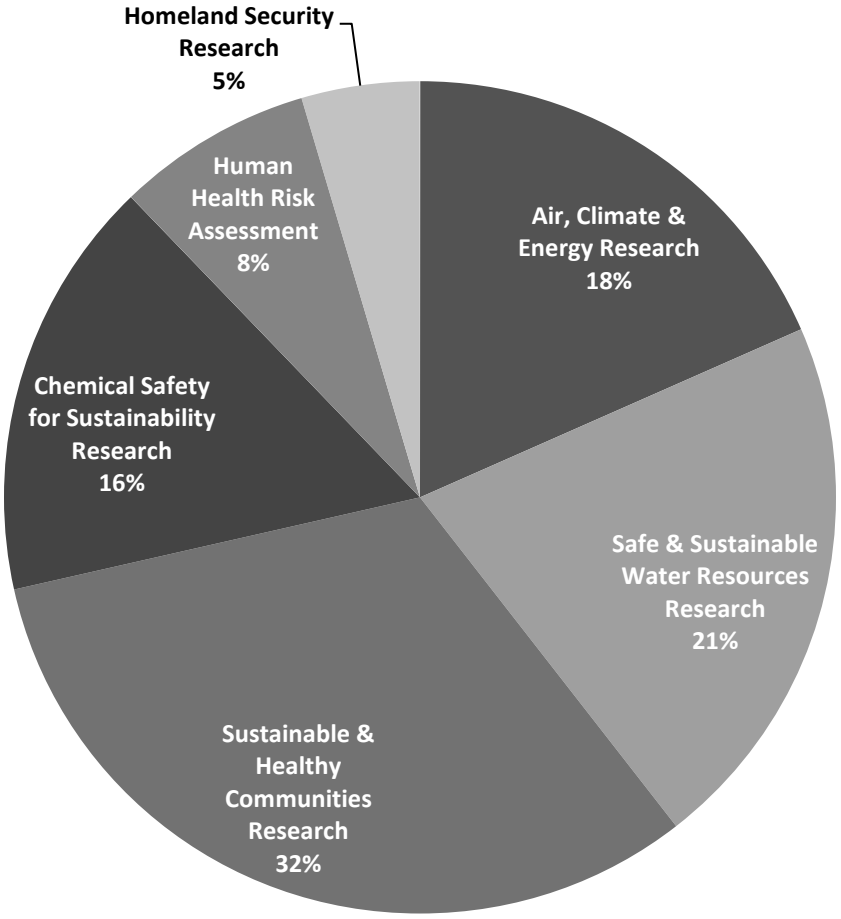

Figure 1: Percentage of FY 2013 Requested Funding for ORD by Program

Although ORD has committed to implementing systems approaches to research, the President's Budget as presently constructed could inadvertently "make silos reappear," since the budget focuses on individual programs and cross-program activities are not described clearly. The SAB understands that ORD will designate lead programs for many cross-cutting research areas (e.g., children's health, climate change), but it is not clear how responsibilities and costs are to be shared across participating programs. The lack of transparency for cross-program integration processes may in part reflect the relative novelty of ORD's research structure. However, SAB

review of the President's requested research budget requires a more explicit and transparent exposition of the processes and activities that implement integration and coordination across programs and a clearer linkage of these activities to components of the budgets. Integration processes should be formalized, clearly supported by dedicated resources and carefully structured to encourage and sustain cross-program collaboration and integration to avoid research silos. ORD's cross-program approach to environmental justice illustrates this need. The Safe and Healthy Communites program is designated as the lead program for this priority activity, but ORD has not provided information about how integration across all of ORD's activities will proceed.

Although collaboration and integration require resources, they will also create synergies, eliminate duplication, and save resources in the long term. Active collaboration and integration are warranted not only among ORD programs, but across federal agencies as well. Some of the EPA's cross-cutting themes (e.g., sustainability, environmental justice, building tribal partnerships, climate change) are multi-agency themes. Small amounts of funding from several agencies could be pooled to provide useful amounts of money, particularly in the areas of planning for food, fuel and energy security in climate-resilient communities. This strategy could leverage some current EPA grants, such as Tribal General Assistance Program (GAP) funds that are so small that they often have marginal results.

ORD's six strategic research action plans reference and build upon advice from the SAB and ORD's Board of Scientific Counselors (SAB 2010 and 2011a), The SAB commends ORD for developing these strategic research action plans, a critical first step in implementing the integrated, transdisciplinary programs. Those plans that contained clear connectivity between mission, programs and budgets were most helpful to the SAB for this budget review. The SAB recommends that ORD update annually the tables of expected research outputs in each strategic research action plan and also identify key milestones for multi-year research outputs. Future budget development and review could be made more efficient and transparent because a direct comparison between planned and actual outputs could be made and progress toward multi-year objectives could be better understood.
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3. Specific Comments on the EPA's Research Programs

3.1. Air, Climate and Energy

ORD's strategic research action plan for Air, Climate and Energy (U.S. EPA 2012a) identifies the following problem statement, vision, and policy relevant research themes. Table 2 provides an overview of the requested budget for the program.

Air, Climate and Energy: problem statement, vision and themes

Problem statement: *Protecting health and the environment from the impacts of climate change and air quality in a sustainable manner are central 21st century challenges. These challenges are complicated by the interplay between air quality, the changing climate, and emerging energy options.*

Vision: *EPA provides the cutting-edge scientific information and tools to support EPA's strategic goals of protecting and improving air quality and taking action on climate change in a sustainable manner.*

Policy-relevant research themes:

- *Assess impacts – Assess human and ecosystem exposures and effects associated with air pollutants and climate change at individual, community, regional, and global scales;*
- *Prevent and reduce emissions – Provide data and tools to develop and evaluate approaches to prevent and reduce emissions of pollutants to the atmosphere, particularly environmentally sustainable, cost-effective, and innovative multipollutant and sector-based approaches; and*
- *Respond to changes in climate and air quality – provide human exposure and environmental modeling, monitoring, metrics and information needed by individuals, communities, and governmental agencies to adapt to the impacts of climate change and make public health decisions regarding air quality.*

Table 2: Budget overview for the Air, Climate and Energy Program

Dollar totals may not add exactly due to rounding.

	FY 2011 Actuals		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
Program/Project	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Global Change	$19.4		$18.3		$20.3		$2.0	
Clean Air	$91.1		$78.5		$82.9		$4.3	
Other	$9.2		$2.0		$2.8		$0.7	
Air, Climate & Energy Research Totals	$119..8	311.2	$98.8	306.6	$105.9	308.4	$7.0	1.8

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in Air, Climate and Energy strategic research action plan and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

The requested budget will permit the EPA to advance many of the strategic research directions reflected in the strategic research action plan (U.S. EPA 2012a). For the clean air subprogram, these include a focus on multi-pollutant approaches, hydraulic fracturing impacts and a shift to new, more efficient ways to monitor air quality. For the global change subprogram, this includes work at the local, regional and national level on climate change impacts and adaptation. For the energy subprogram, work on impacts of biofuels is included.

The clean air program is one of the EPA's biggest success stories with estimated economic, social and environmental benefits far outweighing the costs. The ORD investment in the underlying science supporting the National Ambient Air Quality Standards has had enormous returns (Heintz et al.; 2011, U.S. EPA 2011) and must be continued. The requested budget supports this priority.

For climate change research, the President's budget focuses on adaptation products and does not highlight plans for climate change mitigation and global-level work described in the strategic research action plan and listed as FY 2013 outputs. The EPA has clarified that mitigation-related research is being added to adaptation-related research already being conducted, because of EPA's expanded role in mitigation, resulting from the Endangerment Finding (U.S. EPA 2009). The SAB views this dual focus positively and would welcome additional research on climate mitigation.

Life-cycle assessment across energy technologies, which is mentioned in the strategic research action plan, does not appear to be a priority in FY 2013 based on the budget narrative. The Air, Climate and Energy program should have a major role in this line of research, in collaboration with other ORD programs.

Economic and social sciences work warrant greater emphasis in the Air, Climate and Energy program. Understanding how to effect behavioral change is central to the Administrator's goals of taking action on climate change and improving air quality. Effective approaches to decreasing vehicle miles traveled, for example, will advance both goals.

Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?

Given resource constraints, the Air, Climate and Energy program is attempting to accomplish important work efficiently, leveraging other resources and partnerships. There is a 7.2 percent increase in total resources from the FY 2012 enacted budget to $105.9M in the FY 2013 President's budget request, relative to 1.4 percent overall increase in entire ORD budget. There is an increase in person-years of 0.5 percent to 308.4 FTEs in the FY 2013 President's budget request, relative to the FY 2012 enacted budget.

The requested modest increase in Clean Air funds (6.0 percent increase from the FY 2012 enacted budget to $82.9M in the FY 2013 President's budget request) is needed. It is required to provide the scientific and methodological basis for moving to multi-pollutant approach and the research supporting a shift toward cheaper alternative approaches to monitoring air quality, two important activities. The requested investment of $3.76M in research on hydraulic fracturing impacts on air quality is appropriate. This research is needed so that the EPA can provide science to support decisions made by policy makers and practitioners. Since the use of this technology is proceeding rapidly, the EPA should ensure that sufficient funds are devoted to lay the foundation of the science needed to evaluate its effects.

While the percent increase for Global Change is relatively large (10.9%), the absolute amount of the budget ($20.3M, or about five percent of the ORD budget) is low relative to the magnitude of the problem and the EPA's role under the Endangerment Finding and relative to all the other ORD programs.

EPA has provided a sufficient rationale for eliminating several programs (e.g., the Mercury Research Program, fluid modeling facility) and significantly reducing others (e.g., development of exposure assessment tools).

Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

The President's budget identifies a number of important objectives and work products for FY 2013. These should be achievable with the proposed budget given the limited information provided to the SAB. The objectives and work products are well-defined but, in some instances, they could be more specific, for example, in the development of information and tools to help communities address impacts of climate change on air and water quality. In other instances, there is a need for information in the President's Budget to correspond more clearly with the strategic research action plan.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

The SAB supports the ORD's use of systematic, clearly identified mechanisms to foster collaboration across ORD programs. Such mechanisms are critical to encourage system-wide approaches. The majority of Air, Climate and Energy activities lend themselves to systems approaches and to collaboration across ORD programs (e.g., the multi-pollutant approach requires collaboration with the Human Health Risk Assessment, Safe and Sustainable Water Resources and Sustainable and Healthy Communities and life-cycle analysis of different energy options requires collaboration with all ORD programs).

EPA is aware of the many existing opportunities to leverage other federal resources in the areas of air pollution, climate change and energy, and is actively engaged in efforts to coordinate and maximize impact, including collaboration with the National Institute of Environmental Health Sciences, National Center for Environmental Health, Department of Energy, Federal Highway

Administration, National Oceanic and Atmospheric Administration, and the U.S. Global Change Research Program.

Because cook stove emissions may differ during use in different geographical and cultural contexts and adoption of cook stove technology is critical for the success of this intervention, the EPA should consider the suggestion by SAB last year that the Air, Climate and Energy program engage science and engineering graduate students in Peace Corps Master's International programs in its cook stove work. The SAB advises the program to build on an existing 2010 Memorandum of Understanding between the EPA and Peace Corps.

3.2. Safe and Sustainable Water Resources

ORD's strategic research action plan for Safe and Sustainable Water Resources (U.S. EPA 2012e) identifies the following problem statement, vision, and policy relevant research themes. Table 3 provides an overview of the requested budget for the program.

Safe and Sustainable Water Resources: problem statement, vision and themes

Problem statement: *Increasing demands for sources of clean water combined with changing land use practices, growth, aging infrastructure, and climate change and variability, pose significant threats to the Nation's water resources. Failure to manage our Nation's waters in an integrated, sustainable manner will limit economic prosperity and jeopardize both human and aquatic ecosystem health.*

Vision: *SSWR uses an integrated, systems approach to research for the identification and development of the scientific, technological and behavioral innovations needed to ensure clean, adequate and equitable supplies of water that support human well-being and resilient aquatic ecosystems.*

Policy-relevant research themes:

- *Sustainable water resources - Ensure safe and sustainable water quality and availability to protect human and ecosystem health by integrating social, economic and environmental research for use in protecting and restoring water resources and their designated uses (e.g., drinking water, aquatic life, recreation, industrial processes) on a watershed scale.*
- *Sustainable water infrastructure systems – ensure that water of sufficient quality is available to meet human uses and needs and maintain resilient aquatic ecosystems.*

Table 3: Budget overview for the Safe and Sustainable Water Resources Program

Dollar totals may not add exactly due to rounding.

	FY 2011 Actuals		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
Program/Project	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Drinking Water	$50.9		$50.2		$51.6		$1.5	
Water Quality	$66.6		$63.3		$69.5		$6.3	
Safe & Sustainable Water Resources Research Totals	$117.5	435.7	$113.5	436.3	$121.2	443.5	$7.7	7.2

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in Safe and Sustainable Water Resources Strategic Research Action Plan and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

In the strategic research action plan for the Safe and Sustainable Water Resources (U.S. EPA 2013e), ORD identifies seven issue areas[2] that impact water resources and build the foundation for the research approach. The program encompasses two broad, interrelated research themes: Sustainable Water Resources and Sustainable Water Infrastructure Systems. Each theme is then mapped to priority science questions. The SAB is impressed with the breadth of interactions in developing these research priorities. Input was considered from EPA scientists, EPA regions, the EPA's Office of Water, other federal programs, as well as other stakeholders across water associations, utilities, water research foundations, environmental groups, tribes, industry and state agencies.

The requested allocation of funds within the Safe and Sustainable Water program is appropriate. The increase of $4.3M to investigate the impacts of hydraulic fracturing within the Safe and Sustainable Water Resources programs complements the research investment related to hydraulic fracturing in the Air, Climate and Energy program. This prioritization is consistent with comments from the SAB and fosters collaboration and crosscutting research among ORD programs. The requested increase of $2.0M for a Southern New England Program for Innovative Estuarine Approaches (identified in the *FY 2013 EPA Budget in Brief* as the Center for Innovative Estuarine Approaches) and the requested increase of $1.8M for regional projects and research to monitor and understand the benefits of existing integrated natural, green and grey infrastructure are important. Although these increases are modest, it is appreciated in an environment of scarce economic resources, as the requested investment demonstrates that the Administration understands the importance of research generally and the Safe and Sustainable Water program specifically.

The decision to reduce funding for the Beaches Program is appropriate, as this program has delivered the information and data for which it was designed. However, the SAB recommends continued funding for programs that are associated with the control of pathogens in drinking water.

The prioritization and allocation of resources in the requested budget are strategic and map well to the problem statement and expected research outcomes listed in the strategic research action plan. The Safe and Sustainable Water Resources program must prioritize research that addresses increasing demand for clean water sources, changing land use practices and aging infrastructure place on water quality. Although strong consideration of crosscutting areas such as hydraulic fracturing is important, ORD also should support research on monitoring and emerging contaminants such as endocrine disruptors and pharmaceutical compounds.

[2] increasing demand for sources of clean water; changing land use practices; growth; aging infrastructure; increasing energy and food demands; increasing chemicals in commerce, and climate variability and change

Water reuse is a priority research area that is mentioned both in the strategic research action plan and in the President's Budget for ORD. However, it is not clear from the budget information provided to the SAB where there is funding to support research for this priority area. The EPA recently co-sponsored a study by the National Academy of Sciences (NAS) on water reuse (NAS 2012). The NAS report outlines 14 research priorities for water reuse for the EPA to consider in budget planning. Although other groups are active in the area of water reuse (e.g., WateReuse Association and WateReuse Foundation), there is a need for scientific leadership from federal agencies, especially in the area of research on the potential health impacts associated with reuse of municipal wastewater and greywater. While there are already significant resources and leadership provided in the area of water reuse by state agencies, professional associations, and the practitioner community, in and outside the United States, there is a need for leadership on public health issues associated with water reuse. The EPA is in a unique position to partner with federal agencies such as Centers for Disease Control and Prevention to address critical research needs related to health risk that may be associated with using reclaimed water.

Accordingly, the SAB advises EPA to devote meaningful resources to this priority and assume a strategic leadership role appropriate for its mission to protect human health and the environment. SAB strongly supports the use of a systems-based approach to nutrient management as described in the President's budget. Such a systems approach should include investments in research on human systems as well as natural systems. It is not clear from materials provided to the SAB whether the requested budget for nutrient research includes social, behavioral and decision sciences research on understanding the behavior of people and larger human systems, and designing and implementing new institutional approaches, such as nutrient trades and nutrient markets. Such research is especially significant given the importance of non-point pollution and the need to develop effective, innovative mechanisms and institutions for prevention and control.

Overall, the requested level of funding for the Safe and Sustainable Water Resource program will enable the program to reach its prioritized research goals.

Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?

There is a 6.8 percent increase in total resources from the FY 2012 enacted budget to $121.2M in the FY 2013 President's budget request. The President's Budget also requests an increase of 6.2 FTE over the FY 2012 enacted for a total of 443.5 in the FY 2013 President's budget request.

The overall increase is appropriate, especially given the difficult current economic environment. The Safe and Sustainable Water Resources program represents a merger of mature and effective water research programs with a strong history of conducting good science, and delivering important information in a timely manner. Specific allocation of resources to support hydraulic fracturing, ecosystem research and green infrastructure is appropriate.

Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

The strategic research action plan for the Safe and Sustainable Water Resources program is noteworthy for the clarity of outcomes related to science questions presented in the Table of Outputs and Outcomes. This table is designed around the two overarching themes and seven science questions related to these themes. It presents a comprehensive roadmap of about 50 of the outputs and expected outcomes, i.e., the expected results or consequences that a partner or stakeholder will be able to accomplish due to ORD research. This table covers the period 2012 through 2017. These should be achievable with the proposed budget.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

The EPA has made a quantum shift in its operational culture/philosophy, first by consolidating programs and second by making a strong commitment to engage in collaborative and partnering research, both among its programs, and with other federal agencies. The strategic research action plan for the Safe and Sustainable Water Resources program documents the program's strong efforts to actively engage other federal agencies in these collaborative and partnering ventures. The SAB would appreciate some indication of management and budget implications of collaborations, both within the EPA and with other federal agencies. The President's Budget, for example, includes a discussion in the context of the Safe and Sustainable Water Program of establishing "Communities of Practice" across ORD on the topics of model protocols, hydrology and decision support. These collaborative efforts should enable interdisciplinary linkages between programs, but the budget does not identify which ORD program will lead the activities, and how the activity will be managed or supported by resources.

ORD's Net Zero work highlights two issues related to sustainability: water reuse and energy consumption. This program involves collaboration with the Department of Defense to pilot technologies useful to communities. ORD should continue to build such partnerships and should reach out to agencies such as the Bureau of Land Management, professional societies and utilities that have existing activities and expertise in this area.

3.3. Sustainable and Healthy Communities

ORD's strategic research action plan for Sustainable and Healthy Communities (U.S. EPA 2012g) identifies the following problem statement, vision, and policy relevant research themes. Table 4 provides an overview of the requested budget for the program.

Sustainable and Healthy Communities: problem statement, vision and themes

Problem statement: *Communities make social, economic, and environmental trade-offs in a resource-constrained world. These trade-offs are often not well characterized in terms of the implications and interactions between human health, ecosystem services, economic vitality, and social equity. Conventional decision-making often does not adequately characterize these complex interactions.*

Vision: *The Sustainable and Healthy Communities Research Program (SHC) will inform and empower decision-makers in communities, as well as in federal, state and tribal community-driven programs, to effectively and equitably weigh and integrate human health, socio-economic, environmental, and ecological factors into their decisions in a way that fosters community sustainability.*

Policy-relevant research themes:

- *Data and Tools to Support Community Decisions: data, methods, and indicators, spatial analyses, and decision tools to assist communities in developing effective approaches to achieve their sustainability goals.*
- *Forecasting and Assessing Ecological and Community Health: information and methods to help communities assess how the natural and built environments affect the health and well-being of residents and to identify sound and sustainable management options.*
- *Implementing Near-Term Approaches to Sustainable Solutions: methods and guidance to address existing sources of land and groundwater contamination that advance innovative approaches toreduce new sources of contamination and enable the recovery of energy, materials, and nutrients from existing waste streams. This research provides scientific support to EPA program and regional offices , states and tribes .*
- *Integrated Solutions for Sustainable Outcomes: will assess the state of the art for sustainable practices for four high-priority community decision areas with environmental impacts: waste and materials management; infrastructure, including energy and water; transportation options; and planning and zoning for buildings and land use. It will use whole-system modeling to integrate these four areas to better achieve outcomes with multiple benefits and to develop and test methods to estimate the Total Resource Impacts and Outcomes of alternate decisions (TRIO methods).*

Table 4: Budget overview for the Sustainable and Healthy Communities Program

Dollar totals may not add exactly due to rounding.

	FY 2011 Actuals		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
Program/Project	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Human Health	$52.9		$45.3		$44.5		($0.8)	
Ecosystems	$68.7		$60.8		$60.2		($0.6)	
Other research budgeted in the Science and Technology account*	$70.8		$64.1		$60.5		($3.6)	
Other research budgeted in non Science & Technology accounts	$23.1		$18.7		$18.9		$0.2	
Sustainable & Healthy Communities Research (Totals)	$215.5	633.4	$188.9	612.7	$184.1	620.9	($4.8)	8.2

*FY 2012 and FY 2013 do not include $0.5M for conferencing activities management out of the Office of the Chief Financial Officer.

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in SHC Strategic Research Action Plan and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

The President's requested FY 2013 budget identifies a modest reduction of 2.5 percent from the FY 2012 enacted budget to $184.1M. The President's Budget also requests an increase of 8.2 FTE over the FY 2012 enacted for a total of 620.9 in the FY 2013 President's budget request.

Within the constraints of the FY 2013 budget, the Sustainable and Healthy Communities Program will be able to achieve the goals of the strategic plan only if it is able effectively to integrate work with the other ORD programs in the many areas where their goals and tasks are interdependent. Tracking nutrient flows (e.g., through the nitrogen cascade) is just one example of a complex goal that will require efforts from many other programs and agencies. In many cases, the Sustainable and Healthy Communities program will take the lead in cross-program collaborations, and this cannot be accomplished without some cost. A concern is that integration and collaboration across programs is not explicitly identified among the tasks in the strategic plan and the cost of these activities does not seem to be specifically called out in the budget. True cross-program integration of scientific activities along with sharing of data can only take place when goals such as water and air quality for communities and ecosystems are planned in concert with other appropriate ORD programs, laboratories and research facilities, as well as relevant EPA offices and other federal and state agencies. Effective and efficient integration can leverage limited and declining budgets to accomplish the important and challenging tasks set out for the Sustainable and Healthy Communities program. But making that happen is not free.

Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?

The FY 2013 Budget in Brief indicates that the President's specific requests for research within the Sustainable and Healthy Communities program on human health ($44.5M) and on ecosystems ($60.2M) both show modest reductions from FY 2012 (about -1.8% and -1.0%, respectively). As noted above, the downward trend for ecosystems research has persisted for many years and the overall effect continues to be of concern to the SAB.

Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

The strategic research action plan for the Sustainable and Healthy Communities program provides detailed plans and outputs for FY 2013 associated with the program themes presented in the text box at the beginning of this section. While detailed levels of resources are not provided at this level of analysis, rough indications for levels of effort were provided, ranking Theme 2 (Forecasting and Assessing Ecological and Community Health) as the highest, followed by Themes 3 (Implementing Near-Term Approaches to Sustainable Solutions) and 1 (Data and Tools to Support Community Decisions), with Theme 4 (Integrated Solutions for Sustainable Outcomes) generally receiving the lowest proportion of FY 2013 resources. Theme 2 is clearly at the core of the program and central to the EPA mission of protecting human health and the environment. The activities planned under Theme 2 will be challenging and likely to be in high demand across the Agency now and well into the future. Theme 3 has the largest number of specified outputs for FY 2013, many of which are in direct response to program office and other Agency needs for science to support current and near-term regulatory activities. Themes 1 and 4 both involve newer research directions where methods and data are being developed as a foundation for future research. In sum, the general allocation of resources across research themes within the program for FY 2013 seems to be appropriate and well justified.

The strategic research plan identifies numerous important outputs to address the agency's concerns for children's health and environmental justice (Theme 2, Topic 2.2 identifies "Enhancing Children's Health" and "Securing and Sustaining Enviornmental Justice" as subtopics with multiple expected outputs). However, all of these outputs indicate multi-year time horizons (e.g., from FY 2011-FY 2016), making it difficult to determine what activities are to be funded by the FY 2013 budget. It will be important for the Sustainable and Healthy Communities program to determine and report annual milestones for these and other multi-year activities so that progress can be effectively tracked and evaluated.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

The strategic research action plan for this program identifies a number of important collaborations and partnership agreements with other Federal agencies, including the U.S. Geological Survey, U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration. Along with several other ORD programs, the Sustainable and Healthy Communities program will partner with the Department of the Army in the Net Zero Initiative, specifically to develop and demonstrate innovative waste management technologies, consistent with the program's own goals in waste and materials management. Such collaborations between federal agencies increase efficiency and should continue to be encouraged.

3.4. Chemical Safety for Sustainability

ORD's strategic research action plan for Chemical Safety for Sustainability (U.S. EPA 2012b) identifies the following problem statement, vision, and policy relevant research themes. Table 5 provides an overview of the requested budget for the program.

Chemical Safety for Sustainability: problem statement, vision and themes

Problem statement: *Although chemicals are essential to modern life, we lack innovative, systematic, effective, and efficient approaches and tools to inform decisions that reduce the environmental and societal impacts of chemicals while increasing economic value.*

Vision: *EPA science will lead the sustainable development, use, and assessment of chemicals by developing and applying integrated chemical evaluation strategies and decision support tools.*

Policy-relevant research themes:

The CSS program identified three research areas (developing the scientific knowledge, tools, and models needed to conduct integrated, timely, and efficient chemical evaluations; improving methods for assessment and informing management for chemical safety and sustainability; and providing targeted high-priority research solutions for immediate and focused attention). The program also identified eight research themes:

- *Inherency*
- *Systems Models*
- *Biomarkers*
- *Cumulative Risk*
- *Life Cycle Considerations*
- *Extrapolation*
- *Dashboards*
- *Evaluation*

Table 5: Budget overview for the Chemical Safety for Sustainability Program

Dollar totals may not add exactly due to rounding.

	FY 2011 Actuals		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
Program/Project	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Endocrine Disruptors	$10.7		$16.9		$16.3		($0.6)	
Computational Toxicology	$22.4		$21.2		$21.3		$0.1	
Other Research	$52.1		$53.7		$56.7		$3.0	
Chemical Safety for Sustainability Research (Totals)	$85.2	284.1	$91.7	291.2	$94.2	293.5	$2.5	2.3

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in Chemical Safety for Sustainability Strategic Research Action Plan and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

The requested budget will allow the EPA to advance its strategic research directions. Given the current fiscal climate, the President's budget request for a 2.7 percent increase from the FY 2012 enacted budget to $94.2M in FY 2013 seems reasonable. The President's Budget also requests an increase of 2.3 FTE over the FY 2012 enacted for a total of 293.5 FTE in the FY 2013 President's budget request. This research program is critical to the EPA's core mission, which requires evaluation of the potential impacts on human health and the environment of thousands of chemicals in existence and being developed. It is desirable to move away from animal testing Computational toxicology and predicted inherency (i.e., the physical, chemical and biological properties of a chemical that influence exposure, effects and sustainability) may facilitate a move away from animal testing and its associated financial costs and ethical concerns. This research program can also advance two other priorities, cumulative risk assessment, through research on chemical mixtures, and sustainability, through identifying chemicals with safer or more sustainable properties.

Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?

Within the requested budget for this program, the changes from the FY 2012 enacted budget appear reasonable and reflect informed trade-offs across research activities. The SAB supports the requested increase of $4.1M for sustainable molecular design. ORD and the Chemical Safety for Sustainability program in particular have a major role in sustainability research. Because this program area has high visibility and importance, delivering products of well-conducted research on a timely basis is critical and should help both private and public entities move towards sustainability. Sustainable molecular design research will also provide results that support other ORD research outputs.

One significant reduction within this research program in the President's FY2013 requested budget is a reduction of $0.6M for nanomaterial properties. ORD identified its current primary role in nanotechnology as identifying the fate of nanomaterials in the environment, an important niche for EPA given that other federal agencies funding development of nanotechnology applications. The Chemical Safety for Sustainability program is also undertaking research on acute toxicity testing of nanomaterials and mechanisms of action. Understanding these properties of nanomaterials is needed for evaluating ecosystem and public health risks. The program's recent accomplishments for nanotechnology include assessing the impact of nano cerium-doped diesel emissions on an airshed, providing studies to support program office decisions about registering products containing silver nano particles, and the results of using bimetallic nanomaterials for the *in situ* treatment of poly-chlorinated biphenyls. The need for such assessments is likely to become greater as the use and production of nanomaterials increases. If requests for research on nanomaterials increase or if the research generated by the Chemical Safety for Sustainability program identifies public health or ecosystem concerns from

nanomaterials, significant increases in resources beyond the level requested in the President's Budget are likely to be necessary for this program area.

The President's Budget also identifies a reduction of $0.7M for efforts to evaluate real world exposures to endocrine disrupting chemicals for humans and wildlife. Completing the work for endocrine disrupting chemicals provides key information on their toxicity and chemical properties for use in risk assessment. Reduced resources in this area will delay research outputs. Such delays are regrettable but understandable given the fiscal climate.

Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

There is one output identified in the strategic research action plan for FY 2012 (Approaches for standardized testing of nanomaterials) and three outputs identified for FY 2013: (1) Prioritization of regulatory chemical inventories based on in vitro molecular signatures (patterns of response) for endpoints of cancer, developmental toxicity, reproductive toxicity; (2) Quantify acute toxicity of selected nanomaterials; and (3) Data, methods, and science to inform PCB exposure and mitigate risk to children to support EPA regional decisions. Assuming the FY 2012 outputs are met, the requested resources for FY 2013 should be sufficient.

It is less clear if the resources are sufficient to complete progress towards all the outputs identified in the strategic research action plan. The Chemical Safety for Sustainability program has 107 outputs scheduled to be completed by FY 2017. Seventy-eight (73 percent) are to be completed in FY 2016. These are ambitious targets, but the program seems to have processes in place to take into consideration the needs of its partners and customers, to monitor progress and to identify scientific, management, or resource issues that may hinder the successful completion of these outputs.

Two well-defined outputs that merit special comment are related to Theme 7 (Dashboards) and Theme 8 (Evaluation). The strategic research action plan describes dashboards as interactive websites that "provide partners with accessible, useful graphical depictions of all available chemical data (e.g., information and studies) related to the user's specific queries to help answer the chemical-related question." The evaluation theme identifies the following desired outcomes: "initial and follow up *Pro forma* surveys of program office, regional and external partners" and "A program office and regional partners outreach and engagement plan." The SAB commends the Chemical Safety for Sustainability program for these themes, which respond to the SAB and ORD Board of Scientific Counselors' concerns (U.S. EPA SAB 2011a, 2011b) that "there is no proactive budget initiative to develop ways of employing the results of the CSS program, including high throughput data, into hazard or risk assessment."

Activities related to these themes are important to the success of the Chemical Safety for Sustainability program. The SAB welcomes additional detail about these activities at future discussions of ORD strategic research directions. Of special interest is the design of Dashboards being developed for intended users and the information in the strategic research action plan does not describe them in detail. Will the Dashboards include data from new approaches for developing toxicity information, including new information related to chemical/physical

properties related to "inherency"? How will the quality or accuracy of those data be characterized? How will Dashboards be made available to clients and stakeholders, other federal agencies, states and territories, academia, and the general public? These questions are of special interest to the SAB and have budget implications.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

The Chemical Safety for Sustainability program appears to be coordinating and partnering within the EPA and other federal agencies as well as other public and private entities. The SAB advises the program to continue and expand this coordination and leveraging of resources at every opportunity.

3.5. Human Health Risk Assessment

ORD's strategic research action plan for Human Health Risk Assessment (U.S. EPA 2012d) identifies the following problem statement, vision, and policy relevant research themes. Table 6 provides an overview of the requested budget for this program.

Human Health Risk Assessment: problem statement, vision and themes

Problem statement: *EPA's decisions must be based on scientifically-defensible evaluationsof data that are relevant to assessing human health impacts. The current demand for human health assessments of individual chemicals and chemical mixtures is not being fully met.*

Vision: *The HHRA research program will generate timely, credible human health assessments of individual chemicals and chemical mixtures to support priority EPA risk management decisions, thereby enabling EPA to better predict and prevent risk.*

Policy-relevant research themes:

- *Integrated Risk Information System (IRIS) health hazard and dose-response assessments;*
- *Integrated Science Assessments (ISAs) of criteria air pollutants;*
- *Community Risk and Technical Support (CRTS) for exposure and health assessments; and*
- *Modernizing Risk Assessment Methods (Methods).*

Table 6: Budget overview for the Human Health Risk Assessment Program

Dollar totals may not add exactly due to rounding.

	FY 2011 Actuals		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
Program/Project	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Human Health Risk Assessment (Science and Technology account)	$46.1		$39.6		$40.5		$0.9	
Human Health Risk Assessment (Non Science and Technology account)	$3.7		$3.3		$3.3		0	
Human Health Risk Assessment Totals	$49.9	196.6	$42.9	193.4	$43.8	195.9	$0.9	2.5

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in HHRA Strategic Research Action Plan and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

The President's Budget requests a 2 percent increase from the FY 2012 enacted budget to $43.8M in FY 2013 and 2.5 additional FTEs. The requested 2013 budget allows ORD to maintain its strategic directions but not to address upcoming issues. The last two years have seen relatively flat budgets for this program, although more work is expected, given the need to incorporate expected outputs from the Chemical Safety and Sustainability Program. The SAB has emphasized the need to invest in modernizing the human risk assessment approach to move beyond the one-pollutant-at-a-time framework (U.S. EPA 2011b). It is encouraging to see that the President's Budget addresses the issue of mixtures and multi-pollutant assessment approaches, however, it is unclear how innovation and modernization of the risk assessment program will be achieved. The complex computational toxicology and Tox21 tools ultimately will need to be applied by the Human Health Risk Assessment program. Streamlining of the Integrated Risk Information System process will bring some efficiencies, but given the limited information provided to the SAB, it is difficult to assess whether the modernization effort will get the attention it warrants. As the SAB noted in the budget review last year, such modernization is critically important. A tight partnership between the Human Health Risk Assessment program and the Chemical Safety for Sustainability program is necessary for success in this effort.

Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?

The Human Health Risk Assessment program makes key contributions to the EPA's strategic goals, but requested funding would be reduced for some activities. These reductions may cause delays in final products. There would be a $0.3M reduction for generating Integrated Science Assessments supporting National Ambient Air Quality Standard reviews, including the multi-pollutant Integrated Science Assessment for nitrogen oxides and sulfur oxides and a $0.4M reduction for methods and model development. Because some of the wording in the strategic research action plans and President's Budget is vague, it is not clear whether some initiatives are in need of new or increasing funds or how much flexibility there is to address emerging risk assessment issues.

The continual monitoring and compilation of the literature on human health and ecological effects through the Health and Environmental Research Online (HERO) project should provide a mechanism to ensure that the EPA is aware of major findings that would have a substantial effect on the standard-setting process.

Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

The objectives for this program are focused and limited, but significant. There are well-defined work products for FY 2013 for the Integrated Risk Information System and Integrated Science Assessments. The basic work can continue with the current budget, but it is not clear how new work (e.g., on chemical mixtures) can be initiated with a flat budget. Products for risk assessment modernization are less clear, and as a result, this work could be neglected as deadlines for other products lead to those activities receiving more attention. Furthermore, it is not clear how the Human Health Risk Assessment program will incorporate the findings from the Chemical Safety for Sustainability program into risk assessments. This new activity may be expensive initially. Given the flat budget and no shortage of chemicals to assess, the SAB is concerned that the more innovative work on multiple chemicals and high throughput analysis results will suffer.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

As noted above, the partnership with the Chemical Safety for Sustainability program needs to be very tight and there is also a need to coordinate closely with the Air, Climate and Energy program regarding Integrated Science Assessments supporting National Ambient Air Quality Standards. The Human Health Risk Assessment needs fluid collaboration and interactions with each of the other ORD programs. This should be a prime example of the implementation of systems thinking at ORD.

3.6. Homeland Security

ORD's strategic research action plan for Homeland Security (U.S. EPA 2012c) identifies the mission and policy relevant research themes. The strategic research action plan did not provide a problem statement and vision. Table 7 provides an overview of the requested budget for this program.

Homeland Security: mission and themes

Mission: *The U.S. Environmental Protection Agency (EPA) has a responsibility to help communities prepare for and recover from disasters, including acts of terrorism. EPA's role includes helping to protect water systems from attack, assisting water utilities to build contamination warning and mitigation systems, and leading remediation of contaminated indoor and outdoor settings and water infrastructure. Critical science gaps exist in all these areas. EPA's Homeland Security Research Program (HSRP) was established to conduct applied research and provide technical support that increases the capability of EPA to achieve its homeland security responsibilities. The HSRP helps build systems-based solutions by working with Agency partners to plan, implement and deliver useful science and technology products.*

Policy-relevant research themes:

- *Securing and Sustaining Water Systems;*
- *Characterizing Contamination and Determining Risk; and*
- *Remediating Indoor and Outdoor Environments.*

Table 7: Budget overview for the Homeland Security Program

ORD actuals are unavailable in source document (*Budget in Brief*), so enacted totals are noted here.

Program/Project	FY 2011 Enacted		FY 2012 Enacted		FY 2013 President's Budget		Change from 2012 to 2013	
	$M	FTE	$M	FTE	$M	FTE	$M	FTE
Homeland Security Research	$26.7	64.3	$26.6	64.1	$26.4	64.7	-$0.2	0.6

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in the Homeland Security Strategic Research Action Plan and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

The President's budget request identifies a 0.1 percent reduction from the FY 2012 enacted budget to $26.4M in FY 2013 and 0.7 additional FTEs. This represents a decrease in extramural funding for this program two years in a row. The requested budget will permit the EPA to advance much of the strategic research identified in the strategic plan.

The President's Budget narrative states that the Homeland Security Research Program will re-envision research so that science products have application to a broad set of disasters that could be related to terrorism, the result of accidents, or natural disasters. The strategic research action plan and research investments primarily focus on "remediation science." This focus on remediation science has been at the expense of research to reposition the Homeland Security program towards developing science to support resilient infrastructure and to help communities better adapt to extreme perturbations caused by disasters. Budget cuts make developing this science a more difficult challenge.

Dissemination of knowledge and products to the states and communities should remain a high priority for the Homeland Security program. However, no information was provided on specific allocation of resources to this effort.

<u>Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?</u>

The President's Budget identifies a reduction of $0.35M in decontamination research, which is appropriate considering the maturation of this research effort. In contrast, though the water quality program has demonstrated an ability to produce quality and useful products for users, the President's Budget only identifies an increase of $0.16M for the water security program and an increase of only 1.1 FTE.

Are there well-defined objectives/work products for next year's budget? Can these objectives/work products be achieved with the given resources?

The President's Budget identifies a number of important objectives and outputs for FY 2013. These are achievable given the historical successes of the Homeland Security program and the requested budget, based on the limited information provided. The President's Budget, however, does mention that Homeland Security program will focus research to address managing large volumes of contaminated food and agricultural wastes and the need to sample and analyze this waste. The SAB cautions that taking on additional responsibilities at a time that the Homeland Security program is experiencing budget reductions requires careful management attention. This new activity should be leveraged with resources from agencies such as U.S. Department of Agriculture and the Food and Drug Administration.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

The disaster-response research community has investigated the question of resilient communities from a social science perspective (Morrow 2008; Norris 2010; Twigg 2009; United Nations 2007). The SAB advises the Homeland Security program to engage with that group of research scholars, the governmental (e.g., the Federal Emergency Management Agency), nongovernmental entities (e.g., Community and Regional Resilience Institute), and others, making use of their findings.

The Homeland Security Program has partnerships with the Department of Homeland Security and Department of Defense. The Homeland Security program should prioritize methods to disseminate relevant knowledge generated by these partner organizations to users more closely affiliated with the EPA.

3.7. Economics and Decision Sciences

The Office of Policy did not provide a strategic research action plan for the Economics and Decision Sciences research program. Instead, it provided the mission statements below and a program overview which identified activities of the program. Table 8 provides an overview of the requested budget for this program.

NCEE and the Economics and Decision Sciences Research Program

NCEE Mission: *The mission of EPA's National Center for Environmental Economics (NCEE) is to contribute to better environmental decision-making by advancing the theory and practice of economics and risk analysis within the Agency. NCEE achieves its research mission by conducting, supporting, and applying research in environmental economics and environmental science, with a focus on human and ecosystem health; and improving economic analysis and risk assessment by identifying better ways to link the social and natural sciences.*

Economics and Decision Sciences Program: *The STAR Economics and Decision Sciences (EDS) research program supports research by external social scientists that environmental decision-makers can use in real-world situations. The EDS program assists EPA in estimating costs and benefits of proposed actions, identifies costs savings of non-regulatory approaches, and assists in optimizing the use of its enforcement compliance resources.*

Table 8: Budget overview of the Economics and Decision Sciences Program

		FY 2007 Enacted $M	FY 2008 Enacted $M	FY 2009 Enacted $M	FY 2010 Enacted $M	FY 2011 Enacted $M	**2012 (estimate)** $M	FY 2013 President's Budget $M
(a)	EDS - extramural $	$2.3[#]	-	-	$1.2	$0.5	-	$1.0
(b)	NCEE - research, funded with extramural $	$0.2	$0.7	$0.2	$0.6	$1.9	TBD	$2.0
(c) = (a+b)	**Extramural research - Subtotal**	$2.5	$0.7	$0.2	$1.8	$2.4	TBD	$3.0
(d)	NCEE other program support (non-research), funding with extramural $	$2.7	$1.6	$1.3	$2.0	$1.0	TBD	$2.0
(c+d)	**Total**	$5.2	$2.3	$1.5	$3.8	$3.4	TBD	$5.0
	NCEE staff (# FTEs)*	35 FTEs	38 FTEs	36 FTEs	36 FTEs	32 FTEs	32 FTEs	32 FTEs

Notes:
2007 funding provided by ORD. Figures in subsequent years are funds provided as part of NCEE's budget.
* Staff with technical background in economics or other science field. Majority of technical staff (~85%) are economists – no major changes in distribution between 2007-2013.

How well will the requested budget permit the EPA to advance its strategic research directions as reflected in Economic and Decision Sciences program overview and the priorities identified in the President's Budget? Are there any areas where the EPA should increase investments or reduce investments, based on demonstrated accomplishments or clearly identified needs?

As indicate above, NCEE provided a mission statement but did not provide specific strategic research objectives. It also provided a list of ongoing research projects for the Economics and Decision Sciences Research Program and other activities conducted by NCEE staff.

Funding for economics and decision sciences is not adequate to advance understanding of the many important research questions faced by the EPA in this area. The President's budget request of $3 million is very modest, and far from adequate for advancing economics and decision sciences research sufficiently to support EPA needs. The President's request, however, is a significant improvement over funding levels in recent years, and is at least useful for advancing the narrow purposes for which this funding has been used, i.e., to help fund workshops, provide supplementary funding for dissertation research and to provide early career grants. These funds achieve as much as they do only because they are effectively leveraged with other public and private funds, which makes this a very good investment of modest public funds.

The NCEE Program Overview indicates that activities involve much more economics than other decision sciences. The SAB observes there are good opportunities for collaboration of economists and other decision scientists in many of these projects. For example, one very important project is trying to understand why consumers and firms under-invest in energy saving technologies that appear to be very good investments. By reducing energy use, such investments also reduce emissions and help protect the environment. Hence, it is important for the EPA to understand why consumers and businesses fail to take advantage of low-cost opportunities to reduce energy expenditures.

Social and behavioral scientists with training and experience in this area could make a valuable contribution to these research questions. For example, there is a large literature in decision sciences on behavior change that identifies barriers to change and develops strategies for overcoming barriers. Given the resources, a team of economists and decision scientists would make important advances in our understanding of how to design cost-effective (indeed, negative cost) strategies for reducing pollution emissions through behavior change.

The SAB notes that since 2005 no funding has been provided for the Pollution Abatement Costs and Expenditures survey that collects data on overall pollution abatement expenditures from over 20,000 manufacturing facilities. The EPA has used this survey data in some regulatory analyses and for periodic reports on national or program costs (e.g., U.S. EPA 2011). Government and academic researchers also rely upon these data, using them to analyze the impact of environmental regulations on important economic and environmental outcomes (e.g., job growth; competitiveness, environmental performance, opening and closing of manufacturing facilities and productivity growth). This is an especially important research direction for the EPA since it not only contributes to essential analyses required to assess the economic effects of proposed regulations, but also can be used to improve the design of future regulations so that they are both effective in meeting environmental goals and are less burdensome to industry.

Are the changes since the FY 2012 enacted budget appropriate, taking into consideration overall resources, FTEs, and intramural and extramural resources?

The increase in extramural funding for this program area estimated for 2013 (a 33 percent increase from the FY 2011 enacted budget to $3.0M for FY 2013) is appropriate and will restore stability to an important EPA research program. This is a good investment of public funds especially since most of the external funds are well leveraged.

Human systems are the primary drivers of the environmental challenges that the EPA is charged with managing. The EPA regulatory actions focus primarily on changing the behavior of human systems in order to protect the environment. As a consequence, effective environmental management requires a thorough understanding of how humans systems operate, and how to design regulations to effectively manage human systems. Research on economics and decision sciences is essential to meeting this challenge, and SAB recommends that research should be a higher priority and with more substantial funding.

Are there well defined objectives/work products for next year's budget? Can these be accomplished with the given resources?

The documents provided to the SAB did not provide a set of strategic research objectives, but rather provided a list of work products, including work products that are just starting up or that are ongoing through 2013. Externally funded projects are mostly workshops, dissertation grants and funding for early career research. The primary purpose is to help build capabilities of the next generation of researchers, although ORD also capitalizes on the findings of these research activities (especially by participating in workshops). However, the funded projects are not tied to specific ORD research objectives and work products.

The extramural resources are very modest, but they can be of some help advancing research in this area. Many important internal research projects are being carried out, and this research is well tied to the NCEE mission.

Are there opportunities to leverage the EPA resources with other resources, particularly federal resources?

The SAB notes that cooperative research across the EPA's research programs is essential to meeting research goals. Although many of the ORD Research Programs identify the need for social, behavior and decision sciences, the SAB understands that there is little coordination between the National Center for Environmental Economics and ORD's Research Programs. For example, SAB understands that the NCEE does not participate in ORD's strategic research planning other than discussions with the Sustainable and Healthy Communities research program on selected ecological valuation topics. Coordination between ORD and NCEE is essential for meeting the research objectives with tightly constrained budgets.

Many agencies outside of the EPA face similar problems in assessing costs and benefits of actions, including non-market benefits, for example, Natural Resource Damage Assessments by National Oceanic and Atmospheric Administration, U.S. Department of Agriculture research on ecosystem services, the National Science Foundation and the Army Corps of Engineers. There are many opportunities for leveraging funds for research on valuing ecosystem services, both within ORD (e.g., with the Sustainable and Healthy Communities Program) and outside of ORD, and these should be actively pursued.

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