

**Summary Minutes of the  
U.S. Environmental Protection Agency (EPA)  
Science Advisory Board (SAB) Advisory Committee on EPA's  
Report on the Environment**

**Meeting, June 30 – July 1, 2009**

Committee Members: See Committee Roster – Appendix A

Date and Time: Tuesday, June 30, 9:00 a.m. - 5:00 p.m.; Wednesday, July 1, 8:30 a.m. - 12:00 noon Eastern Daylight Time

Location: EPA Science Advisory Board Conference Center, 1025 F Street, N.W., Washington, D.C.

Purpose: The purpose of this meeting was to provide consultative advice on development of EPA's Report on the Environment (ROE).

Attendees: Committee Chair: Dr. James Sanders

Committee Members: Dr. Henry Anderson  
Dr. Timothy Buckley  
Dr. Ingrid Burke  
Ms. Lauraine Chestnut  
Dr. Aaron Cohen  
Dr. Loveday Conquest  
Dr. Jeffrey Griffiths  
Dr. Charles Hawkins  
Dr. Lynda Knobeloch  
Dr. Allan Legge  
Dr. Amanda Rodewald  
Dr. Mark Schwartz  
Dr. Alan Steinman  
Dr. Helen Suh  
Dr. Duc Vugia  
Dr. Stephen Weisberg  
Dr. Judith Weis

EPA SAB Staff: Thomas Armitage, Designated Federal Officer  
Anthony Maciorowski, SAB Office

EPA Staff: Arden Calvert  
Gelena Constantine

Will Georgia  
Patricia Murphy  
Denice Shaw  
Michael Slimak  
Madalene Stevens  
Stephanie Suntell  
Kevin Teichman  
Rick Ziegler

Others Present:            Learned Foote, TRNS  
                                 Nick Hart, OMB  
                                 Maria Hegstad, Inside EPA  
                                 Jennifer Helmick, ERG  
                                 Kent Thornton, FTN Associates

### **Meeting Summary**

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

### **Convene Meeting**

Dr. Thomas Armitage, Designated Federal Officer (DFO) for the SAB Advisory Committee on EPA's Report on the Environment convened the meeting at 9:00 a.m. on June 30. He stated that the EPA Science Advisory Board (SAB) is a chartered federal advisory committee and reviewed Federal advisory Committee Act (FACA) requirements. He noted the Committee's compliance with ethics requirements. Dr. Armitage stated that as DFO, he would be present during Committee business and deliberations. He stated that summary minutes of the meeting would be prepared and certified by the Chair.

### **Welcoming Remarks**

Dr. Anthony Macioriowski, Deputy Director of the EPA SAB Office, welcomed the Committee members and thanked them for providing advice to EPA on development of EPA's Report on the Environment.

### **Introduction of Members, Purpose of Meeting, and Review of the Agenda**

Dr. James Sanders, Chair of the SAB Advisory Committee on EPA's Report on the Environment provided introductory remarks. He asked members of the Committee and other meeting attendees to introduce themselves. After the introductions, he reviewed steps that EPA had taken to develop the 2008 Report on the Environment and noted that the SAB had previously reviewed a draft of that report before it was published. He stated

that the Committee would be providing additional advice to assist EPA in building on the previous SAB recommendations and looking for ways to clarify and improve the usefulness of the next version of the Agency's Report on the Environment (to be published in 2012). He also stated that, because the meeting of the Committee was a consultation (not a review) on proposed approaches for developing the Report on the Environment, a consensus advisory report would not be written. He stated that the comments of individual Committee members would be appended to a letter that he would send to the EPA administrator summarizing key points discussed at the meeting.

Dr. Sanders stated that the Committee had been asked to review an EPA paper titled, *Issues for Initial Consultation with the SAB Advisory Committee on EPA's Report on the Environment*. He noted that four charge questions had been given to the Committee. He reviewed the charge questions (Appendix C) and the meeting agenda (Appendix B). Dr. Sanders then noted a change in the agenda. He stated that Dr. Kevin Teichman, EPA Deputy Assistant Administrator for Science would be arriving shortly and would speak to the Committee when he arrived. Dr. Sanders then asked EPA staff to present opening remarks and background information to the Committee.

### **Remarks from EPA**

EPA staff presented information to provide an historical perspective on the Agency's development of the ROE and describe planned activities to further develop the ROE. The EPA presentations are attached in Appendix D. EPA staff presentations provided: an overview of the ROE, approaches under consideration to restructure the ROE, issues for the consultation (i.e., the use of conceptual models and supplemental information in the ROE), and conceptual model examples to provide an understanding of indicators of status and trends in drinking water and outdoor air.

### ***Remarks from Dr. Denice Shaw (EPA Office of Research and Development)***

Dr. Denice Shaw of EPA's Office of Research and Development thanked the Committee for providing consultative advice to EPA and described how the ROE had been organized and developed. She noted that the ROE contained environmental indicator information to answer policy-relevant questions of importance to the Agency. She stated that the report did not analyze or diagnose cause and effect relationships among indicators. Dr. Shaw presented examples of the questions and indicators in the ROE, EPA's indicator selection criteria, and examples of gaps and challenges to be addressed in developing the next version of the Report. Several key gaps and challenges were mentioned. These included: lack of reliable national indicators of trends, challenges in scaling indicators, and challenges in quantifying uncertainty. Panel members asked a number of questions.

A member asked whether EPA had undertaken an analysis of how well the current version of the ROE addressed EPA's information needs. EPA staff responded that the Agency was currently in the process of determining what should be done to make the ROE as useful as possible.

A member asked why EPA did not address cause-effect relationships in the ROE. EPA staff responded that the Agency had not been comfortable drawing such conclusions because *a priori* planning would be needed to collect specific data for that purpose.

A member noted that one of the main goals in revising the ROE was to make it useful to the Agency. She asked how EPA was currently using the ROE. EPA staff responded that the ROE provided data for EPA programs to answer policy relevant questions.

Dr. Sanders then asked Dr. Teichman to speak to the Committee before continuing the discussion with Dr. Shaw.

***Remarks from Dr. Kevin Teichman (Office of Research and Development)***

Dr. Teichman presented a brief overview of how the ROE had been developed and emphasized the importance of the report. He noted that the ROE could provide information for strategic planning. He stated that the SAB Committee could assist EPA in making the ROE more useful, particularly for determining science and research needs.

A member asked how the ROE could influence development of the next EPA Strategic Plan. Dr. Teichman indicated that information in the ROE could help guide strategic planning by providing a better understanding of human health and environmental status and trends relevant to policy.

A member asked what level of resources had been committed to developing the ROE. Dr. Teichman briefly summarized the resources that had been dedicated to the ROE.

A member asked whether ORD was making sure that other offices in EPA were involved in developing the ROE. Dr. Teichman responded that the ROE was developed with input from EPA program offices and EPA Regions. He noted that there was a great amount of cross-Agency involvement in the ROE.

A member noted that EPA seemed to want the ROE to be useful for developing policy to control environmental stressors. She stated that it was important to link stressors and outcomes and develop a better understanding of relationships between stressors. Dr. Teichman responded that these were basic research questions. He stated that in developing the ROE, EPA was not conducting basic research, but he noted that the ROE could provide the impetus for further research.

A member questioned whether developing an understanding of environmental trends required cause-effect diagnosis. Dr. Teichman responded that EPA was looking for data that would lead the Agency to a better understanding of cause and effect, but often the necessary indicator information was not available. The member agreed that more information was needed but stated that the ROE set up the expectation that there would be a linkage of cause and effect information.

Dr. Sanders then thanked Dr. Teichman for his presentation and for responding to questions from the Committee. He then asked Dr. Shaw to continue her presentation (see Appendix D)

***Remarks from Dr. Shaw (continued)***

Dr. Shaw described how EPA planned to restructure the ROE to align it with the architecture of EPA's strategic plan. She described EPA's strategic planning architecture.

***Remarks from Drs. Patricia Murphy (EPA ORD) and Kent Thornton (FTN and Associates)***

Dr. Patricia Murphy of EPA's office of Research and Development presented an example showing how the EPA strategic Plan goal for Clean and Safe Water could be aligned with Chapter 2 (the water chapter) of the 2008 Report on the Environment. She compared measures in the Strategic Plan with ROE water indicators and presented a conceptual model that could be used to articulate the intended ROE scope of interest and identify indicators and information gaps in answering the question, "What are the trends in the quality of drinking water and their effects on human health?" She described how supplemental information could be used in the ROE to provide additional information about contaminants in private drinking water wells.

Dr. Kent Thornton of FTN Associates described a conceptual model that could be used to articulate the intended ROE scope of interest and identify indicators and information gaps in answering the question, "What are the trends in outdoor air quality and their effects on human health and the environment?" Dr. Thornton also presented an example to show how supplemental information on mercury in bald eagle feathers on Great Lakes shores could be used in the ROE. Dr. Murphy then discussed the value of incorporating conceptual models into the ROE and reviewed the charge questions to the Committee.

Following Dr. Murphy's concluding remarks and a break the Committee the Chair called for a general discussion of approaches proposed in EPA's paper, *Issues for Initial Consultation with the SAB Advisory Committee on EPA's Report on the Environment*

***General Committee Discussion***

The Committee discussed EPA's proposed approaches to incorporating conceptual models and supplemental information into the ROE and asked clarifying questions.

A member noted that the SAB had previously recommended that EPA develop an overarching conceptual model for the ROE. He stated that an overarching conceptual model was needed, and he had expected to see this, but the Agency had not yet proposed such an approach. He asked whether an overarching model was being developed. EPA staff responded that this was something that might be accomplished after developing more specific conceptual models corresponding to the individual questions in the report.

Another member noted that it was important to develop useful conceptual models that were neither too detailed nor simple. He asked whether EPA had considered the amount of detail needed in a conceptual model. EPA staff responded that the Agency had considered incorporating a general model along with more detailed underlying models corresponding to specific questions in the ROE.

Another member stated that a conceptual model should represent the philosophical basis for the entire ROE, and that an overarching framework was needed. EPA staff responded that, as discussed in the issue paper that had been provided to the Committee, the Agency was considering building a conceptual model based on the need for strategic planning information.

Several members stated that the conceptual model was the “glue” that should hold the ROE together. A member noted that the conceptual model was also a communication tool, and that it should be developed with input from policy makers. Agency staff stated that in that regard it would be important to bring people with knowledge of data and data mining together with people who can use data.

The Committee discussed who the key users of the ROE were. EPA staff stated that a target audience of the e-ROE was the general public. EPA staff indicated that other key audiences of the ROE were EPA managers and staff involved with strategic planning. A member stated that he did not see how the five chapters in the 2008 ROE meshed. He stated that additional introductory material was needed to clarify this. The Committee discussed whether it made sense to use the same report structure for both the human health and environmental indicators. The Committee also discussed whether the report should link science and policy.

Several members stated that the current version of the ROE was greatly improved over previous drafts. They stated that EPA’s proposed approach to developing conceptual models appeared to be focused on the Agency’s regulatory functions. A member noted that a simpler conceptual model might focus on providing information needed to support strategic planning. He stated, however, that it was not clear what EPA’s priorities were for the ROE. He noted that the 2008 ROE indicated that EPA did not want the questions in the report to “be at the level of regulations.”

The Committee discussed the kind of information that could be provided every four years in the ROE. EPA staff suggested that annual updates could be provided in the e-ROE and that every four years there could be a major revision of the ROE. Several members noted that one audience of the report might be members of Congress who may want updated information every four or five years. A Committee member stated that EPA should consider the kind of information members of Congress would want. He also stated that EPA should further explore the issue of uncertainty. He stated that it may not be possible to see environmental trends for decades because of uncertainty. Other members agreed that thinking about the value of the ROE in this way would lead to a better understanding of how the report could be used by policy makers.

EPA staff responded, indicating that copies of the ROE had been sent to Congress. EPA staff also stated that it was difficult to quantify uncertainty. A Committee member stated that it was important to include both status and trend information in the ROE.

The Committee discussed the need for integration of the information presented in the 2008 ROE. A member noted that the ROE chapters in the 2008 report were not integrated and he asked what barriers must be overcome to make this happen. EPA staff noted that models and indicators were needed to inform policy, and this would lead to better integration. A member stated that it was important to consider using indicators that provided information about more than exposure to a single contaminant. For example, she suggested that status and trend information about bird species in New England could be useful. She stressed the need to select indicators that provided a more holistic picture of environmental status and trends.

A Committee member asked whether EPA intended to change the ROE indicator selection criteria in order to incorporate more supplemental information into the report. EPA staff responded that the Agency had not proposed changing the indicator selection criteria. Staff noted that one option discussed in the issue paper was providing such supplemental information in an “incubator site.” Members discussed how developers of the ROE might address changes in the Agency’s Strategic Plan. EPA staff noted that feedback loops were needed to address changes in the Strategic Plan. A member stated that EPA could do more to make the ROE more understandable to the public. He noted that better connections between human health and environmental health indicators were needed. Another member noted that there seemed to be a “disconnect” between the ROE and work that had been completed to link indicators and human health impact estimates. EPA staff noted that the ROE did not capture all of this work. Another member stated that this kind of data might be included in the ROE as supplemental information.

A member stated that it might be useful to include more supplemental information in the report and identify it as either high or low quality data. EPA staff agreed that it might be useful to include additional supplemental information but noted that data quality was highly variable and that this was a problem (example: TRI data might be at the low end of data quality and EMAP data might be at the high end). A member stated that laying out the conceptual model would enable the Agency to focus on processes that were most important, and to include the most appropriate data in the report. Another member noted that there were various health, social connections, and economic connections that could be considered in the conceptual models. He asked whether EPA had considered capturing such “externalities” in the models. EPA staff responded that a conceptual model might include these components.

A member asked EPA staff why the Agency did not want to link cause and effect indicators in the ROE. EPA staff responded that many of the available indicator data sets were not derived with the intention of providing cause and effect information, and to do that “after the fact” would be difficult.

Following the general discussion, the Chair called for public comments. There were no public comments so the Chair called for discussion of individual Committee member responses to EPA's charge questions.

***Discussion of the response to charge question #1: EPA's proposed conceptual modeling approaches***

The Committee discussed the question of whether the conceptual modeling approaches proposed in EPA's issue paper could effectively align the ROE with EPA's strategic goals and objectives and communicate the intent and scope of the questions in the ROE. A member stated that he supported aligning the ROE with EPA's strategic goals and objectives but he also noted that it would be important to have a strategic planning cycle that is "in sync" with development of the ROE. Another member stated that the conceptual model linking the ROE to EPA's strategic plan was useful but may not be a good fit for all of the questions in the ROE. She stated that the purpose of the ROE was not clearly articulated, and that made it difficult to evaluate the proposed conceptual model approaches.

Several members suggested that EPA consider modifying the proposed conceptual models so they would "start" with policy decisions. A member noted that in developing a conceptual model EPA should consider the human health issues of susceptibility, environmental justice, and scaling. He also stressed the importance of linking health outcomes to exposure.

Another member stated that EPA's proposed conceptual models (i.e., those proposed in EPA's issue paper) were useful but the drinking water model might be too complicated. He suggested that EPA consider using a more holistic hierarchical conceptual model.

Members suggested that using a Pressure-State-Response model might be a more useful approach for communicating the intent of the questions in the ROE. A member referred EPA to the European Environmental Agency's model. Another member stated that the conceptual framework of the ROE should lead to identification of new questions to be answered. She suggested that the Millennium Ecosystem Assessment framework might be a good conceptual model framework to consider for this purpose. She stated that this framework showed how the environment is providing services.

Another member noted that the conceptual models used in the ROE should provide opportunities to explain why EPA will include various indicators in report. He also stated that the conceptual models should be used to understand what is missing from the ROE. A member stated that the current ROE lacked an overarching model of the report's structural framework and architecture and noted that this was needed.

The Committee then discussed the usefulness of EPA's proposed conceptual modeling approaches for presenting the underlying scientific foundation of questions in the ROE and providing a framework for selecting indicators and identifying gaps, limitations and useful supplemental information. Several members stated that they liked the idea of a

model that fits all media. A member noted that EPA's proposed modeling approaches were good, but linkages between actions and trends were needed. Another member stated that data from sentinel sites might be considered for use in the ROE and he also noted that it was very important to consider uncertainties. In addition, he stated that it was important to include additional useful supplemental information in the ROE.

A member stated that EPA had begun to develop good conceptual modeling approaches but he noted that there was a further need to link indicator endpoints to EPA actions. He stated that developing the conceptual linkage of the ROE to the Agency's Strategic Plan was important. In addition, he noted that it was important to identify the primary audience of the report. He stated that if the public was a key audience, it might be useful to assign "grades" to environmental status and trends. A member suggested that EPA could link ambient levels of measured indicators to effects assessments in order to provide more information for setting EPA program targets. Another member stated that the proposed conceptual modeling approaches were helpful but lacked cohesion. He noted that the ROE was an important project and it was important that the models used and indicators selected provide a more coherent view of status and trends in the environmental media. He noted that the models to be used in the ROE should show points of intervention where environmental problems could be addressed. Several members noted that the models to be used should be linked to EPA actions. Another member stated that conceptual models should tie the chapters of the ROE together. He noted, however, that the previous SAB ROE panel had not recommended that the models necessarily be used to link the ROE to the Agency's Strategic Plan.

The Committee discussed how ROE indicators were initially proposed and selected for use in the report. EPA suggested that a WIKI mechanism might be useful. Another member stated that he liked the evolution of the ROE from previous versions. He stated that EPA's proposed air model showed sources of pollutants and their linkage to human health. He noted, however, that the model was an oversimplification that did not address multi-factorial causes of disease. He noted that it would be a challenge to represent such complicated scenarios in a simplistic way. Another member stated that the national wadable stream and lake assessment provided a valuable spatial assessment of relative risk.

Another member suggested that EPA look at leading and trailing environmental indicators. He noted that the ROE looked at trailing indicators and stated that EPA might consider looking at leading indicators.

The Chair then thanked the members for their comments and stated that after a break the Committee would discuss responses to charge question #2.

***Discussion of the response to charge question #2: Recommendations concerning other possible approaches to conceptual model development***

The Committee discussed a number of approaches to conceptual model development. Members suggested that in developing conceptual models EPA should consider health

effects in vulnerable populations. In addition a member suggested that EPA consider health effects observed at low levels of exposure to pollutants. A member noted that the 2008 ROE looked at the effectiveness of EPA programs but it did not consider the new generation of chemicals used in small amounts. She noted that the ROE could provide baseline information for some of the new generation of chemicals. She also noted that when population exposure was described in the ROE it would be useful to provide information about how many people were exposed and where they were exposed.

A member reiterated the statement that in developing conceptual models for the ROE it was important to consider linkages to action and cause/effect information. He suggested that as the ROE is moved to an electronic platform, multi-dimensional conceptual models could be considered. Another member noted that there were many ways to develop conceptual models. He stated that EPA could consider using classical ecological process models as well as operational process models. Other members agreed that it would be useful to consider using these approaches. A member stated that the operational process model could focus on information needed for management purposes. A member indicated that EPA should not be constrained to using only one model framework. He noted that, although one overarching model was needed to tie together the chapters of the report, different models could also be used within various parts of the report.

Several members discussed the need to use models that would enable EPA to look “upstream” beyond the sources of pollutants to identify indicators that capture attitudes about conservation and how they are changing. These kinds of models could be useful in directing EPA toward interventions that influence disease. A member noted that the concept of ecosystem services could be used to connect various chapters of the ROE. The Committee discussed how the need to address global warming could require the use of new indicators. The Committee then discussed potential sources of new information on pollutant discharge to water and emission to air. Members further discussed the importance of integrating the air, water, land, human health, and ecological condition chapters of the ROE. Members noted that human welfare and ecosystems were intertwined and indicated that the ROE could be structured with linkages.

The committee further discussed the need to clarify the purpose of the ROE. A Committee member stated that the report might more appropriately be titled, “Report on EPA’s Stewardship of the Environment.” EPA staff responded that the ROE covered more than EPA’s regulatory responsibilities.

The Chair thanked the Committee members for their comments and indicated that on the following day the Committee would discuss the use of supplemental information and also review the key points discussed in response to all of the charge questions. He asked members to be prepared to summarize recommendations concerning the points discussed at the meeting.

Before the meeting recessed for the day a member of the public requested the opportunity to comment. The Chair recognized Rick Bigler of EPA’s Office of Research and Development. Mr. Bigler briefly described a modeling tool that was developed as part of

EPA's CADDIS (Causal Analysis Diagnosis/Decision Information System) project and indicated that it might be useful to consider for use in the ROE.

The Chair thanked Mr. Bigler for his comments and recessed the meeting for the day.

### **Wednesday, July 1, 2009**

Dr. Sanders convened the meeting and called for the discussion of consultation questions 3 and 4 (addressing EPA's proposed use of supplemental information in the ROE). He also reviewed the agenda for the day and stated that before adjourning, the Committee would discuss and summarize the key points and recommendations to EPA.

#### ***Discussion of the response to charge questions 3 and 4: EPA's proposed use of supplemental information in the ROE***

The Committee discussed the use of supplemental information in the ROE. A member stated that supplemental information could be very useful to fill data gaps, look at emerging problems, and consolidate other information in the report. She noted that the appropriate use of supplemental information would depend upon the audiences and uses of the ROE.

A member stated that supplemental information could be very helpful in identifying problems that might not be national in scope, but were nevertheless very important. Another member stated in some cases only regional data were available to understand important problems. A member noted that EPA's proposed use of an "incubator site" for supplemental indicator information had merit, but she noted that such information might be ignored if it were not included in the ROE. A member stated that EPA could consider using expert reviewers to determine the robustness of certain data sets. She suggested that each data set might receive a color code indicating its reliability.

Another member suggested several possible options concerning the use of supplemental data in the ROE: these included putting the data into an appendix, use of hyperlinks, and including the data in the report. He stated that it was important to indicate how much "weight" would be given to the data. He stated that in an "ideal world" the data should be peer reviewed. He stated that he would not like to see the supplemental data quarantined

A member indicated that a Delphi process could be useful in determining what supplemental data to include in the ROE. She noted that case studies would be useful and also stated that good data were available from the EPA EMAP and REMAP programs. She noted that these data were collected using a probabilistic sampling design. She further stated that the validity of supplemental data used could be verified through a peer review process.

Another member also stated that he thought supplemental data could be very useful when no national coverage was available, but he expressed the opinion that it was important to

use high quality supplemental data. He stated that supplemental information like the mercury data in the EPA issue paper could be useful but also noted that could be difficult to make sense of large datasets that were not comparable because they were obtained from different sources. He stated that different data sets could, however, be useful for illustrating a problem.

The Chair stated that he thought supplemental data had great potential for use in identifying new and emerging problems. He noted however, that EPA could be criticized for “cherry picking” the data if they were not carefully reviewed and selected. He noted, for example, that the mercury study example provided to the Committee was probably one of many studies that may document differing trends. EPA staff agreed that there were many studies that could be considered and noted that the selection could be narrowed by careful evaluation.

A member stated that it was important to send a message forward that interagency cooperation on monitoring was very important. She stated that studies that had been peer reviewed by the scientific community should be used in the ROE.

The Committee discussed application of meta-analysis to make supplemental data sets more useful in the ROE. Several members expressed support for this concept. A member noted that there were many very good data sets that could supplement the indicators in the ROE, but he expressed the opinion that the indicator selection criteria (with the exception of national representativeness) should be applied.

The Committee asked questions about the resources that had been dedicated to development of the ROE. EPA staff indicated that three full time FTEs and an Agencywide workgroup were dedicated to ROE development.

A member reiterated the statement that the supplemental information to be used should be selected carefully. He stated that, rather than just providing information to show strong local or regional trends, the supplemental information should be accompanied by a summary of what is known about the indicator(s). This could be provided in text or by incorporating meta-analysis. EPA staff responded that it was very important to present information in the ROE in such a way that it would be useful. A member suggested that in addition to the ROE, EPA should publish a ten to twenty page executive summary. She noted that the ROE would be more useful if the summary were available to target audiences. Another member reiterated the importance of identifying the audience of the ROE. A committee member stated that each media chapter in the ROE should contain a discussion of emerging issues. He noted that the supplemental information would be very useful to fill data gaps.

The Committee asked EPA staff how the ROE workgroup had functioned. EPA staff responded that there was an advisory board, an interagency workgroup, regional involvement, and involvement from the Office of Environmental Information (which had developed a less technical summary ROE companion document). The Committee discussed how to make the report more “usable.” Members noted that some people who

could use the report might not have technical backgrounds. They noted that a web-based tool could be used to provide additional useful information. Several members indicated that the ROE could be more useful if additional interagency data were used in the report.

The Committee discussed including more public health tracking information in the ROE. A member stated that this kind of information was available from the Centers for Disease Control and Prevention. Committee members discussed providing the public health tracking data as supplemental information. EPA staff responded that the Agency needed to use information collected by other agencies, and that additional cross-agency coordination would be useful.

The Committee discussed whether the ROE should provide information for interpretation or synthesize answers to questions in the report. Several members indicated that including more synthesis would make the document more useful to decision makers.

*Highlights of the Committee discussion*

Following the discussion of charge question responses, the Chair and committee members summarized key points that EPA should consider in developing the ROE. A summary of the key points discussed is provided in Appendix E. EPA staff thanked the Committee for their comments.

The Chair then stated that he would develop a draft of the letter to the Administrator and that this would be sent to the Committee for review before it was finalized. He stated that the Committee would meet during the coming year to provide additional advice to EPA on development of the ROE.

The Chair then thanked members for their participation and adjourned the meeting.

Respectfully Submitted:

Certified as True:

*/Signed/*

*/Signed/*

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Dr. Thomas Armitage  
Designated Federal Officer

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Dr. James Sanders, Chair  
SAB Advisory Committee on EPA's  
Report on the Environment

## **APPENDICES**

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Appendix A: Committee Roster

Appendix B: Meeting Agenda

Appendix C: Charge to the Committee

Appendix D: Shaw, Murphy, and Thornton Presentation Slides

Appendix E: Summary of Key Points Discussed

## Appendix A – Committee Roster

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### U.S. Environmental Protection Agency Science Advisory Board Advisory Committee on EPA's Report on the Environment

#### **CHAIR**

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

#### **MEMBERS**

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

**Dr. Henry Anderson**, Chief Medical Officer, Division of Public Health, Wisconsin Division of Public Health, Madison, WI

**\*\*Dr John Bailar**, Scholar in Residence, The National Academies, Washington, DC

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

**Dr. Ingrid Burke**, Director, Haub School and Ruckelshaus Institute of Environment and Natural Resources, University of Wyoming, Laramie, WY

**Ms. Lauraine Chestnut**, Managing Economist, Stratus Consulting Inc., Boulder, CO

**Dr. Aaron Cohen**, Principal Scientist, Health Effects Institute, Boston, MA

**Dr. Loveday Conquest**, Professor, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA

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

**Dr. Charles Hawkins**, Professor and Director, Western Center for Monitoring and Assessment of Freshwater Ecosystems, Department of Aquatic, Watershed, and Earth Resources, Utah State University, Logan, UT

**Dr. Lynda Knobeloch**, Senior Toxicologist, Wisconsin Department of Health Services, Madison, WI

**Dr. Allan Legge**, President, Biosphere Solutions, Calgary, Alberta, Canada

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

**\*Dr. Peter Scheff**, Professor, Environmental and Occupational Health Sciences, School of Public Health, University of Illinois at Chicago, Chicago, IL

**Dr. Mark Schwartz**, Professor, Department of Environmental Science and Policy, College of Agriculture, University of California, Davis, CA

**Dr. Alan Steinman**, Director, Annis Water Resources Institute, Grand Valley State University, Muskegon, MI

**Dr. Helen Suh**, Associate Professor, Environmental Health, School of Public Health, Harvard University, Boston, MA

**Dr. Duc Vugia**, Chief of Infectious Diseases Branch, Division of Communicable Disease Control, California Department of Public Health, Richmond, CA

**\*Dr. Kathleen Weathers**, Senior Scientist, Cary Institute of Ecosystem Studies, Millbrook, NY

**Dr. Judith S. Weis**, Professor, Department of Biological Sciences, Rutgers University, Newark, NJ

**Dr. Stephen Weisberg**, Executive Director, Southern California Water Research Project Authority, Costa Mesa, CA

#### **SCIENCE ADVISORY BOARD STAFF**

**Dr. Thomas Armitage**, Designated Federal Officer, U.S. Environmental Protection Agency, Washington, DC

\* Unable to attend the June 30 - July 1, 2009 meeting

\*\* Unable to attend the June 30 - July 1, 2009 meeting but submitted written comments

## Appendix B – Meeting Agenda

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**U.S. ENVIRONMENTAL PROTECTION AGENCY  
SCIENCE ADVISORY BOARD  
Advisory Committee on EPA’s Report on the Environment  
Public Meeting, June 30 – July 1, 2009  
SAB Conference Center  
1025 F Street, N.W., Room 3705, Washington, D.C. 20004**

### AGENDA

#### **Tuesday, June 30, 2009**

- 9:00 - 9:10 a.m.                    **Meeting Convened by the Designated Federal Officer**  
Dr. Thomas Armitage
- Welcome**  
Dr. Vanessa Vu, Director  
EPA Science Advisory Board Staff Office
- 9:10 – 9:20 a.m.                    **EPA Remarks**  
Dr. Kevin Teichman, Deputy Assistant Administrator for  
Science  
EPA Office of Research and Development
- 9:20 - 9:35 a.m.                    **Introduction of Members, Purpose of the Meeting and  
Review of Agenda**  
Dr. James Sanders, Chair
- 9:35 - 10:30 a.m.                    **Historical Perspective and Future Direction of EPA’s  
Report on the Environment**  
Dr. Denice Shaw  
EPA National Center for Environmental Assessment
- Dr. Patricia Murphy  
EPA National Center for Environmental Assessment
- Dr. Kent Thornton  
FTN and Associates
- 10:30 - 10:45 a.m.                    **BREAK**
- 10:45 - 11:45 a.m.                    **Committee Discussion: Clarification  
of Consultation Topics**

Dr. James Sanders and Committee

11:45 a.m. - 12:00 noon

**Public Comments**

12:00 noon – 1:15 p.m.

**LUNCH**

1:15 – 3:15 p.m.

**Committee Discussion in Response to Consultation  
Question 1: EPA’s Proposed Conceptual Modeling  
Approaches**

Lead Discussants and Committee

- Aligning the ROE with EPA’s strategic goals and objectives
- Communicating the intent and scope of questions in the ROE
- Presenting the underlying scientific foundation of questions in the ROE
- Providing a framework for selecting indicators and identifying gaps, limitations and useful supplemental information

3:15 – 3:30 p.m.

**BREAK**

3:30 – 5:00 p.m.

**Committee Discussion in Response to Consultation  
Question 2: Recommendations Concerning Other  
Possible Approaches to Conceptual Model Development**

Lead Discussants and Committee

5:00 p.m.

**RECESS FOR THE DAY**

**Wednesday, July 1, 2009**

8:30 – 10:00 a.m.

**Committee Discussion in Response to Consultation  
Questions 3 and 4: EPA’s Proposed use of  
Supplemental Information**

Lead Discussants and Committee

10:00 – 10:15 a.m.

**BREAK**

10:15 – 11:30 a.m.

**Committee Discussion in Response to Consultation  
Questions 3 and 4 (continued)**

Lead Discussants and Committee

11:30 a.m. – 12:00 noon

**Review Highlights of Committee Discussion**

Dr. James Sanders, Chair

12:00 noon

**ADJOURN**

## Appendix C – Committee Charge

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### Issues for Consultation

#### **Background**

##### *Purpose and History of EPA's Report on the Environment (ROE)*

In 2001 EPA initiated work to assemble an extensive set of environmental indicators in order to provide high quality information on the state of the environment. A goal of this effort was to compile and present indicator status and trend information that would enable EPA and the public to assess progress toward accomplishing EPA's goals of cleaner air, purer water and better protected land. EPA presented these indicators in its 2003 *Draft Report on the Environment Technical Document* and its summary *Draft Report on the Environment Highlights Document*.

Following Science Advisory Board (SAB) reviews of the 2003 draft ROE and a revised 2007 draft of the report, EPA published its 2008 Report on the Environment. In 2008 EPA also published a shorter ROE document that highlighted national trends. EPA's 2008 ROE provided indicator information to answer 23 "policy- relevant" questions that the Agency found to be critically important to its mission. Thus, although the 2008 ROE provided information on a broad range of indicators, the focus of the report shifted toward providing information that was relevant to EPA's mission.

In September 2008, EPA also released an online electronic Report on the Environment, or eROE. The eROE ([www.epa.gov/roe](http://www.epa.gov/roe)) contains the current indicator data that are updated quarterly.

##### *SAB Recommendations to Improve the draft 2007 ROE*

In its peer review of the draft 2007 ROE, the SAB emphasized the value and importance of the report. The SAB strongly supported continued development of the ROE and provided recommendations to improve the report before its publication in 2008. The SAB also provided long-term recommendations to improve future versions of the ROE. In general, the SAB found that:

- The ROE lacked a framework describing the scientific understanding of relationships between indicators and the basis for including them in the report.
- The ROE presented status information to establish baselines for reporting future trends, but the lack of long-term trend information in the document precluded trend analysis for many indicators.

- The rigid application of indicator selection criteria resulted in the exclusion of valuable and relevant information that could be used to further analyze trends.
- The ROE was limited because it contained little data interpretation and no conclusions supported by statistical analysis.

The current SAB consultation focuses on issues regarding the first three bullets.

### *Scope of the ROE 2008*

The 2008 ROE was organized around five main chapters, “Air,” “Water,” “Land,” “Human Exposure and Health,” and “Ecological Condition.” Each chapter was organized around a set of critical “policy-relevant” questions that EPA wanted to answer with confidence in order to be adequately informed about important environmental trends. However, EPA stated that these questions could not necessarily be fully answered with indicators that met the Agency’s indicator definition and six indicator selection criteria in the report. In the ROE 2008 EPA defined an indicator as a numerical value derived from actual measurements of a stressor, state, or ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment. The ROE 2008 did not include presentations of statistical confidence in the status of and trends in the indicators. When indicator trends were reported they were interpreted as the direction of change, and did not imply statistical significance. EPA recognized that uncertainty is an important issue and stated that it planned to quantify uncertainty in future versions of the ROE and its indicators.

### *Future Direction of the ROE*

EPA intends to publish the next full edition of the ROE in 2012. Emphasis will be placed on presenting the status of and trends in environmental and human health conditions of interest to the EPA in order to inform the Agency’s planning and decision making. EPA intends to restructure the ROE to more directly align chapters of the report with EPA’s Strategic Plan goals, and to align the policy questions in the ROE with objectives in the Agency’s Strategic Plan. Any revision of the ROE in this regard must take into account the new Administration’s long-term perspectives on strategic planning. Although a draft of EPA’s new strategic plan for 2009-2014 has not yet been released, the overall architecture of the Strategic Plan (with goals, objectives, and sub-objectives) is not likely to change. As stated above, EPA also plans to enhance indicator information in future versions of the ROE to include quantitative uncertainty information.

## **Issues for the SAB Consultation**

### *Overarching Issues*

In its review of the draft 2007 ROE, the SAB recommended including conceptual frameworks in the report to illustrate scientific understanding of relationships between

indicators and the basis for including them in the report. The SAB also recommended that EPA relax restrictive indicator selection criteria to enable the use of additional indicators that could inform the stated questions. EPA's Office of Research and Development (ORD) is seeking early consultation with the SAB on conceptual models for restructuring and refining the next version of the ROE in order to better support Agency planning, problem formulation, and decision making and make the conceptual underpinnings of the questions and indicators clearer to the reader. ORD is also seeking consultation with the SAB on the proposed use of regional and sub-regional indicators and supplemental information to help answer ROE questions.

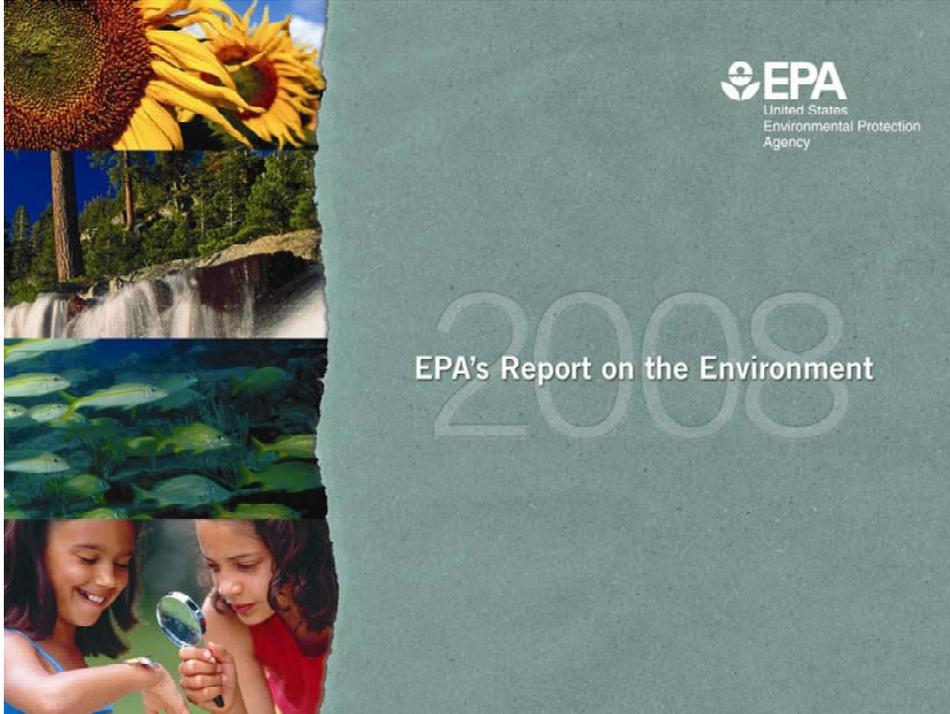
ORD has developed an issue paper for the consultation describing how EPA proposes to restructure and refine the next version of ROE. The issue paper contains two examples of conceptual models to illustrate the scope of the questions and to select indicators. One example is a generalized conceptual model framing the 2008 ROE question, "What are the trends in the quality of drinking water and their effects on human health?" The other example is a conceptual model framing the 2008 ROE question, "What are the trends in outdoor air quality and their effects on human health and the environment?" Section 4 of the issue paper discusses EPA's proposed use of supplemental information in the next version of the ROE. Specifically, ORD has requested consultation on the following issues.

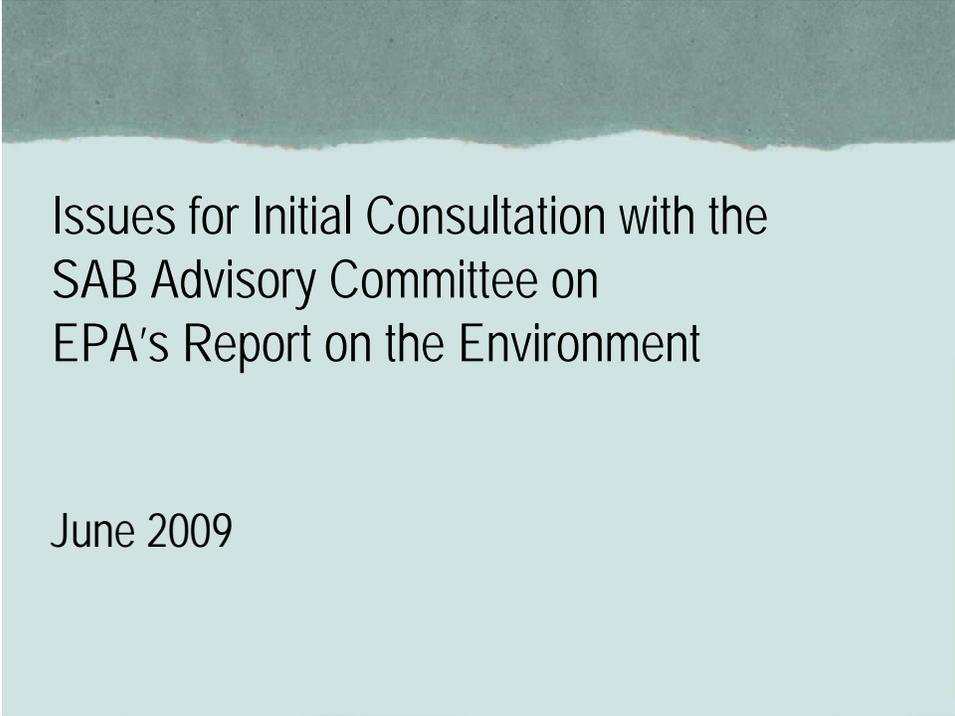
#### *Specific Issues for Consultation*

1. Please comment on whether EPA's proposed conceptual modeling approaches are logical and useful for:
  - Aligning the ROE questions with the Agency's strategic goals and objectives.
  - Communicating the intent and scope of questions in the ROE.
  - Presenting the underlying scientific foundation of questions in the ROE.
  - Providing a framework for selecting indicators and identifying associated gaps, limitations, and useful supplemental information.
2. Does the Committee have recommendations concerning other possible approaches to conceptual model development that would be useful in identifying or highlighting important ROE topics, indicators for consideration, research, or development?
3. Please comment on the logic and utility of EPA's proposed use of supplemental information to answer questions in the next version of the ROE.
4. Does the Committee have recommendations for criteria to assure that supplemental information included in the ROE is objective, free from bias, scientifically valid, and supports intended purpose of the report?

**Appendix D – Presentation from Shaw, Murphy, and Thornton**

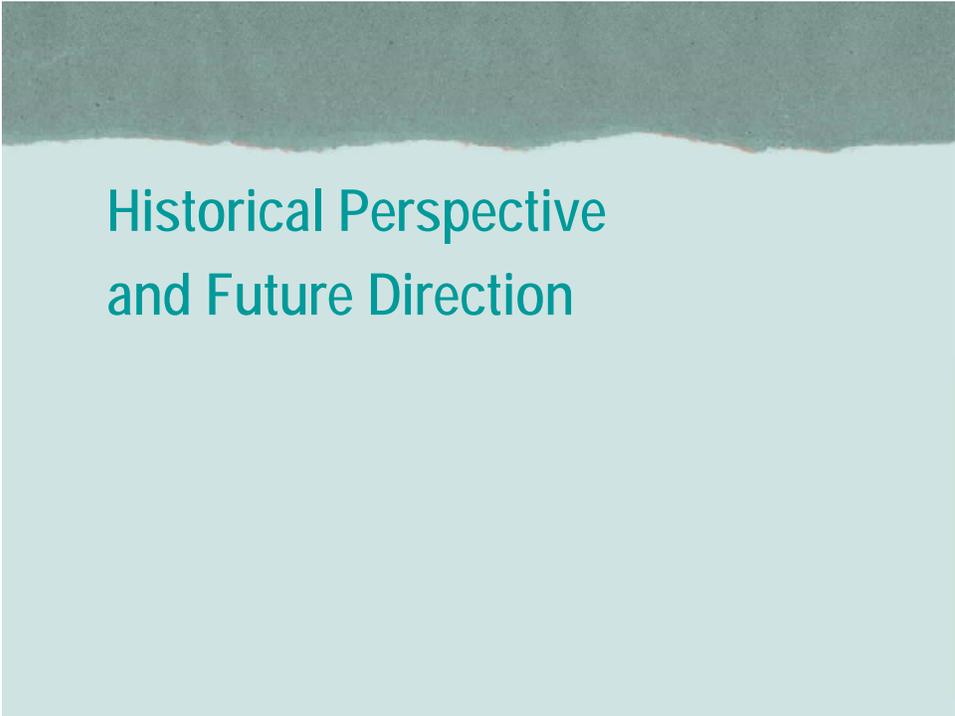
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Issues for Initial Consultation with the  
SAB Advisory Committee on  
EPA's Report on the Environment

June 2009



**Historical Perspective  
and Future Direction**

# Topics

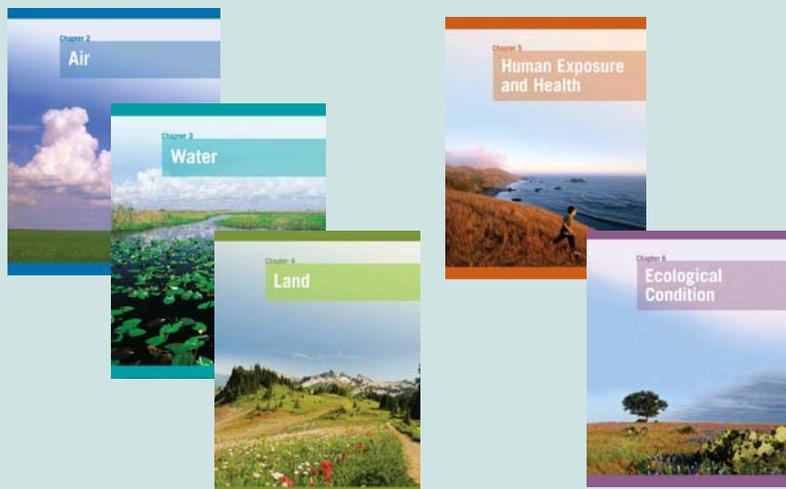
- Overview of the ROE
- Restructuring the ROE
- Consultation Issues:
  - Conceptual models
  - Supplemental information
- Examples:
  - Drinking water
  - Outdoor air

## Overview of the ROE

### ROE Purpose

- Presents scientifically sound indicators of status and trends and important gaps in environmental and human health conditions to answer questions important to EPA's mission.
  - Does *not* analyze or diagnose the reasons for, and relationships between, trends in stressors and environmental and health outcomes.
- Provides objective, reliable information on status and trends and important scientific input to EPA planning, decision making and priority setting.
  - Not intended to be the *only* scientific input needed to inform planning and decision making.

## How is the ROE organized?



## The ROE Questions—Examples

- *What are the trends in...*
  - *...outdoor air quality and their effects on human health and the environment?*
  - *...the quality of drinking water and their effects on human health?*
  - *...land cover and their effects on human health and the environment?*
  - *...human exposure to environmental contaminants?*
  - *...the extent and distribution of the nation's ecological systems?*

## What are the ROE indicator criteria?

- The indicator is **useful**. It answers (or makes an important contribution to answering) a question in the ROE.
- The indicator is **objective**. It is developed and presented in an accurate, clear, complete, and unbiased manner.
- The underlying data are characterized by **sound collection methodologies, data management systems to protect their integrity, and quality assurance procedures**.

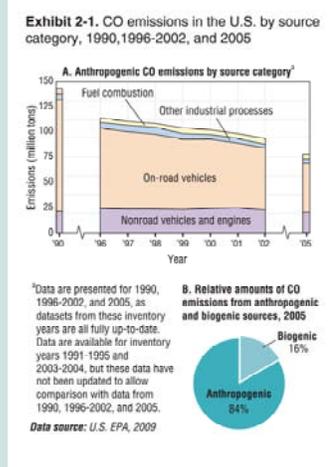
## What are the ROE indicator criteria?

*(continued)*

- Data are available to **describe changes or trends** and the latest available data are **timely**.
- The data are **comparable across time and space**, and representative of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.
- The indicator is **transparent and reproducible**. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

## ROE Indicator Examples

- *Examples from the air chapter:*
  - Example question: What are the trends in outdoor air quality and their effects on human health and the environment?
    - Example indicators: Carbon Monoxide Emissions, Regional Haze, Ozone Levels over North America
- See [Indicator: Carbon Monoxide Emissions](#)



## Example of Gaps and Challenges

- Question:
  - *What are the trends in outdoor air quality and their effects on human health and the environment?*
- Gap:
  - No national-level indicators of human exposure to outdoor air pollutants or effects of those exposures.
- Challenges:
  - Actual measurements of human exposure nationwide would be highly resource intensive.
  - Incomplete scientific understanding of how all air pollutants, whether acting alone or in combination, can affect human health.

## Major Gaps in 2008 ROE

- There are almost no reliable national indicators of trends in the effects of contaminants in air, water, and land on human health or ecological condition.
- Scaling of indicators remains challenging.
- Quantifying uncertainty is a priority.

## How does the ROE answer the questions?

- Presents 85 indicators
  - meet ROE indicator definition and criteria
  - peer reviewed
- Describes gaps
- Describes limitations

## The eROE

[www.epa.gov/roe](http://www.epa.gov/roe) contains:

- Electronic version of the ROE (eROE)
- Underlying data, metadata, references, and peer review documentation for the ROE indicators
- Regional reports presenting ROE indicators relevant to each EPA Region
- Updates of the ROE indicators (quarterly)
- EPA's *2008 Report on the Environment: Highlights of National Trends* (highlights of the ROE for the interested public)



## Chronology

- 2001-2002 Peer review of indicators, internal Agency review, external review.
- Jun 2003 EPA publishes 2003 Draft ROE TD.
- Mar 2004 [SAB Panel reviews the 2003 Draft ROE TD.](#)
- Jun 2005 External peer review of proposed indicators for 2007 ROE TD.
- Jul 2005 Public peer review workshop on the proposed indicators.
- Oct 2005 EPA announces a second public peer review and public comment period for additional and updated proposed indicators.
- Feb 2006 Agency review of 2007 draft report.
- Mar 2006 EPA releases the updates to the indicators, external peer review comments, and EPA's Response to Comments.
- Oct 2006 Interagency review of the 2007 draft report.
- May 2007 EPA releases the draft report for public review and comment.
- Jul 2007 [SAB Panel reviews the 2007 draft report.](#)
- May 2008 EPA releases the final report, EPA's 2008 ROE.

## ROE Future Directions

- EPA intends to publish the next full edition of the ROE in 2012.
  - Emphasis on presenting the status and trends information to environmental and human to inform the Agency's planning and decision making.
- EPA intends to restructure the ROE to more directly it with the Agency's Strategic Plan.
  - Will take into account the new Administration's goals and priorities.
- EPA plans to enhance indicator information to include quantitative uncertainty information.

## SAB Comments (2007): Conceptual Frameworks

- EPA should incorporate a conceptual framework to illustrate the connectedness between the media, human health, and ecological condition.
- The conceptual framework should address relationships between source, transport, and fate of human and environmental health hazards, as well as exposure to receptors, dose, and impact.
- EPA should explicitly state how each question in the Report is related to a conceptual framework.
- EPA should provide a clear description of why each indicator is important, the rationale for selecting the indicator, what it tells, and the documented relationship between the indicator and human health and ecological condition

## SAB Comments (2007): Indicators

- The criterion of national representation excludes potentially valuable and relevant regional indicators supported by long-term data sets.
- EPA should consider relaxing the restrictive indicator selection criteria so that additional indicators can be included.

## SAB Comments (2007) for Future Consultations

- Systematic treatment of indicator uncertainty
- Scaling and sub-national indicators
- Synthesis and integration component

## SAB Comments (2007): Conceptual Frameworks

- EPA should incorporate a conceptual framework to illustrate the connectedness between the media, human health, and ecological condition.
- The conceptual framework should address relationships between source, transport, and fate of human and environmental health hazards, as well as exposure to receptors, dose, and impact.
- EPA should explicitly state how each question in the Report is related to a conceptual framework.
- EPA should provide a clear description of why each indicator is important, the rationale for selecting the indicator, what it tells, and the documented relationship between the indicator and human health and ecological condition

## Restructuring the ROE

## Restructuring the ROE to Better Meet EPA's Information Needs

- More visibly align ROE with Agency's strategic architecture.
  - Align 2012 ROE chapters with EPA Strategic Plan Goals
  - Align 2012 ROE policy questions with objectives in EPA Strategic Plan
- Develop conceptual models for each ROE question.
- Include supplemental information.

## Background: EPA's Strategic Plan

- The public manifestation of Agency planning.
- Serves as the Agency's road map over 5-year horizons and guides EPA in establishing the annual goals.
- Helps EPA measure progress in achieving strategic goals and recognize where adjustments are needed.
- Basis to focus on the highest priority environmental issues and ensure taxpayer dollars used effectively.

# EPA Strategic Architecture

- Five Goals
  - Clean Air and Global Climate Change
  - Clean and Safe Water
  - Land preservation and Restoration
  - Healthy Communities and Ecosystems
  - Compliance and Environmental Stewardship
  - Objectives
    - Sub-objectives
      - Strategic measures

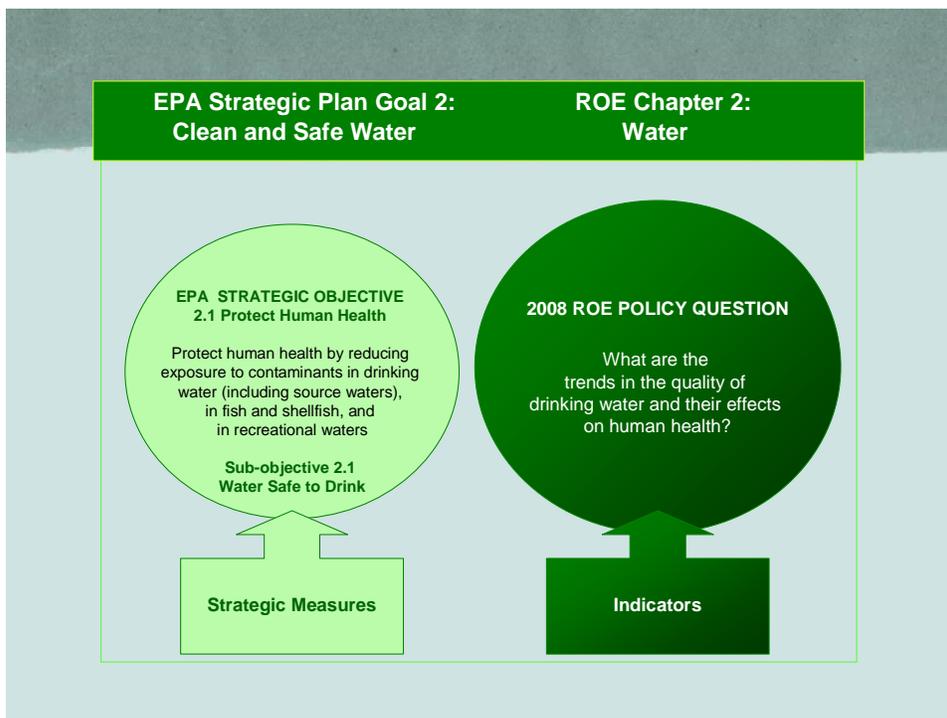
## Example

- Goal 2: Clean and Safe Water
  - Objective 2.1: Protect human health
    - Sub-objective 2.1.1: Water safe to drink
      - Strategic measure: By 2014, 93 percent of population served by CWS will received water meeting all health-based standards

*NOTE: Agency Strategic Plans must be updated every three years. The examples provided here are from the 2009-2014 "Change Document" which proposes changes to the 2006-2011 Strategic Plan, and are intended for illustrative purposes only.*

## Example 1 Based on 2008 ROE Drinking Water Question

- Example will show:
  - Alignment with EPA Strategic Plan
  - Use of conceptual model
  - Use of supplemental information



## Alignment of Strategic Measures and ROE Information: Drinking Water

### STRATEGIC PLAN (Change Document)

- **Strategic measures**
  - Populations served by CWS with no health-based violations
  - Percent of CWS providing drinking water that meets health-based standards
  - Actions taken to protect source waters
  - Safe drinking water for tribal populations
  - Safe drinking water in US-Mexico border area and Pacific Island territories (Goal 4)
- **Proposed “changes in strategies”**
  - Emerging contaminants, measures related to SWTR and DBP Rule
- **“Challenge” (from 2008 PAR)**
  - Water scarcity

### 2008 ROE

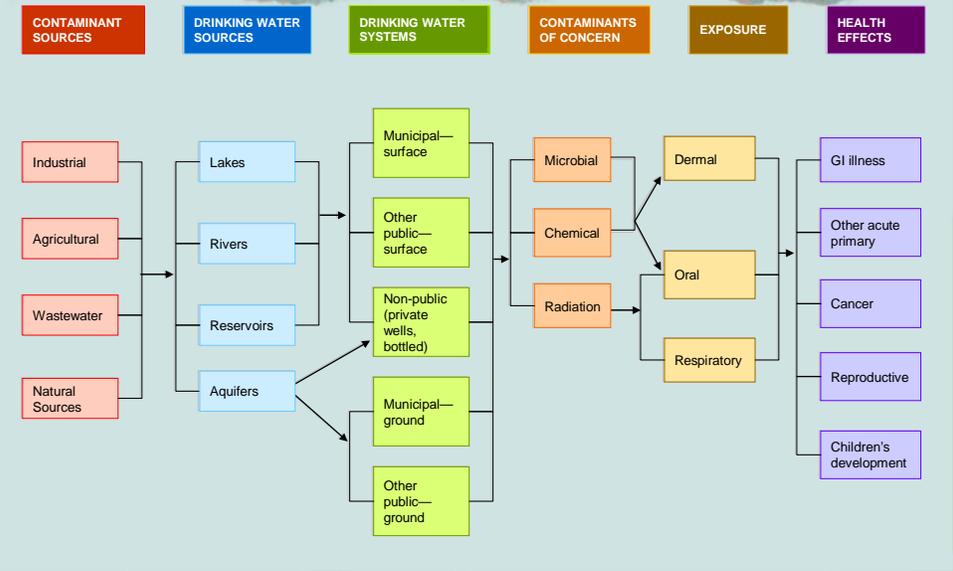
- **ROE indicator**
  - Populations served by CWS with no health-based violations
- **Proposed ROE indicator**
  - Expanded coverage to tribal populations
- **ROE indicator gaps**
  - Quality of water from systems *with* violations
  - Bottled water
  - Private wells
  - WBD outbreaks and illnesses

## Conceptual Model to Support Planning, Problem Formulation, and Decision-Making

- Helps build consensus about the scope and intent of question
- Provides a common framework
  - To identify and select indicators
  - To identify gaps and supplemental information needs
  - To identify possible strategic measures and where research might be directed
- Envision dialogue around ROE questions

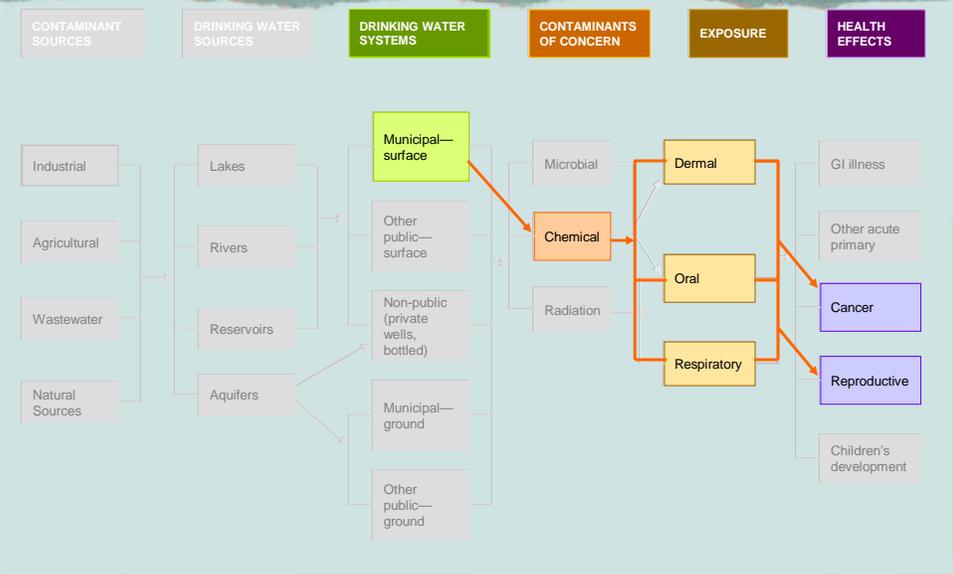
# Conceptual Diagram for the 2008 ROE Drinking Water Question

**QUESTION:** What are the trends in the quality of drinking water and their effects on human health?



# Conceptual Diagram for the 2008 ROE Drinking Water Question

**QUESTION:** What are the trends in the quality of drinking water and their effects on human health?



# Conceptual Approach for Estimating Human Chloroform Uptake

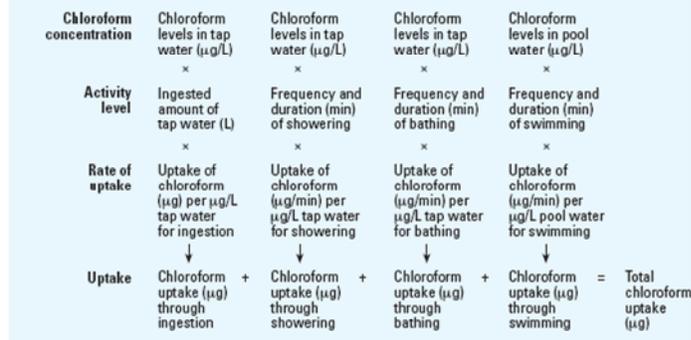
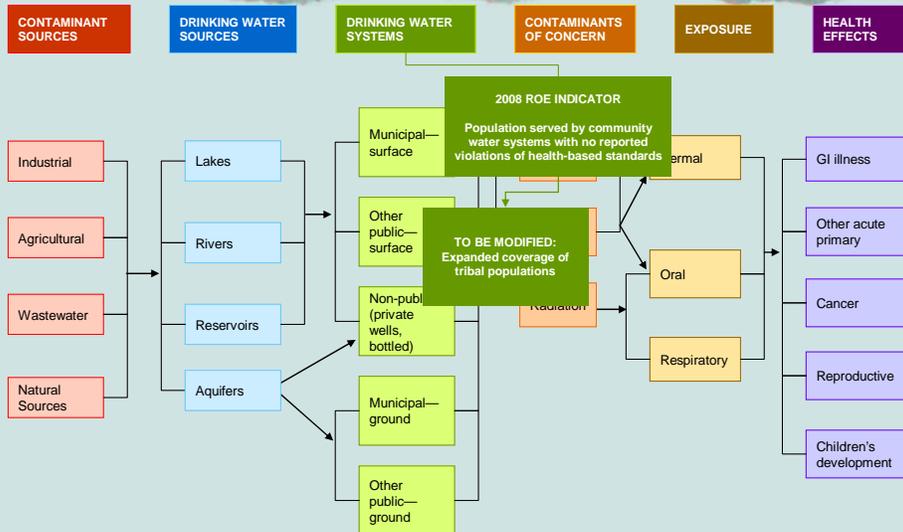


Figure 1. Schematic overview of the simulation of chloroform uptake for a mother.

Source: Whitaker et al., 2003. The Relationship between Water Concentrations and Individual Uptake of Chloroform: A Simulation Study. *Environ Health Perspect* 111:688-694.

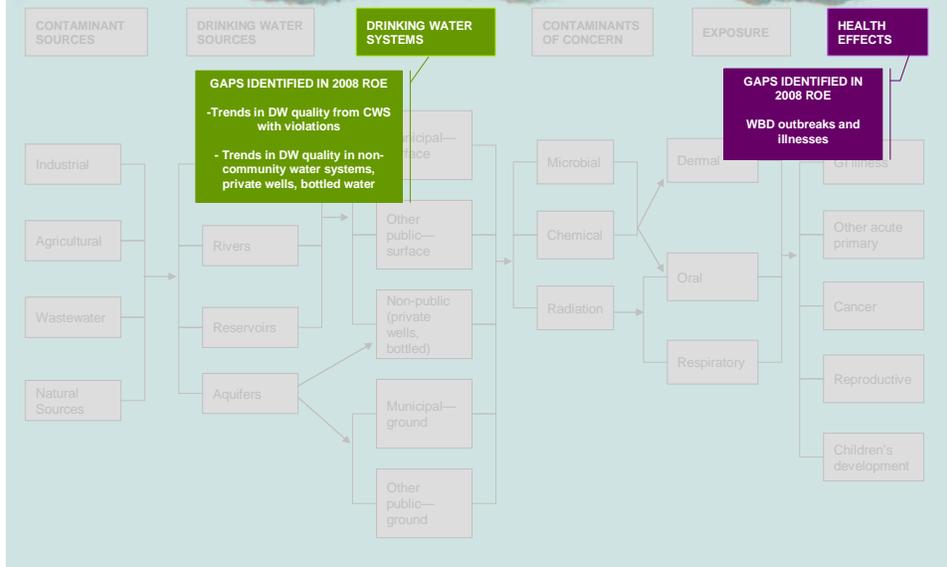
# Conceptual Diagram for the 2008 ROE Drinking Water Question

**QUESTION:** What are the trends in the quality of drinking water and their effects on human health?



## Conceptual Diagram for the 2008 ROE Drinking Water Question Gaps as Identified in 2008 ROE

**QUESTION:** What are the trends in the quality of drinking water and their effects on human health?



## Supplemental Information in the ROE

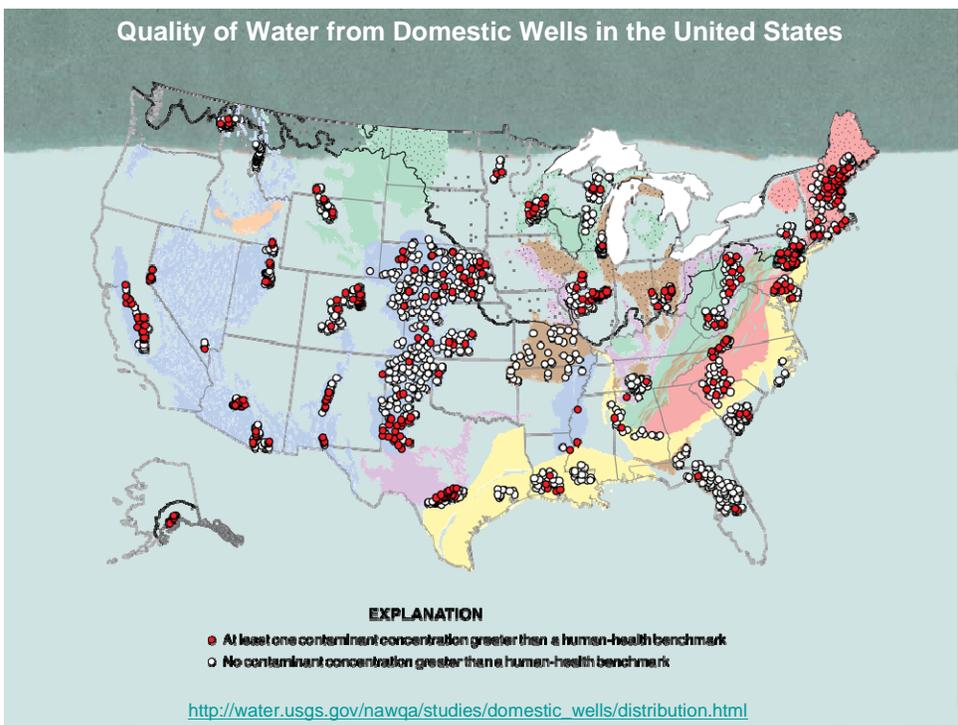
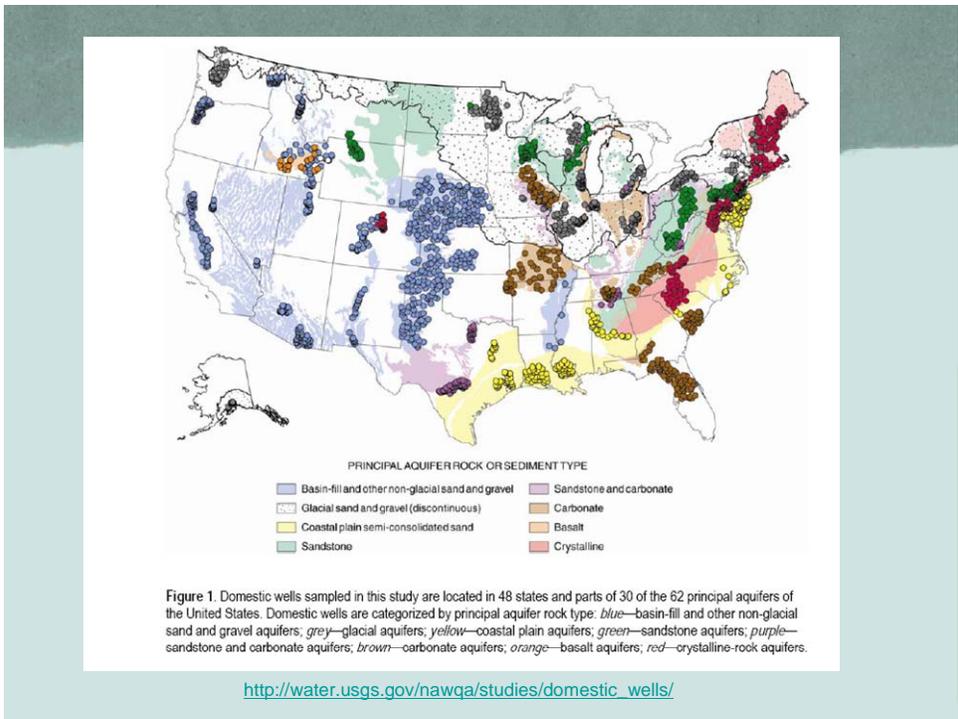
- The 2008 ROE does not include “case studies” that are not representative of a target population, or data sets that do not meet other ROE criteria.
- *Supplemental information* may help address the ROE questions and could provide candidates for future indicators.
- Considerations regarding *what* to include and *how* to incorporate, e.g.,
  - Inclusion criteria
  - An indicator “incubator” site to link ROE to valuable non-indicator information

## Supplemental Information: Drinking Water Question

- **Noted gap in 2008 ROE:** No currently available indicators of DW quality for non-community water systems or bottled water that meet ROE indicator definition and criteria.
- **Possible solution:** Fill the gap using supplemental information to augment that provided by the indicators and more thoroughly answer the ROE question

## Example Supplemental Information

- Recent U.S. Geological Survey (USGS) study
  - Concentrations of contaminants in 2,100 private drinking wells across the United States.
  - Sampled private wells in most of the major ground-water aquifers in the United States.  
[http://water.usgs.gov/nawqa/studies/domestic\\_wells/](http://water.usgs.gov/nawqa/studies/domestic_wells/)
  - Shows the range of contaminants that can occur in private well water

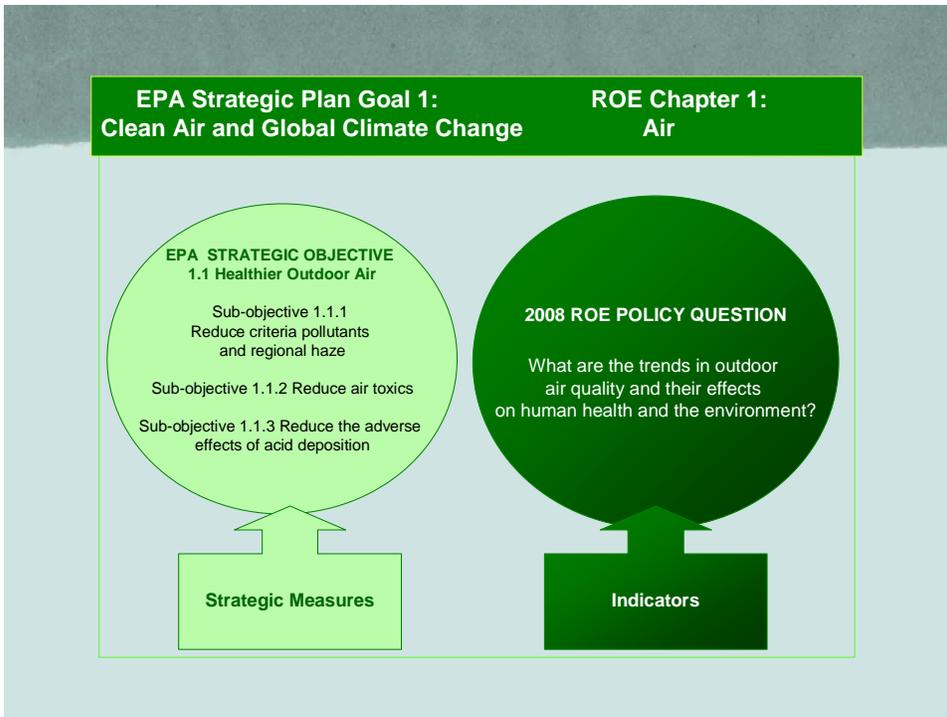


Example 2  
Based on 2008 ROE Outdoor Air Question

- Example will show:
  - Alignment with EPA Strategic Plan
  - Use of conceptual model
  - Use of supplemental information

Alignment of ROE Policy Question  
and EPA Strategic Objective

Outdoor Air



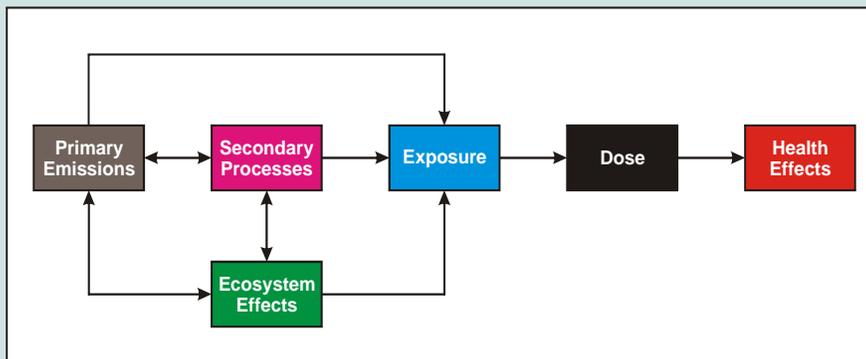
## Alignment of Strategic Measures and ROE Indicators: Outdoor Air

STRATEGIC PLAN (Change Document)	2008 ROE
<ul style="list-style-type: none"> <li>• <b>Strategic measures: criteria pollutants and regional haze</b> <ul style="list-style-type: none"> <li>- Criteria pollutant emission reductions</li> <li>- Criteria pollutant emission inventories</li> <li>- Visibility improvement</li> </ul> </li> <li>• <b>Strategic measures: air toxics</b> <ul style="list-style-type: none"> <li>- Air toxics emission reductions</li> </ul> </li> <li>• <b>Strategic measures: acid deposition</b> <ul style="list-style-type: none"> <li>- Reduction of number of acidic water bodies</li> <li>- SO<sub>2</sub> emissions reductions</li> <li>- Sulfur and nitrogen deposition reductions</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>ROE indicators</b> <ul style="list-style-type: none"> <li>- Criteria pollutant (and precursors) emissions, ambient concentrations, pollution-related effects</li> <li>- Air toxics emissions (from NEI)</li> <li>- Mercury emissions</li> <li>- Ambient concentrations of benzene</li> </ul> </li> <li>• <b>ROE indicator gaps</b> <ul style="list-style-type: none"> <li>- Particulate matter speciation</li> <li>- Indicators of most air toxics emissions and ambient concentrations</li> <li>- National-level exposure and effects indicators</li> </ul> </li> </ul>

# Conceptual Model to Support Planning, Problem Formulation, and Decision-Making

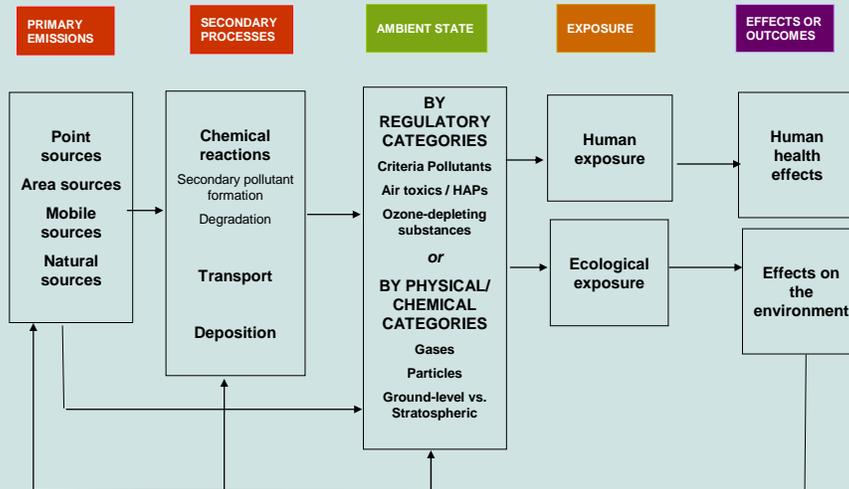
Outdoor Air

## Air Conceptual Model - Panel



## Conceptual Model for the 2008 ROE Outdoor Air Question

**QUESTION:** What are the trends in outdoor air quality and their effects on human health and the environment?



## Conceptual Model - Implications

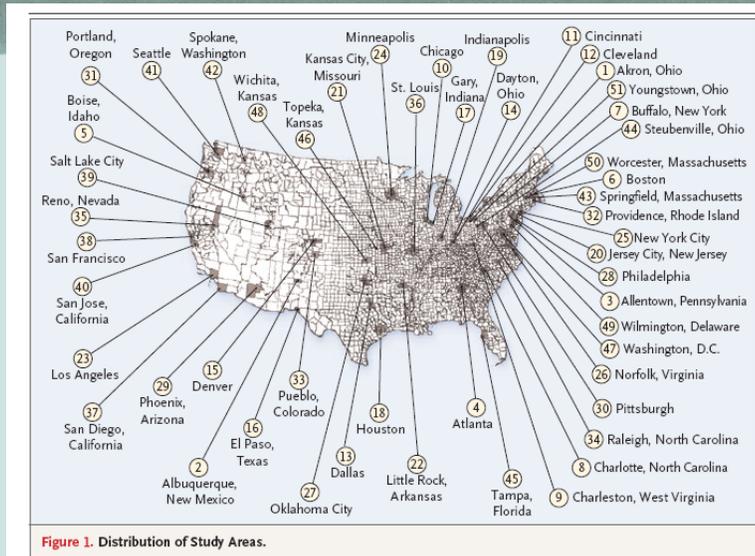
- Hierarchical sets of models needed, based on:
  - Time-space relationships
    - Compatible indicator time-space scales
  - Exposure and effects
    - Incomplete linkage – missing national/regional exposure-effects indicators
  - Multi-pollutant interactions
    - Helps relate and illustrate pollutant interactions and importance of considering multi-pollutant interactions

## Outcome of Draft Model for Outdoor Air

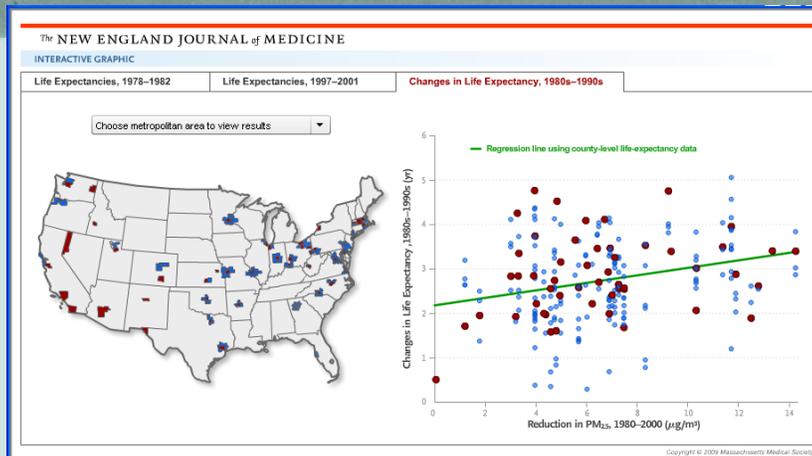
- Appropriate and useful for depicting situations that involved direct exposure to toxic pollutants (e.g., criteria pollutants and air toxics where the exposure pathway is direct atmospheric exposure).
- Not appropriate for outdoor air pollutants that exert their primary effects through another media (e.g., acid deposition, mercury, and lead).
- Conceptual models for this question should accommodate the concepts of human welfare so that these effects also are recognized and included as explicit outcomes of interest (e.g., regional haze impacting scenic vistas).
- *Consider more (more focused) questions for outdoor air?*

## Supplemental Information: Outdoor Air

- No national indicators available that track over time the occurrence of health effects attributable solely to exposure to one or more air pollutants.
- However, substantial epidemiologic evidence base links specific diseases to these exposures.
- Supplemental information could help address the question:
  - An analysis using data from 51 U.S. metro areas showed that over the period of record, overall life expectancy has increased by 2.7 years, and reduction in exposure to  $PM_{2.5}$  accounted for as much as 15 percent of that increase (Pope et al., 2007).



The locations of the counties included in the study are shown in gray, and the dots represent the approximate locations of the 51 metropolitan areas in the study.

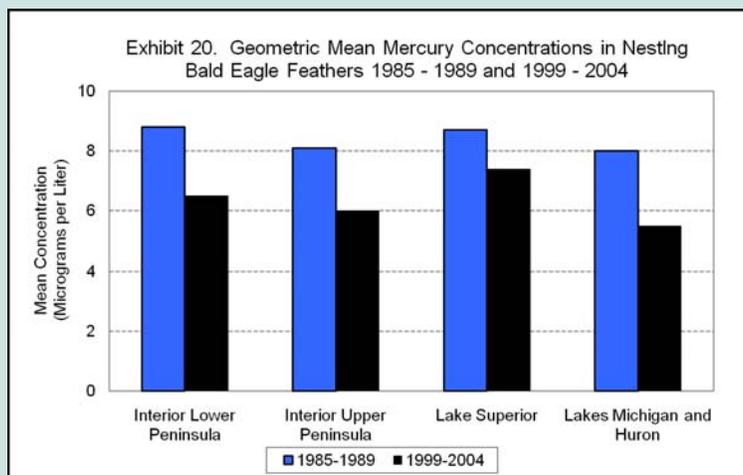


Pope CA III, Ezzati M, Dockery DW. Fine-particulate air pollution and life expectancy in the United States. *N Engl J Med* 2009;360:376-86.

<http://content.nejm.org/cgi/content/full/360/4/376/DC1>

## Supplemental information for outdoor air: Air pollutants and effects in wildlife

- State of Michigan monitors mercury in bald eagle feathers on Great Lakes shores.
- Slight decrease between the 1985-1999 and 1999-2004 sampling periods, corresponding to mercury emissions reductions.
- Data not necessarily representative of eagle populations nationwide.
- Air or sediment?



## Summary and Conclusions

### Value of Conceptual Models in the ROE

- Clearly illustrate the scope of the question.
- Depict the scientific conceptual foundation of the question.
- Show the role played by each indicator in helping to answer the question, and interrelationships of indicators.
- Illustrate where indicator gaps exist.
- Highlight where supplemental information might be useful to help answer the question.
- Communication tool for discussion among scientists, policy developers, and decision-makers to improve ROE's usefulness in strategic planning.

## Value of Supplemental Information in the ROE

- Provide some insight into health and environmental trends that are relevant to the question.
- Help illustrate how indicator gaps might be filled.
- Identify possible future ROE indicators.

## Charge Questions

## Charge Question #1

Please comment on whether EPA's proposed conceptual models approaches are logical and useful for:

- Aligning the ROE questions with the Agency's strategic goals and objectives.
- Communicating the intent and scope of questions in the ROE.
- Presenting the underlying scientific foundation of questions in the ROE.
- Providing a framework for selecting indicators and identifying associated gaps, limitations, and useful supplemental information.

## Charge Question #2:

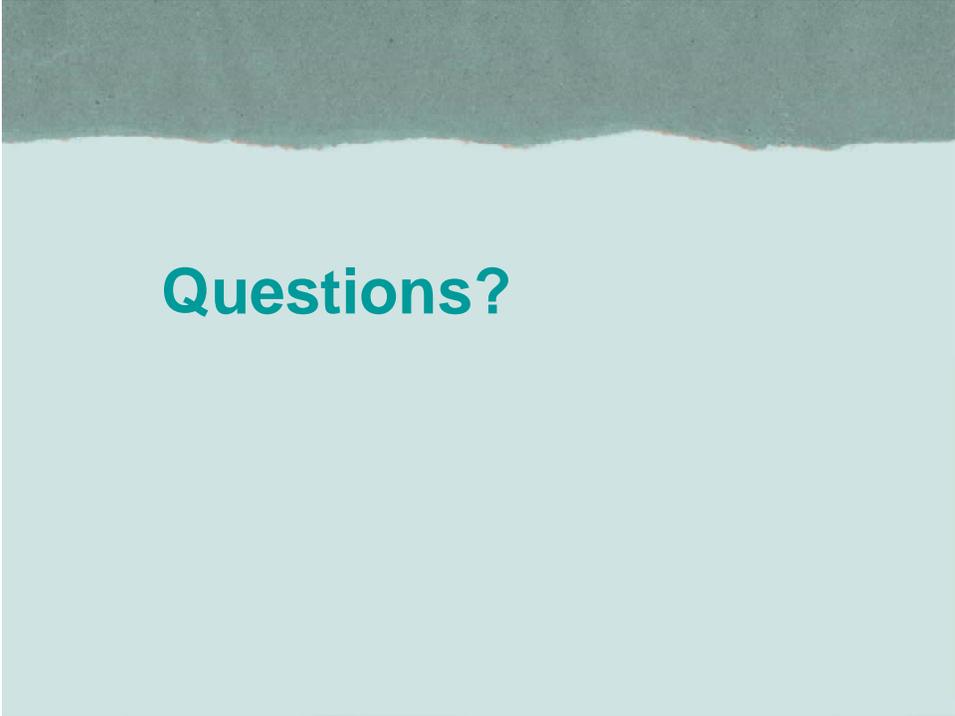
Does the Committee have recommendations concerning other possible approaches to conceptual model development that would be useful in identifying or highlighting important ROE topics, indicators for consideration, research, or development?

### Charge Question #3

Please comment on the logic and utility of EPA's proposed use of supplemental information to answer questions in the next version of the ROE.

### Charge Question #4

Does the Committee have recommendations for criteria to assure that supplemental information included in the ROE is objective, free from bias, scientifically valid, and supports intended purpose of the report?



**Questions?**

## Appendix E – Summary of Key Points Discussed

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- **EPA’s Report on the Environment is an important document that can be of great value to the Agency and the public.** EPA has made remarkable progress in developing the Report on the Environment and has responded to many SAB comments on previous drafts of the report.
- **Additional improvements are needed to make the ROE a more effective strategic planning and public information tool. The developers of the ROE need more resources to incorporate these improvements.** Because of the breadth of the ROE, developers of the report periodically require additional technical support in biostatistics, surveys, epidemiology, toxicology, and other relevant disciplines. It is important that EPA commit to providing that technical assistance either by hiring additional full-time staff or making experts elsewhere in ORD available to work on the report.
- **A clear mission statement for the ROE is needed.** A clear mission statement is needed not only to define the intended audiences of the report, but to clearly define its objectives in a more general sense. If properly conceived, the mission statement could provide guidance and direction on other key issues such as choice of an overarching and unifying conceptual model. The audience of the ROE is not clearly defined. EPA has stated that it intends to restructure the ROE to more directly align its chapters with EPA’s Strategic Plan goals, and to align policy questions in the ROE with objectives in the Agency’s Strategic Plan. The main audience would therefore appear to be EPA leadership. However, there are multiple potential audiences. It may not be possible to write the ROE in a way that will be optimal for all audiences, so EPA must decide who the most critical audience is or prepare different versions of the ROE for different audiences. For example, it may be useful to develop a “Citizen’s Guide” to the ROE for the public. This version of the ROE could be prepared using simpler language, colorful graphics, and a transparent approach to convey the key messages of the document.
- **There is a need for an overarching and unifying conceptual model for the ROE.** The current ROE lacks an overarching conceptual framework that brings together the scientific elements of the report and allows the natural placement of each indicator in the framework. The conceptual models proposed by EPA for use in the ROE are media specific and provide little insight into how chapters, questions, and indicators in the report are interconnected. The ROE conceptual framework should provide the foundation for understanding what EPA is interested in knowing and why. The conceptual framework should connect the questions in the report, embrace important new questions, issues, and indicators, and also provide guidance on what should and should not be included in the ROE. EPA may wish to consider using the European Environmental Agency’s Pressure-State-Response approach to develop an overarching conceptual framework for the ROE. Other possible conceptual modeling approaches are provided in the attached comments.

- **It may be useful to incorporate additional process-oriented models into the media chapters of the ROE.** Specific chapter models could address the underlying scientific foundation of many of the ROE questions and indicators. Slightly more detailed models may also be developed for some of the individual questions. The SAB previously recommended that such models be process-oriented. Although EPA has stated that it is not the intent of the ROE to identify mechanisms and drivers of the indicators, some recognition of the underlying processes is necessary to present the scientific foundation of questions in the report and identify strategies to remedy and avoid problems. EPA’s proposed conceptual model examples for the drinking water and air questions show linkages from emissions to health and environmental effects and this is helpful in putting individual indicators into a context. However, not all of the linkages in these models are equally important and not all of the linkages are under EPA jurisdiction. Furthermore, the proposed models do not account for important “effect modifiers” such as meteorology or age.
- **Alignment of the ROE with EPA’s strategic goals and objectives makes sense but indicators should be linked to EPA program actions.** If the ROE is to be effectively used in the strategic planning process it needs to link the indicators to EPA program actions and describe benchmarks or goals, where possible, so that progress relative to goals can be assessed. The link between reductions in pollutants and improvements in environmental quality should be made, with the goal of answering the question, “how much reduction in emissions or environmental concentration is needed to produce environmental improvements?” The overarching conceptual model for the ROE needs to include the feedback loop of EPA regulation and policy as an action/response that affects the environment. Consideration of both an ecological process model as well as an operational process model that focuses on linking management actions with desired environmental outcomes would be appropriate in this regard. In addition, some historical perspective should be provided. The reader needs to know where we have come from, where we are today, and where we need to be in the future.
- **It is important to retain rigorous criteria for the selection of ROE indicators, but supplemental information can be useful in filling gaps where national data are unavailable and addressing questions of limited geographic scope. This information can help identify emerging vulnerabilities or threats and consolidate information that may be useful to a broad set of users.** EPA’s proposal to include supplemental information in the ROE has merit. However, if the supplemental information is quarantined in a ROE incubator site or appendix as proposed, the information may be of limited use. Therefore, at the very least, the ROE should include information about the indicators that are listed in the incubator site. If additional resources are focused on meta-analysis of supplemental data, it may be possible to combine results from different supplemental studies and develop aggregate results that could be used in the ROE. It may also be possible to integrate supplemental information into the ROE and provide additional metadata information

about the data source, rigor, geographic region of significance, and level of confidence in the data.

- **It is important to provide a defined place in the ROE for discussions of emerging issues. The document should be forward-looking.** Emerging issues should be discussed in the ROE, perhaps in the supplemental information section but also in an executive summary, to show that EPA is aware of and beginning to monitor or consider important new issues. It will be these emerging issues that are likely to encompass the EPA's efforts in coming decades, and in order for the ROE to help drive strategic planning, these issues must be identified and prioritized.
- **Regional problems require regional treatment.** Not all problems are national. This is particularly true of ecosystem problems. For example, ecologists have long recognized increased tree mortality in the eastern U.S. driven by acid rain, and increased tree mortality in some regions of the U.S. driven by invasive species (e.g., gypsy moth) and urban island effects (high urban tree mortality). In developing the ROE, EPA should consider using regional indicators that represent important status and trend information. EPA may see its mandate as national in scope, but many readers of the ROE do not make distinctions between national, regional, and state jurisdictions. In considering the use of regional indicators it is important to ensure use of appropriate scales for analysis of information.
- **The ROE should contain an executive summary that distills and synthesizes the indicator information to address the questions in the report.** The 2008 ROE is a great collection of indicator data, but alone it is not sufficient for planning purposes because it does not draw conclusions about the state of the environment. Some synthesis or interpretation, rather than just providing summary information and allowing users to interpret or draw conclusions, would be useful. If connections cannot be made between indicators and outcomes, questions in the report should probably be reworded. The executive summary should also be published as a separate document because it is likely to be of interest to the general public, law makers, and policy makers who may not read the entire ROE.
- **In developing the ROE, EPA should emphasize producing a powerful and interactive web-based platform with links to pertinent websites containing additional data and information.** The 2012 ROE should be available as a printed report, but each chapter should be published in an electronic format that is fully searchable. Additional resources will be needed to accomplish this.
- **Where possible trends in environmental indicators should be linked to indicators for ecological condition and human health.** For example, EPA has estimated the health impacts of air pollution in quantitative terms in other reports. These estimates provide direct answers to the ROE question for air and would help fill gaps that exist in the 2008 ROE.

- **Several other key points are provided for EPA's Consideration.** 1) It is important to maintain the statistical validity and scientific rigor of the ROE. 2) An efficient way to use staff, produce fresh products and keep policy-makers focused would be to produce a different ROE chapter once per year on a rotating schedule. 3) Integration across agencies that conduct environmental monitoring is critical. An interagency monitoring effort/clearinghouse/data source would be very useful.