

**Summary Minutes of the U.S. Environmental Protection Agency  
Science Advisory Board (SAB)  
Environmental Economics Advisory Committee  
Public Meeting  
November 14, 2003 – Arlington, VA**

Panel Members: See Roster (Attachment A)

Date and Time: Friday, November 14, 2003, 8:30 a.m. to 4:00 p.m., EST

Location: Hilton Arlington and Towers Hotel, 950 North Stafford Street,  
Arlington, VA 22203

Purpose: The purpose of this meeting was for the committee to conduct deliberations on the EPA draft Environmental Economics Research Strategy (Attachment B).

Attendees: Chair: Dr. Maureen L. Cropper

Members: Dr. Dallas Burtraw  
Dr. Lawrence Goulder  
Dr. James Hammitt  
Dr. Gloria Helfand  
Dr. Catherine Kling  
Dr. Arik Levinson  
Dr. Richard Norgaard  
Dr. Kathleen Segerson  
Dr. Hilary Sigman  
Dr. Robert Stavins  
Dr. Gary Yohe

SAB Staff: Mr. Thomas Miller  
Dr. Vanessa Vu

Other Persons Attending: Mr. Matthew Clark, U.S. EPA/ORD

Other EPA personnel and members of the public, as noted on the sign-in sheets (Attachment C).

Meeting Summary

The meeting generally followed the issues and general timing as presented in the meeting Agenda (Attachment D), except where otherwise noted.

## **1. Opening Remarks**

### Introductory Remarks by the Designated Federal Officer

Mr. Tom Miller, Designated Federal Officer for the EEAC, welcomed committee members to the meeting and briefly reviewed FACA and ethics requirements. Regarding panel members who hold grants to conduct research related to the area being discussed, Mr. Miller said that EPA has reviewed relevant information and determined that the value of the members' participation outweighs any potential concerns about impartiality. Mr. Miller also noted that a transcript is being prepared for this meeting as well as the usual summary minutes.

### Welcome and Introductory Remarks

Dr. Maureen Cropper, EEAC Chair, thanked participants for their attendance and invited EEAC members to introduce themselves. Dr. Cropper suggested that the following EEAC members be responsible for drawing together information in the five research topic areas for the EEAC's report: Human Health Valuation: Dr. Cropper; Ecological Valuation: Dr. Kling; Environmental Behavior and Decision Making: Dr. Levinson; Market Mechanisms and Incentives: Dr. Helfand; and Benefits of Environmental Information Disclosure: Dr. Stavins.

Dr. Vanessa Vu, SAB Staff Office Director, welcomed participants and noted the growing importance of environmental economics research to the Agency and to the new Administrator. She thanked panel members for their time and effort in providing advice to the Agency.

## **2. Review of EPA's Environmental Economics Research Strategy**

### EPA Introductory Remarks

Mr. Matthew Clark, Office of Research and Development (ORD), noted that a research strategy and an implementation plan are necessary for research planning in ORD. He expressed his appreciation for the committee's efforts, and assured members that their advice would be taken seriously. EPA is working hard to strike a balance between basic good science and good science that is applicable to research, Mr. Clark said, and is increasing its recognition of economics as a science. The document being reviewed today will serve as a blueprint for the development of a five-year plan for research.

Mr. Brian Heninger, Office of Policy, Economics and Innovation, National Center for Environmental Economics (NCEE), thanked the committee for its review, and noted that the document would provide background and perspective for the allocation of NCEE staff time.

## **3. Public Comments**

No requests were received for the opportunity to provide comment.

#### **4. Committee Deliberations on the Environmental Economics Research Strategy**

Lead discussants are indicated in parentheses following the subheading for each of the five areas discussed.

##### Valuation of Benefits of Environmental Improvements – Human Health Valuation (Drs. Hammitt and Cropper)

Dr. Hammitt said that human health is considered both as morbidity and mortality, and that there is more experience and information on the latter. He proposed consideration of indices that would allow an easier transfer of value from one type of illness to another. He also noted that social welfare loss does not include costs of illness or willingness-to-pay. In terms of risk to children, Dr. Hammitt noted that much of the discussion addresses developmental endpoints, which are perhaps not handled as well in the literature as are other endpoints. While much work has been done on mortality, he said, he would be interested in more work on how mortality relates to age, health status, voluntary risk, and accompanying morbidity. Dr. Hammitt urged EPA to consider the benefit transfer issue, e.g., to develop a function of health values or a function of attributes of risk, and to work to expand research methods.

Dr. Cropper asked whether the valuation of morbidity and mortality should be done together or separately, as in comorbidity preceding mortality. She recommended examination of the epidemiology on environmental pollutants and disease so that what is being valued in the human health area links closely with the epidemiology, to be of value to the Agency. Economists, epidemiologists, physicians, and others need to determine acute and chronic endpoints, and to answer questions such as “does exposure cause early onset of the disease, or is the disease present and being exacerbated by exposure?” Dr. Cropper also identified the issue of communicating small risks to people. She said that Agency-funded work does not realistically describe risk in terms that people can value. She suggested that the Agency describe different components of disease, and provide a link to functional status limitations, an important area for collaboration between economists and health researchers.

Dr. Cropper noted that the EEAC will address the value of statistical life issue later in this fiscal year. A recent study reanalyzing data from compensating wage studies expresses doubts about the usefulness of currently available estimates in policy. Part of the research strategy may be a look at the criticisms and limitations of the approach to providing estimates, so as to get estimates in which there is more confidence.

Dr. Stavins said that the research areas should meet three criteria. They should be: 1) important generally, important to the Agency’s mission, and the research would not be done otherwise unless there is Agency’s involvement. He identified benefit transfer methodologies as a cross-cutting issue, noting that benefit transfer is used for almost all mortality estimates and many morbidity estimates and also in ecological valuation.

Dr. Kling identified Dr. Cropper’s recommendation about integration with other disciplines as a

cross-cutting issue that also applied to ecological valuation. She also recommended research into perceptions, realities, and what people actually value.

Dr. Hammitt suggested that the EEAC report might address (i) how the link between valuation and risk assessment can yield odd endpoints, e.g. restricted activity days in the air pollution area and (ii) for social decision making, if adding own willingness-to-pay across the population was the most appropriate approach, and if EPA may want to look at other ways of doing social welfare analysis.

Dr. Helfand identified the incorporation of uncertainty of these estimates as a central issue to the research strategy. Dr. Cropper said that the EEAC will be addressing the topic of uncertainty in the coming year. She pointed out that in the retrospective study of costs and benefits of the Clean Air Act, refining the estimate for value of statistical life had the greatest impact. Dr. Helfand said that this was a critical value, and wondered whether further study would give a tighter range.

Dr. Stavins again noted the importance of the treatment of uncertainty in benefit-cost analysis as a cross-cutting issue, noting that new OMB guidelines call for more refined characterization of uncertainties in regulatory impact analyses by all agencies.

Dr. Segerson identified the advantages and limitations of using indices to aggregate endpoints of human health or environmental status as another cross-cutting issue.

Dr. Cropper commented that EPA should take advantage of existing research on how people's perceptions of their functional limitations correlate with certain diagnoses.

Dr. Burtraw suggested an exploration of cost-effectiveness analysis and a general exploration of uncertainty analysis, rather than a specific topic of research. Dr. Cropper said that it was important to identify cross-cutting themes, but not to suggest specific areas for research proposals.

Dr. Goulder asked to what extent economists should be addressing the social welfare function, and recommended a more modest approach. Dr. Norgaard said that there is a lot that can be done in the research direction to contribute to the understanding of human health and ecological valuation. Dr. Kling pointed out that economists do not necessarily think that efficiency (i.e., the benefits exceed the costs) is the answer to all public policy problems.

Dr. Kling identified the appropriate way to integrate with other agencies as a cross-cutting issue for human health and ecological valuation.

Dr. Stavins urged the EEAC to comment on how to do economic analysis well, because this is the area in which it has standing, and to not become involved in discussions of the use of economic analyses in regulatory policy decisions.

Dr. Cropper asked if EPA should get different willingness-to-pay values for different parts of the population. Dr. Goulder said that the EEAC should raise the distributional aspects of these issues, but that others should decide on the equity issues.

Dr. Yohe commented that any research that might help explain sources of uncertainty could be helpful, such as estimates of willingness-to-pay before and after diagnosis. He also said that technological change over short periods of time was a useful topic that was not addressed in the document.

Dr. Hammitt urged the Agency to address areas that appear to be controversial, such as differentiating the value of statistical life by income. Dr. Burtraw suggested that using a single value of statistical life is more practical for the offices but that research can be conducted regarding disaggregating and better understanding the parameter. Dr. Kling concurred that additional research on distributional consequences is important, and that understandable information based in theory is needed by policy makers to understand if they are implementing something that is distributionally unfair.

#### Valuation of Benefits of Environmental Improvements – Ecological Valuation (Drs. Norgaard and Kling)

Dr. Norgaard characterized the document as more vague in this area than in the area of human health effects valuation. He said that he was not accustomed to the idea of aggregating ecosystems, of which there are a great variety, and looking at them generally. Dr. Norgaard said that the report is written as if a steady state exists, and when inputs are changed, a new steady state is reached, but, he said, most ecologists do not think of ecosystems so simply. People need a better understanding of ecology before they are asked to value it, Dr. Norgaard said. He expressed the concern that ecological research is being done at the scenario level rather than the contextual level, and said that the broader concern is cumulative impacts, e.g., if an ecosystem is already damaged, will future insults put it “over the brink.”

Dr. Kling said that, contrary to Dr. Norgaard’s comments, she thought that the document had a lot of detail on endpoints and integration with ecology. Many relevant issues have already been discussed, she noted, such as the complexity of ecosystems; the range of ecosystem services; the lack of understanding of ecological issues; similarities to health issues; and the need to integrate with ecologists. Dr. Kling said that integration with other agencies and the relationship between physical measures and ecological function could be added to the process. She also said that numbers could be improved with attention to the following: the value of time (opportunity cost); uncertainty information for valuation; better design (yielding precision and general bias gains); observed behavior (revealed preference methods); and the cross-cutting issue of willingness-to-accept vs. willingness-to-pay.

Dr. Goulder noted that risk and uncertainty are crucial issues to ecologists, and that economists have tools to address these. Probability distributions, e.g., for time, could be used to incorporate these issues within benefit-cost analysis; this will give different results than would setting key

parameters at “best guess” values. He stated that we know very little about the ecological production function. Dr. Goulder also said that trying to incorporate public risk aversion and relate it to how far one should go regarding the precautionary principle would be an important contribution.

Dr. Segerson said that ecologists are concerned that economists are too focused on small, marginal changes, and asked to what extent economic methods could be used to think about large changes (ones that could tip an ecosystem “over the edge”). She also recommended research into the magnitude of the relationship between willingness-to-accept and willingness-to-pay; Dr. Hammitt said that they are likely to converge for marginal changes, but to be more different for large changes.

Dr. Burtraw noted some shortcomings in the document, e.g., discussing valuation absent a linkage to the scientific models. He said that articulation of willingness-to-pay for ecological situations hinges on the articulation of baseline and requires an understanding of what is going on upstream. Dr. Burtraw identified needs for (i) research regarding relatively small changes and changes at thresholds, (ii) a link to other agencies to invoke the philosophy of integrated assessment, and (iii) research on linking complicated ecological processes to a linear process.

Dr. Cropper asked about the damage function approach used in human health, and asked whether dose-response functions on some measure of ecological functioning could be done for the eight ecological endpoints (p. 11 of the report). Drs. Kling and Norgaard commented that studies with approaches analogous to dose-response are done for ecosystems

Dr. Stavins said that human health valuation may be more important to EPA in terms of statutory requirements, but that ecological valuation has more important research needs, e.g., biophysical outcomes are sometimes in forms that are difficult to subject to economic valuation. Some methods used by EPA are flawed, and the Agency needs to pursue better methods. Work is clearly needed in benefit transfer. Non-use valuation is a big problem.

Dr. Cropper asked about the use of indices to summarize ecosystem health. Dr. Norgaard commented that it would be difficult to get ecologists to agree on an index, and suggested that EPA make efforts to improve the interface between ecologists and the needs of economists.

Dr. Kling noted that ecologists see a well-functioning ecosystem as an endpoint, and that they disagree about how to measure endpoints. Dr. Segerson said that valuation exercises should include how ecological effects emerge over time. Dr. Norgaard noted that having a pristine ecosystem is an issue for ecologists.

Dr. Levinson said that the value of people’s time is an important source of uncertainty in the non-use literature. Dr. Stavins said it also appears in the benefits transfer literature. Dr. Goulder identified contingent valuation as a cross-cutting issue. Dr. Helfand noted that the document mentions the valuation of other effects, like visibility or the impact of air pollution on structures, but does not discuss them in detail; they might warrant some level of research.

Dr. Norgaard said that looking at the state and age distribution of benefits, benefit transfer could be a way to extend the useful life of research conducted in the 1970s and 1980s. Dr. Cropper said that the mortality valuation literature is stronger than the morbidity valuation literature. Dr. Sigman said that an effort should be made to resolve the tension between academic publications (i.e., what is publishable in journals) and EPA's practical research needs.

Dr. Stavins said that a compelling argument had been made that rather than focusing on methodological research, the estimates for health and ecology are not "up to snuff" with current methodology, and EPA should be investing in ways to use existing methodologies to bring the numbers up to date. Dr. Cropper said that it is important to determine who would do such research.

A break for lunch was taken from approximately 11:35 a.m. to 12:15 p.m.

#### Environmental Behavior and Decision-making, Including Voluntary Programs (Drs. Levinson, Segerson, Yohe)

Dr. Levinson commented that enforcement may be more of an art than a science. He said it would be good to know the extent to which each step in enforcement is effective in producing compliance. Given the relatively low probability of a particular plant being monitored in any given year, the potential costs of fines are small in comparison to the costs of compliance; this raises the question of why people comply with environmental regulations. Another fundamental problem is the accessibility of data; the research community could use a comprehensive set. Dr. Levinson also said that EPA could focus on an assessment of the reliability of self-reported data. One line of research about how firms respond to incentives relates to publicly provided data, like the Toxics Release Inventory (TRI), which is not tied to enforcement activities but to the idea that public pressure will improve companies' behavior. Dr. Levinson said that making compliance and auditing information publicly available would mesh with both research and public policy objectives.

Dr. Yohe said that another set of questions had to do with cost-effectiveness issues and the degree to which firms base their decisions only on accounting costs or on other costs, such as liability. The market structure may make a difference, he noted. Issues of compliance, monitoring, and evaluation go beyond the notion of whether firms are behaving the way they should, to whether regulations are effecting the change in the environment they were intended to effect.

Dr. Segerson noted that discussion about what is currently known and not known was limited, compared to other areas of the document. She said that compliance should not be viewed in a linear, unilateral way, but as an interactive process between the firm and the Agency over time. She suggested that more cooperative approaches to compliance might be effective, and that EPA might consider designing a package of ways for people to comply. Dr. Segerson also said that research was needed into the role of municipalities as pollution sources; the difference between

observable and motivational influences on compliance; the strength and impact of non-governmental incentives; and when voluntary approaches are better than regulatory approaches.

Dr. Stavins called for EPA or the EEAC to critically examine the BEN model, used by EPA for situations when companies do not comply with regulations. It is based on the notion that companies owe the government the additional profits made due to being out of compliance. Mr. Miller noted that EPA EPA is peer reviewing BEN in two segments. For the core of BEN, a spreadsheet model, a non-SAB review is being conducted. For the Illegal Competitive Advantage component, the EPA SAB has been asked to establish a peer review panel to evaluate the methodology.

Dr. Sigman noted variation across states in compliance, and suggested systematic collection of data from the states about their enforcement programs. Dr. Goulder said another issue is the difference between *ex ante* estimates and actual compliance costs. Dr. Burtraw commented that apparently flexible performance standards are technology-forcing, and identified the question of how compliance is achieved when incentives do not encourage innovation.

Dr. Kling said that water quality is a major voluntary compliance issue in a large part of the country, called for targeted research on agricultural sources, and urged EPA to increase its discussion of non-point source issues.

Dr. Cropper asked the panel to address the topics on page 10 of the document. Dr. Levinson said that with respect to facility location, it is not clear that this is influenced by regulations. It could be studied.. Dr. Helfand said that the environmental justice literature suggests that there is local interest in the location of facilities and in disproportionate environmental impacts. Dr. Levinson noted that some literature suggests competition can improve welfare, but that newer information suggests it can reduce welfare.

#### Market Mechanisms and Incentives, Particularly Pollution Trading (Drs. Burtraw, Helfand, Sigman)

Dr. Helfand commented that key issues in the trading area of the strategy seem good as designed. The document reduces market mechanisms down to marketable permits. For new markets, key issues are related to predicting future success. Dr. Helfand identified two aspects of monitoring: ambient monitoring for adverse environmental effects, and facility or plant monitoring on the application of incentives. Other incentives should not be dropped; it is unduly narrowing to focus only on training. Dr. Helfand also said that a better understanding of market approaches and of the linkage to the broader economy is needed.

Dr. Burtraw said that the tradable permit program was excellent, but should be incentive-based. He identified the cross-cutting issue of the role of subsidies in providing incentives for firms to achieve environmental goals. Dr. Burtraw said that a lifetime research agenda would include the use of revenues from environmental policies. Measures of benefits and costs are not the final word for setting regulations, he said. Revenue-raising instruments have dramatic benefits, and

potential uses of revenue need to be considered. While open market trading systems have a role, technological change should run through the entire research agenda.

Dr. Sigman noted the tension between a broad vs. a narrow strategy in this area. Broad is desirable but many things are not likely to work. She said that she was troubled by the limitations to tradable permits, e.g., there was no discussion of legal liabilities and innovation. She called for more discussion on integrating enforcement concerns with *ex ante* policy design.

Dr. Goulder added that a potential virtue of tradable permits is that they can be applied in a way that has a greater political feasibility, but that they may have distributional implications. Command-control applications and traditional market designs could be considered; it is useful to see the impacts of different designs that include market approaches on distribution of wealth.

Dr. Norgaard commented that there is no mention of a big market, tradable obligations to purchase renewable energy. These will have clear implications for environmental policy. Dr. Goulder said that this was a very promising area relevant to policy.

Dr. Stavins said that EPA should be encouraged to do research on a point source trading program for water under the rubric of market-based approaches. The BEN Model and liability issues could be cross-referenced. Dr. Kling noted that targeting of spatial damage has been implemented in agriculture in the Conservation Reserve Program and that it has been important there. Much can be learned from looking at that program.

Dr. Hammitt suggested consideration of the extent to which a tradable permit can capture multiple benefits, the risk-risk idea, spatial-temporal detail, wildlife habitat vs. runoff pollution, and ways to get people to use these mechanisms to promote a number of goals simultaneously. He encouraged fundamental research to target incentives to simultaneously deal with a suite of issues.

Dr. Cropper inquired what projects had been funded under the STAR grant program (page 14). Mr. Clark said that funded projects ranged from theoretical work on the best design of permit allocation to work on the best kind of permit. Grant topics include market mechanisms on the design of tradable permits in agricultural communities, experimental economics (e.g., various regimes for air or water pollution), and incentives for redeveloping brownfields.

Dr. Stavins requested that EPA provide the writers with a list of currently funded projects from ORD and NCEE. The Agency will provide additional information on this issue (Received on 11/20/2003).

#### Benefits of Environmental Information Disclosure (Drs. Goulder and Stavins)

Dr. Stavins noted that several statutes require disclosure for emergency response purposes, but that research has not yet been done to investigate their benefits. He recommended a research strategy that included theoretical work to identify the paths through which information disclosure

programs would affect behavior, to provide a framework for econometric analysis. Dr. Stavins also recommended research on the cost-effectiveness or efficiency of approaches and an econometric analysis of current and proposed anti-terrorist efforts on plant safety and security.

Dr. Goulder recommended further research on the effects of voluntary programs on stock prices and behavior, including their potential to achieve ends at lower cost. He praised EPA for the thrust of its discussion (bullet points, p. 20) and call for further research on information disclosure. Dr. Goulder noted that the draft suggests that information disclosure could substitute for regulation, but said there is only a small case where that is accurate. He urged examination of how the two can work in tandem, noting that information disclosure can generate cost savings over a regulation-only approach. Dr. Goulder also encouraged research on the costs to firms and to those people who administer policy programs.

Dr. Kling recommended that EPA look at other areas, although they might be smaller scale, such as labeling (e.g., as was used for shade-grown coffee). Dr. Stavins said that energy efficiency labeling is another area that works.

Dr. Sigman said that stock market and labor market effects are another area of interest. She also asked what economists would say about protecting companies' confidential business information.

Dr. Hammitt asked about the possibility of investigating what is known about how TRI reports compare with actual emissions. Dr. Stavins noted there are also issues about the quality of information that is getting to affected communities. Dr. Hammitt inquired if there are better ways to provide information to the public that would better inform their decisions.

#### Communication of the Research Strategy Charge Question 4

Dr. Cropper asked for discussion on Charge Question 4: What is the best way for EPA to communicate its strategy and plans? Dr. Burtraw said EPA should announce its RFPs well in advance, as well as publicize a list of topics for proposals. Dr. Cropper asked about EPA's current procedures, and Mr. Clark said it was a work in progress. Currently, RFPs are open for at least 90 days. However, EPA has been disappointed in the number of responses received, and would like input on how to improve the process. Dr. Stavins suggested notifying the heads of all departments of economics at U.S. colleges and universities and placing a note in the AERE Newsletter to get the word out more broadly.

## **5. Next Steps**

### Action Items for Completing the Committee Report

Authors were asked to send their drafts to Dr. Cropper and Mr. Miller by December 5. Each draft should mention cross-cutting issues; they are not separate from the other recommendations. Authors should prepare 4 to 5 pages on a topic. Charge Question 1 will be addressed for each of

the five areas. Some of the areas will address Questions 2 and 3, and Dr. Cropper will draft a response on Question 4. Because the report is intended to ~~must~~ be a consensus document, drafts will be circulated before the final report is completed for submission to the SAB Executive Committee when it meets in January.

## 6. Plans for the Future

### Discussion of Potential Follow-Up Tasks and New Topics for the EEAC

Dr. Al McGartland thanked the members for their service to EPA. The new Administrator is very interested in economics and benefit-cost analysis. It is on the agenda for his Senior Management Retreat. Since the last EEAC meeting, he noted that OMB has issued guidelines that are much closer to EPA's guidance.

Dr. McGartland reminded the Committee that EPA had committed to come back to the SAB for additional interactions on the value of statistical life issue, and has been preparing for that. Ms. Nathalie Simon indicated that three on-going studies will be part of the discussion when the issue is brought back to the SAB. Dr. McGartland also said that one option for proceeding would be for the committee to assist EPA in doing a meta-analysis.

Regarding the incorporation of uncertainty into benefit-cost analysis, Dr. McGartland said that the EEAC is to begin an effort with EPA in this regard during FY 2004. Further along in the year, EPA will work on how the risk assessment process translates into benefits assessment, and how to produce more probabilistic estimates.

Dr. Burtraw asked about research funding outside of ORD, noting that all of it must now be competitively sourced, which he said tended to favor large consulting firms over the academic community. This has the effect of narrowing the intellectual content and scope of such research. Dr. McGartland said that both assistance agreements and work assignments within support contracts are now competitive. Dr. Stavins suggested the SAB might write a letter about the potential difficulties associated with this approach. Mr. Miller said that the SAB should plan to meet publically with EPA to discuss the full scope of the issue if it is interested in writing a letter.

The meeting adjourned for the day at 2:50 p.m.

Respectfully Submitted:

Certified as true:

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Thomas O. Miller  
Designated Federal Officer

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Dr. Robert Stavins  
Chair, US EPA SAB  
Environmental economics Advisory  
Committee

## **ATTACHMENTS**

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|--------------|---|
| Attachment A | Roster of the EEAC  |
| Attachment B | EPA Environmental Economics Research Strategy, May 29, 2003, SAB Review Draft |
| Attachment C | Sign-in Sheets  |
| Attachment D | Meeting Agenda  |