

*The National Academies of*  
SCIENCES • ENGINEERING • MEDICINE

**Transition toward Sustainability after 15 Years:  
Where Do We Stand in Advancing the Scientific Foundation?  
A Workshop**

**Date: January 14-15, 2016**

**Location:** Hyatt Regency Newport Beach  
Garden Room I  
1107 Jamboree Rd Newport Beach, CA 92660

**WORKSHOP OBJECTIVES:**

The workshop objectives include convening leading scientists to discuss progress in sustainability science during the last 15 years, identify potential opportunities for advancing the research and use of scientific knowledge to support a transition toward sustainability, and challenges specifically related to establishing metrics/indicators and observations to support sustainability research and practice. The discussions will be used to stimulate thinking about new federal research priorities and guide development of future Academies activities related to the science of sustainability.

**WORKSHOP STRUCTURE:**

The workshop is structured around the six broad topics, including (1) sustainability and economic and population growth; (2) urban systems and resource sustainability; (3) sustainable manufacturing; (4) sustainable food systems and diet; (5) ocean sustainability; and (6) integrated analysis. Each panel will focus on the need for and advances in three areas: (a) sustainability indicators and metrics; (b) models for supporting decision-making; and (c) opportunities to inform decision making. Presenters will be asked to consider specific questions listed in the Statement of Task (see next to session titles below). Each speaker will also be asked to identify new efforts needed to address the range of needs and opportunities related to sustainable economic and population growth (SOT Question 6).

*Thursday, January 14, 2015*

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|----------|---|
| 8:30 AM  | Breakfast available in conference room  |
| 9:00 AM  | <b>Welcome from the National Academies of Sciences, Engineering, and Medicine</b><br>Ralph J. Cicerone, National Academy of Sciences  |
| 9:10 AM  | <b>Welcome, Introductions and Meeting Goals</b><br>David Dzombak (Chair) (NAE), Carnegie Mellon University, Committee Chair<br>Jerry Miller, National Academies of Sciences, Engineering, and Medicine  |
| 9:30 AM  | <b>Keynote Remarks – Sustainability Science: Overview of the State of the Field</b><br>Pamela Matson (NAS), Stanford University<br><i>What are the major advances in the field of sustainability science since the publication of Our Common Journey, as well as remaining gaps, and critical barriers to progress?</i> |
| 10:15 AM | <b>A Brief Update on the Sustainability Roundtable 2015 Sessions on Sustainability Indicators and Metrics</b><br>David Dzombak (NAE), Carnegie Mellon University, Roundtable Co-chair   |
| 10:30 AM | BREAK   |

- 10:45 AM      **Panel I: Sustainability and Economic and Population Growth**  
Moderator: Susan Trumbore (NAS), Max-Planck-Institute for Biogeochemistry
- *Sustainability Indicators and Metrics (SOT Questions 1, 2 and 6)*  
John Weyant, Stanford University
  - *Models for Supporting Sustainability Decision Making (SOT Questions 3 and 6)*  
Joseph Arvai, University of Michigan
  - *Informing Sustainability Science through Advances in Environmental Decision Making and Other Areas of Science (SOT Questions 4, 5 and 6)*  
Wolfgang Lutz, International Institute for Applied Systems Analysis (Demographics)
- 11:45 AM      **Q&A and Discussion**
- 12:15 PM      LUNCH
- 1:15 PM      **Panel II: Urban Systems and Resource Sustainability**  
Moderator: Stephen Polasky (NAS), University of Minnesota
- *Sustainability Indicators and Metrics (SOT Questions 1, 2 and 6)*  
John Crittenden (NAE), Georgia Institute of Technology
  - *Models for Supporting Sustainability Decision Making (SOT Questions 3 and 6)*  
William Solecki, Hunter College
  - *Informing Sustainability Science through Advances in Environmental Decision Making and Other Areas of Science (SOT Questions 4, 5 and 6)*  
Karen Seto, Yale University
- 2:15 PM      **Q&A and Discussion**
- 2:45 PM      BREAK
- 3:00 PM      **Panel III: Sustainable Manufacturing**  
Moderator: Thomas Graedel (NAE), Yale University
- *Sustainability Indicators and Metrics (SOT Questions 1, 2 and 6)*  
Anthony Ku, GE Global Research
  - *Models for Supporting Sustainability Decision Making (SOT Questions 3 and 6)*  
Julie Zimmerman, Yale University (Green Chemical)
  - *Informing Sustainability Science through Advances in Environmental Decision Making and Other Areas of Science (SOT Questions 4, 5 and 6)*  
Steven Skerlos, University of Michigan (Auto Industry)
- 4:00 PM      **Q&A and Discussion**
- 4:30 PM      **Summary Discussion; Wrap up and Plans for Next Day**  
David Dzombak (NAE), Carnegie Mellon University, Committee Chair
- 5:00 PM      **Adjourn**
- 5:45 PM      Shuttle to Bayside Restaurant departs from the Hyatt Regency Newport Beach
- 6:00 PM      **Reception and Working Dinner**  
*Bayside Restaurant, 900 Bayside Drive Newport Beach, CA 92660*  
Keynote Speaker: William Clark (NAS), Harvard University
- 8:15 PM      Shuttle to Hyatt Regency Newport Beach departs from Bayside Restaurant

**Friday, January 15, 2016**

- 8:30 AM Breakfast available in conference room
- 9:00 AM **Welcome and Re-Cap from Previous Day**  
David Dzombak (NAE), Carnegie Mellon University, Planning Committee Chair
- 9:15 AM **Panel IV: Sustainable Food Systems and Diet**  
Moderator: Prabhu Pingali (NAS), Cornell University
- *Sustainability Indicators and Metrics (SOT Questions 1, 2 and 6)*  
Gerald Nelson, University of Illinois, Urbana-Champaign
  - *Models for Supporting Sustainability Decision Making (SOT Questions 3 and 6)*  
Mark Howden, Commonwealth Scientific and Industrial Research Organisation
  - *Sustainability Metrics: Do we Really have the Data for Meaningful Measurement? (SOT Questions 4, 5 and 6)*  
Prabhu Pingali (NAS), Cornell University
- 10:15 AM **Q&A and Discussion**
- 10:45 AM BREAK
- 11:00 AM **Panel V: Ocean Sustainability**  
Moderator: Roberta Marinelli, University of Southern California
- *Sustainability Indicators and Metrics (SOT Questions 1, 2 and 6)*  
Robert Costanza, Australian National University
  - *Models for Supporting Sustainability Decision Making (SOT Questions 3 and 6),*  
Steven Lohrenz, University of Massachusetts Dartmouth
  - *Informing Sustainability Science through Advances in Environmental Decision Making and Other Areas of Science (SOT Questions 4, 5 and 6)*  
Margaret Leinen, University of California, San Diego (Biogeochemistry, Sea Level Rise, and Extent Coastal Adaptation)
- 12:00 PM **Q&A and Discussion**
- 12:30 PM LUNCH
- 1:15 PM **Panel VI: Integrated Analysis**  
Moderator: Kristi Ebi, University of Washington
- *Sustainability Indicators and Metrics (SOT Questions 1, 2 and 6)*  
Anthony Janetos, Boston University
  - *Models for Supporting Sustainability Decision Making (SOT Questions 3 and 6)*  
Elena Bennett, McGill University
  - *Informing Sustainability Science through Advances in Environmental Decision Making and Other Areas of Science (SOT Questions 4, 5 and 6)*  
Thomas Dietz, Michigan State University
- 2:15 PM **Q&A and Discussion**
- 2:45 PM BREAK

3:00 PM

**A Path Forward: The State of Sustainability Science: Future Needs and Opportunities** (All Participants)

Moderator: David Dzombak (NAE), Carnegie Mellon University, Committee Chair

Key Discussants:

- Kai Lee, The David and Lucile Packard Foundation, retired
- William Clark (NAS), Harvard University

***Framing Questions from Statement of Task:***

1. What are the major advances in sustainability science since *Our Common Journey* was released in 1999, what are the remaining gaps, and what have been critical barriers to progress?
2. What progress has been made in establishing sustainability indicators, what are the remaining gaps, and what have been critical barriers to progress?
3. What progress has been made in developing models that are appropriate for supporting decisions related to sustainability, what are the remaining gaps, and what have been critical barriers to progress?
4. What advances in other areas of science (e.g., observing capabilities, models, technology development, indicator development, social sciences) might be usefully applied to advancing sustainability science?
5. How can advances in other frameworks for environmental decision making (e.g., climate adaptation, resilience, early warning systems) inform advances in and be integrated with sustainability science?
6. What new efforts might be needed to address the range of needs and opportunities related to sustainability?

4:15 PM

**Summary Remarks**

Moderator: David Dzombak (Chair) (NAE), Carnegie Mellon University

4:30 PM

**Workshop Conclusion**

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**Participants List**

**David Dzombak (Chair) (NAE)**

Hamerschlag University Professor and  
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Carnegie Mellon University

**Joseph Arvai**

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Enterprise and Director  
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**Blair Bowers**

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**Ralph J. Cicerone (NAS)**

President  
National Academy of Sciences

**William Clark (NAS)**

Harvey Brooks Professor of International  
Science, Public Policy and Human  
Development  
Harvard University

**Robert Costanza**

Professor and Chair in Public Policy  
Australian National University

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**Mark Howden**

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Commonwealth Scientific and Industrial  
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Director and Frederick S. Pardee Professor  
Boston University

**Lek Kadeli**

Acting Assistant Administrator  
Office of Research and Development  
U.S. Environmental Protection Agency

**Anthony Ku**  
Senior Engineer  
Manufacturing and Materials Technologies  
GE Global Research

**Kai Lee**  
Former Program Officer  
The David and Lucile Packard Foundation

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Director of Scripps Institution of  
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International Institute for Applied  
Systems Analysis

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Associate Program Officer  
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University of Southern California

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Energy & Environmental Sciences  
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Director, President's Circle  
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**Steven Skerlos**  
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