Roundtable on Science and Technology for Sustainability

National Academy of Sciences
National Academy of Engineering
Institute of Medicine
National Research Council

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Roundtable on Science and Technology for Sustainability

Goal for Roundtable

Mobilize, encourage, and use scientific knowledge and technology to help achieve sustainability goals and support the implementation of sustainability practices.

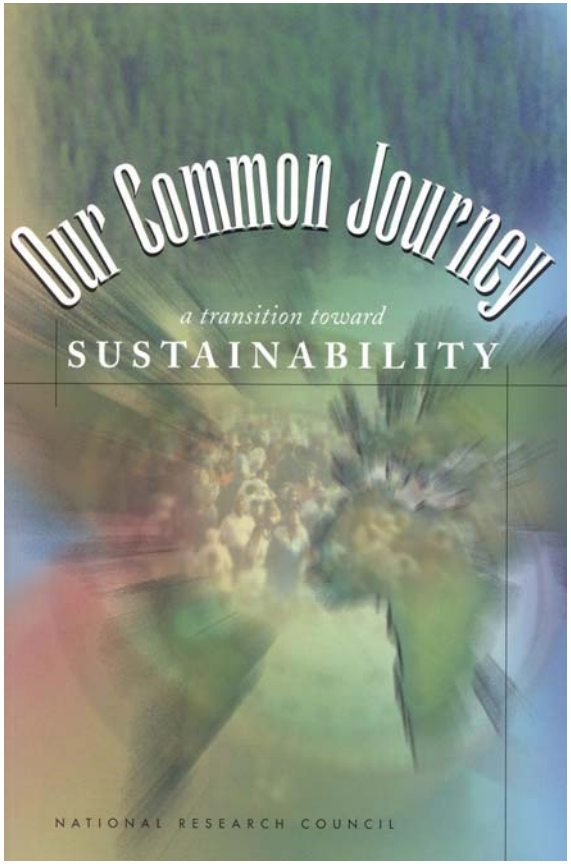
Roundtable on Science and Technology for Sustainability

"How can science and technology contribute more effectively to achieve society's goals of sustainable development?"

A bit of history….

Board on Sustainable Development examined how S&T can help ensure that human needs are met while the Earth's environment is sustained and restored

Our Common Journey **emphasized need for new interdisciplinary "sustainability science and technology"**



What do we mean by Sustainable Development?

- **Common Goals**
  - **Meet human needs of a much larger population**
  - **Sustain life support systems of the planet**
  - **Reduce hunger and poverty**

- **Focus on a transition**

A Brief History of Sustainable Development: Areas for Action

WCED, 1987 Our Common Future	NAS-BSD, 1999 Our Common Journey	Kofi Annan, 2002 WSSD:An Achievable agenda
Population & Human Resources	Human Population	Health
Food Security	Agriculture	Agriculture
Species & Ecosystems	Living Resources	Biodiversity
Energy	Energy	Energy
Industry	Industry	-
Urban Challenge	Cities	-
-	-	Water

What role for S&T?

"How can science and technology contribute more effectively to achieve society's goals of sustainable development?"

Act on what we know--
link knowledge and action; use knowledge in decision support

Develop new knowledge and approaches
focused on pressing problems

Roundtable on Science and Technology for Sustainability

The Roundtable:

- A forum for sharing views, information, analyses, and opportunities related to harnessing science and technology for sustainability.

- A platform from which we can promote change.

Roundtable principles

Roundtable focuses on:

- Strategic needs and opportunities for science and technology to contribute to the transition toward sustainability;
- Issues for which progress requires cooperation among multiple sectors;
- Activities where scientific knowledge and technology can help to advance practices that contribute directly to sustainability goals, in addition to identifying priorities for R&D inspired by sustainability challenges.

Roundtable on Science and Technology for Sustainability

Phase I Activities (2002-2005)

Annual Roundtable meetings

and

Task forces:

“Linking Knowledge with Action for Sustainable Development”

“Environmental Regulation and its Alternatives”

“Rapid Urbanization”

Task Force on Linking Knowledge to Action for Sustainable Development

Task Force Goal:

Connect research to information needs of public- and private-sector decision-makers so that it more effectively informs decisions, and ultimately, actions

Task Force Members:

William Clark, *Co-Chair*, Kennedy School of Government, Harvard University
James Mahoney, *Co-Chair*, National Oceanic and Atmospheric Administration
Robert Frosch, Kennedy School of Government, Harvard University
Gerald Keusch, Boston University
James McGroddy, IBM (retired)
Vernon Ruttan, University of Minnesota
Emmy Simmons, US Agency for International Development

Task Force on Environmental Regulation and Its Alternatives

Task Force Goal:

Facilitate dialogue among leaders in industry, government, policy and S&T community in order to identify 1) legal, regulatory, S&T, and social barriers to more environmentally sustainable development, and 2) opportunities for these communities to work together to address these barriers

Workshop on Environmental Regulation and its Alternatives

Pat Atkins, Alcoa (co-chair)

Brad Allenby, AT&T

Miriam Abraham, Woodrow Wilson International Center for Scholars

Diana Bauer, EPA

Jay Benforado, EPA

Chuck Bennett, The Conference Board

Leslie Carothers, Environmental Law Institute

David Constable, GlaxoSmithKline

John Dernbach, Pennsylvania Department of Environmental Protection

Ira Feldman, Greentrack Strategies

Paul Gilman, EPA

Jonathan Godsall, Canadian Embassy

Karl Hausker, Global Environment and Technology Foundation

Sharon Hayes, EPA

Tom Graedel, Yale University (co-chair)

Alan Hecht, EPA

DeWitt John, Bowdoin College

Charles Kent, EPA

Jerry Keusch, Boston University

Bernd Kramer, German Embassy

Stan Laskowski, University of Pennsylvania

Keith Laughlin, Rails to Trails Conservancy

Pam Matson, Stanford Univeristy

Ed Mongan, DuPont

Anna Phillips, EPA

David Rejeski, Woodrow Wilson International Center for Scholars

Lynn Schlosser, Eastman Chemical

Jim Solyst, American Chemistry Council

Laura Southerland, Canadian Embassy

Gary Waxmonsky, EPA

Workshop on Environmental Regulation and its Alternatives

Workshop identified several S&T and regulatory barriers

Identified topics where more focused workshops or studies could lead to progress

Rapid Urbanization

Task Force Goal:

Identify steps to enhance the contribution of science and technology in guiding rapid urbanization toward more sustainable pathways in the immediate future and multi-decadal time scale

Task Force Co-Chairs:

Chuck Redman, Arizona State University

Alexi Panehal, US Agency for International Development

Contributed to and coalesced with…..

Proposed Urban Environmental Sustainability Program

Goal:

- Help urban leaders and residents worldwide to use scientific knowledge and technology to help guide their economic growth in ways that will improve livelihoods and protect critical environmental and natural resources

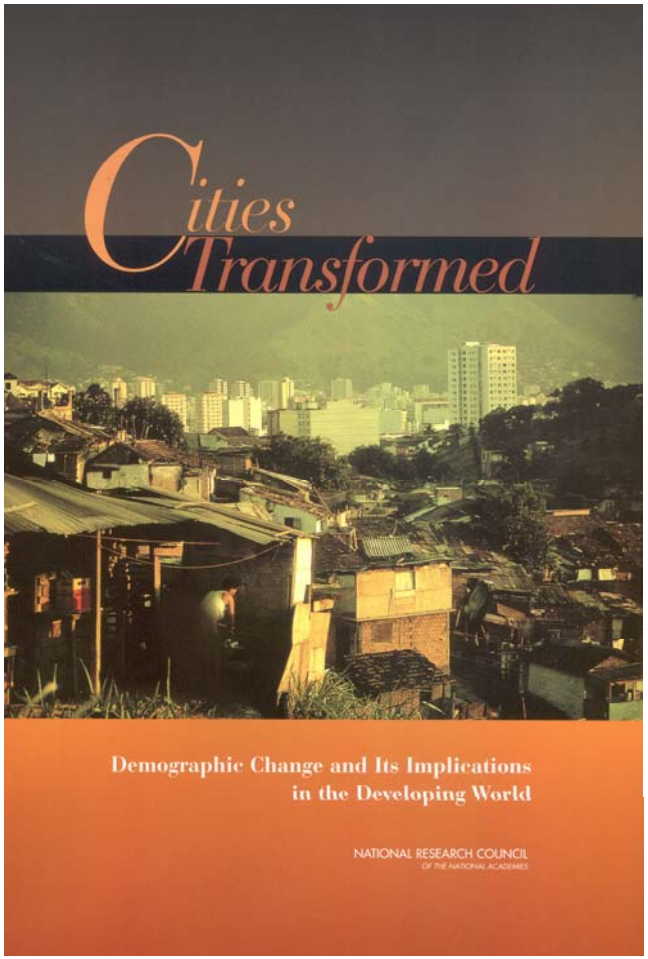
Objectives:

- foster the use of scientific knowledge and technology;
- enhance human and institutional capacity;
- encourage integrated urban planning and local environmental leadership;
- advance the science of urban environmental sustainability;
- extend successful local experience to cities worldwide, and
- evaluate the program's impacts and adaptively manage the program over time.

Urban Environmental Sustainability in Secondary Cities of the Developing World

Academies received 9-month planning grant from the Moore Foundation in June, 2005

Building on intellectual foundation of 2003 NRC report, *Cities Transformed*



Advisory Committee: Urban Environmental Sustainability

Lawrence T. Papay (Chair), SAIC (retired) ***

Xuemei Bai, Institute for Global Environmental Strategies (Kanagawa, Japan)

Ellen Brennan-Galvin, Yale University

Tim Campbell, World Bank Institute

Glen Daigger, CH2M Hill, Inc.

Ralph Gakenheimer, MIT

Simon Gonzalez, Institute of Engineering, Ciudad University, Mexico, D.F

Susan Hanson, Clark University

Jeremy Harris, Honolulu, Hawaii ***

Kai Lee, Williams College *

Akin Mabogunje, Development Policy Centre, Ibadan, Nigeria

Gordon McGranahan, IIED, London, United Kingdom

Todd Mitchell, Houston Advanced Research Center

Chuck Pill, Consultant, Arlington, Virginia

Chuck Redman, Arizona State University

Richard Stren, University of Toronto

Tom Wilbanks, Oakridge National Laboratory

Yueman Yeung, Chinese University of Hong Kong

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STS Roundtable Phase II Potential Next Steps

Continue work on linking knowledge with action for sustainable development. Examine "what works and why" in linking knowledge with action in agriculture, health, conservation, urban sustainability efforts.

Identify common metrics/indicators for sustainability.

Develop "sustainability roadmaps" on key sustainability issues, such as energy and agricultural production.

Apply knowledge about human (and institutional) behavior from social science and economics to identify practical actions to promote sustainability.

Convene focused workshops on specific sustainability issues where there is considerable disagreement within the science and technology community.

Provide leadership on research and development agenda for sustainability science and technology.

Develop education materials on S&T for sustainability

Roundtable principles

Roundtable focuses on:

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Questions

What do you most need from S&T to address your most critical sustainability challenges?

What do you most need/want from the Roundtable?

What are practical goals for the Roundtable over next three years?

STS Roundtable

end

Roundtable Members – Phase I

Pamela Matson (Co-Chair), Stanford University
Ghassem Asrar, NASA*
Patrick Atkins, Alcoa
George Atkinson, Department of State*
Arden Bement, NSF*
Nancy Birdsall, Center for Global Development
William Clark, Harvard University
James Connaughton, CEQ*
David Garman, Department of Energy*
Paul Gilman, EPA*
Thomas Graedel, Yale University
Charles Groat, USGS*
Stuart Hart, University of North Carolina, Chapel Hill
James Mahoney (Co-Chair), National Oceanic and Atmospheric Administration*
George Hornberger, University of Virginia
Sharon Hrynkow, Fogarrty International Center, Health and Human Services*
Joseph Jen, USDA*
Calestous Juma, Harvard University*
Jonathan Lash, World Resources Institute*
John Marburger, OSTP*
Todd Mitchell, Houston Advanced Research Center
Peter Raven, Missouri Botanical Garden
Jeffrey Sachs, Columbia University
Emmy Simmons, USAID*

*Denotes *ex-officio* member

S&T for Sustainability at the National Academies: Selected Examples

Guiding Sustainability Science and Technology

- Roundtable on Science and Technology for Sustainability
- Green Chemistry and Chemical Engineering Education
- The Key National Indicators Initiative

Characterizing the Nature and Extent of Challenges to Sustainability

- Effects of Fishing on Marine Ecosystems
- Environmental Impacts of Wind Energy Projects
- The Mississippi River and the Clean Water Act

S&T for Sustainability at the National Academies: Selected Examples

Catalyzing Research and Technology Development

- Review of the Desalinization Research Roadmap
- Prospective Benefits of DOE's Energy Efficiency and Fossil Energy R&D Programs
- Grainger Challenge Prizes for a Sustainable Future (NAE)

Applying Knowledge to Actions for Sustainability

- Strengthening Science-Based Decision-Making in Developing Countries (established in 2002, post WSSD)
- Grand Challenges for Sustainability in the Chemical Industry
- Energy Futures and Air Pollution in Urban China and the United States

Roundtable on Science and Technology for Sustainability

"How can science and technology contribute more effectively to achieve society's goals of sustainable development?"

Pam's question: How can we more effectively mobilize and harness the strengths of academic institutions to help achieve these goals?

Decision makers

Improved understanding

Existing understanding

(modified from Stokes, 1997)

Environmental Changes Resulting from Human Activities

- Atmospheric compositional changes
- Climate change
- Land cover and land use changes
- Biological invasions and biodiversity loss
- Loss of ecosystem services
- Water resources limitations
- Soil degradation
- Nitrogen and phosphorus enrichment

Decision makers

Improved understanding

Existing understanding

(modified from Stokes, 1997)

Decision Makers

Improved understanding

Improved technology

Existing understanding

Existing technology

(modified from Stokes, 1997)

Decision Makers

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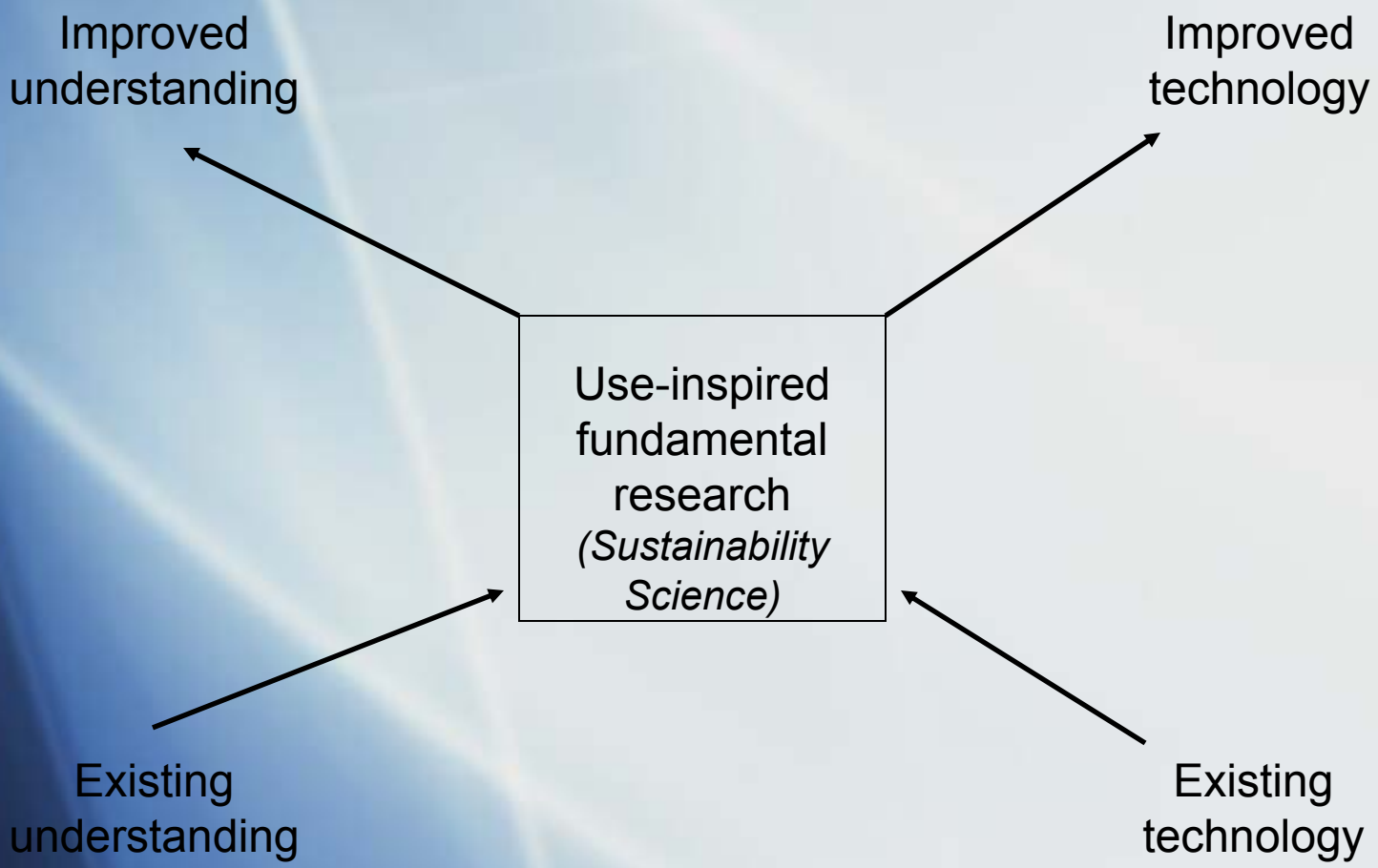
Decision Makers



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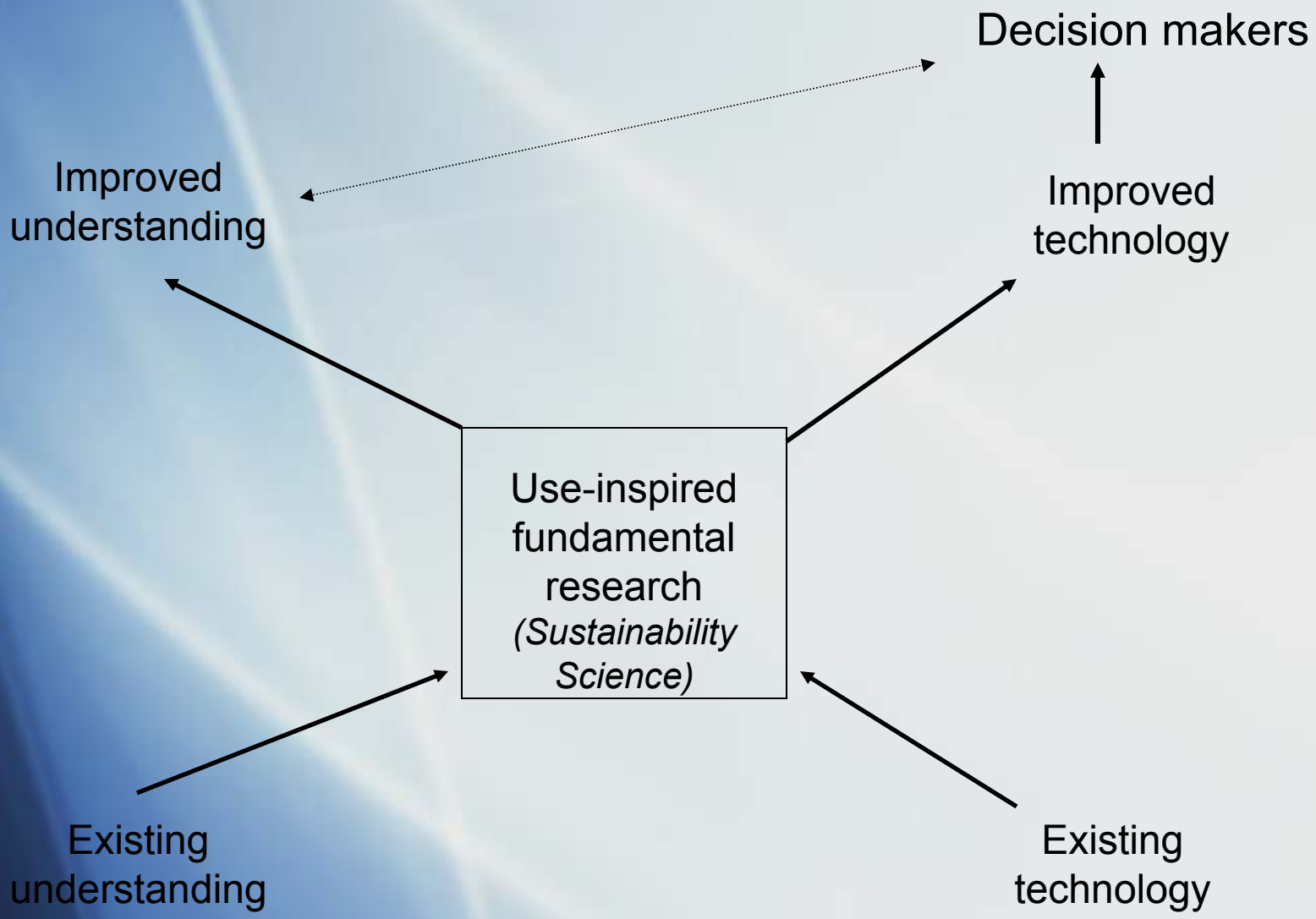

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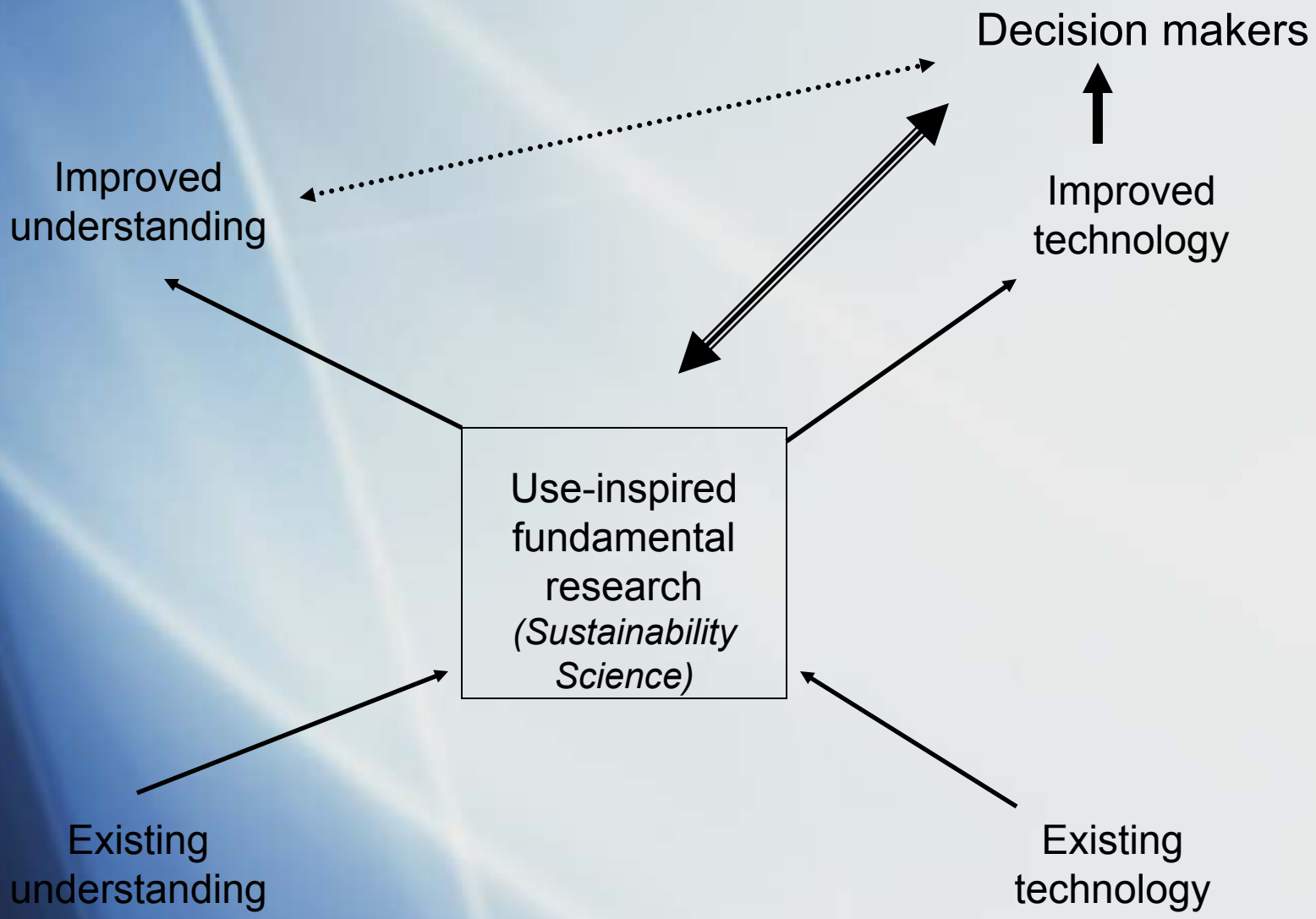


(modified from Stokes, 1997)

The Disciplinary Scope of Sustainability Science

economics, politics, anthropology, culture, history, demography, law, technology, etc

ecology, climatology, atmospheric chemistry and physics, environmental chemistry, limnology, soil science, geography, etc

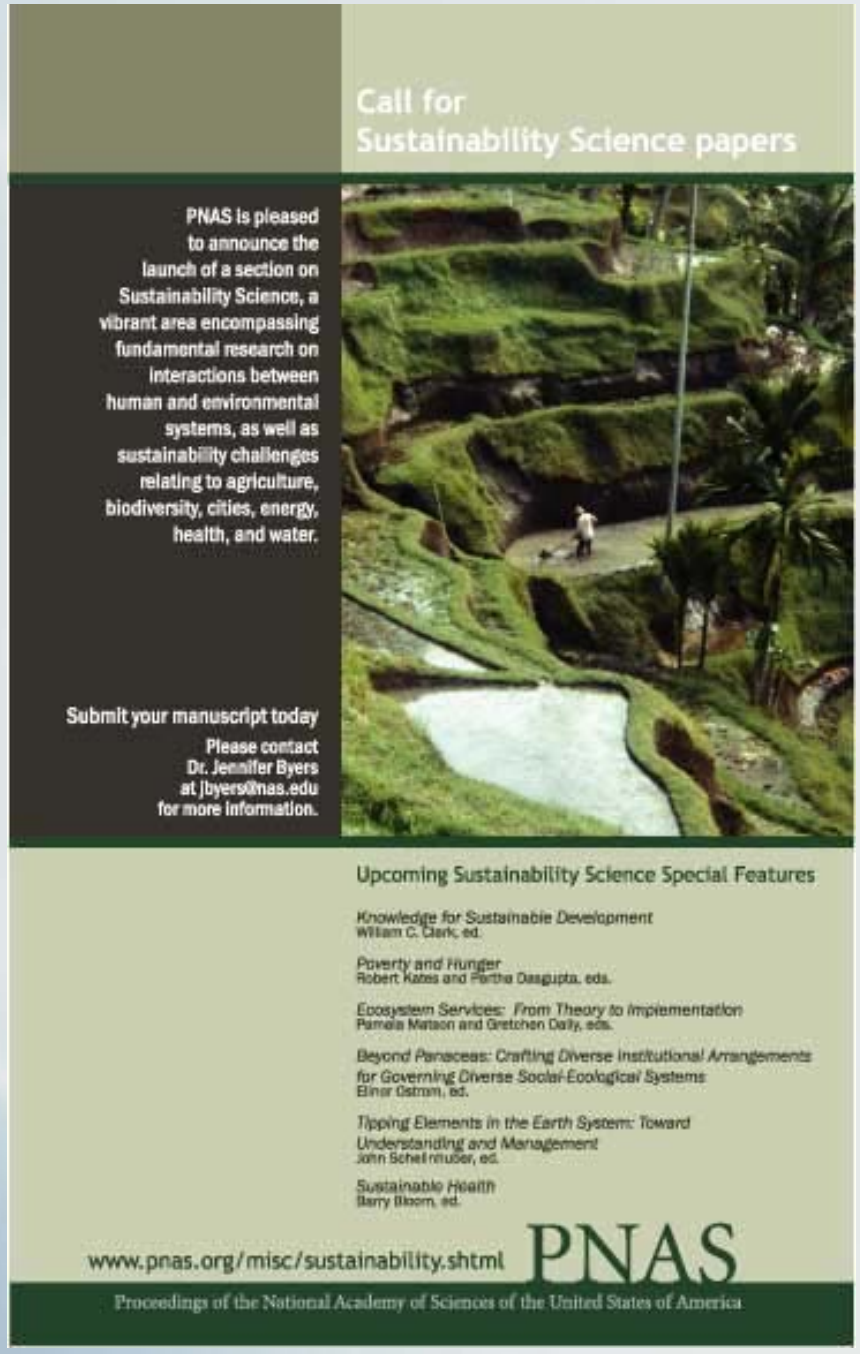
The Problem Scope of Sustainability Science

Trends and transitions, production and consumption systems, vulnerability and resilience, adaptation, thresholds, institutions, incentives, governance……

…”Facilitates information exchange and discussion among individuals, institutions, and networks engaged in S&T for sustainability.”

http://sustsci.aaas.org/index.html

"…fundamental research on interactions between human and environment systems, as well as sustainability challenges relating to agriculture, biodiversity, cities, energy, health, and water."



How can we more effectively mobilize and harness the strengths of academic institutions to help achieve these goals?

How should academic scientists link with decision makers? ("uncommon dialogues" and partnerships)

How should academic institutions be altered to make such interactions commonplace?

How can we more effectively mobilize and harness the strengths of academic institutions to help achieve these goals?

What the most critical needs? Are the "grand challenges of sustainability" defined by the academic community the right ones?

How can the federal research agenda and research funding be made to reflect these needs? What about public-private partnerships for research?