



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

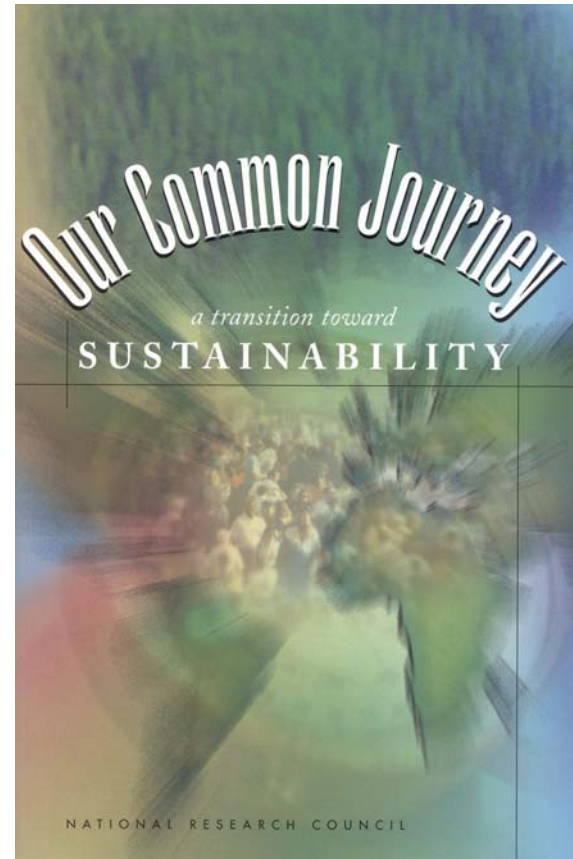
“How can science and technology contribute more effectively to achieve society’s goals of sustainable development?”



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:

- ④ Strategic needs and opportunities for science and technology to contribute to the transition toward sustainability;
- ④ Issues for which progress requires cooperation among multiple sectors;
- ④ 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 University

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:

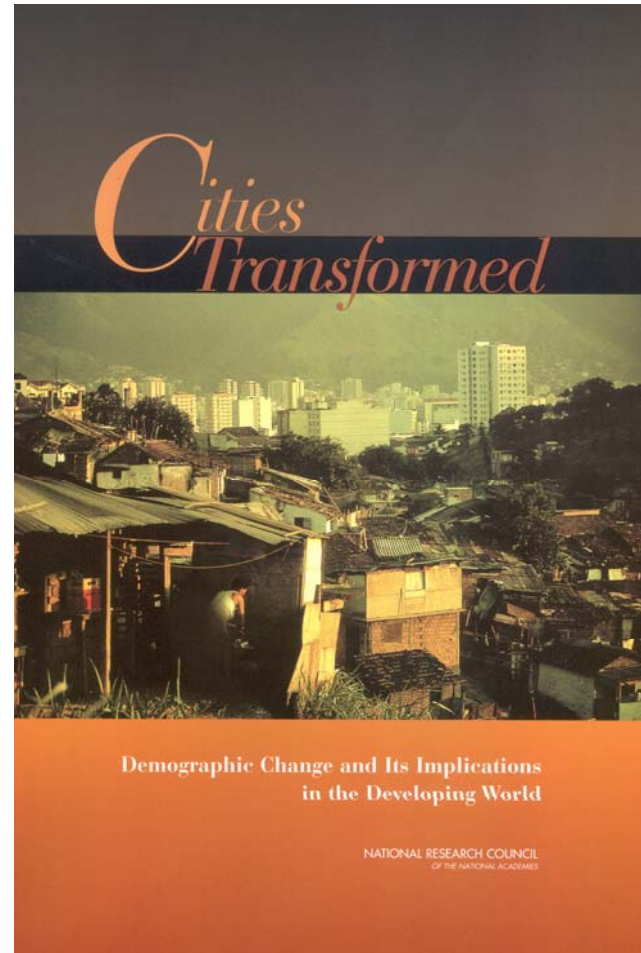
- foster the use of scientific knowledge and technology;
- enhance human and institutional capacity;
- encourage integrated urban planning and local environmental leadership;
- advance the science of urban environmental sustainability;
- extend successful local experience to cities worldwide, and
- evaluate 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



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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, Fogarty 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



Existing
understanding



Improved
technology

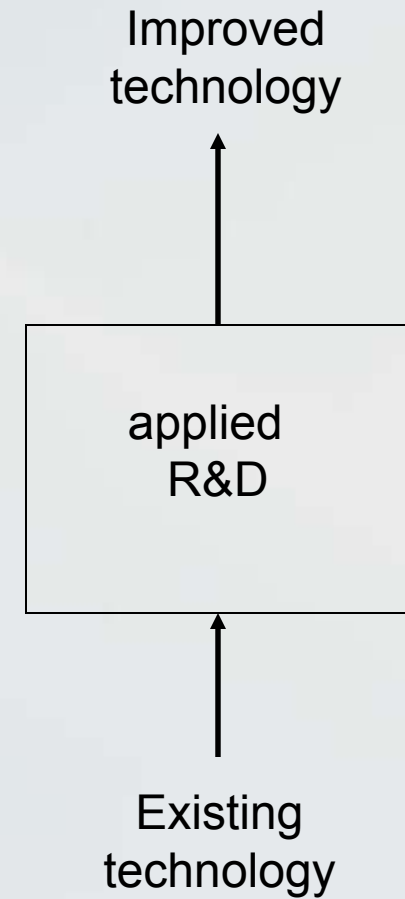
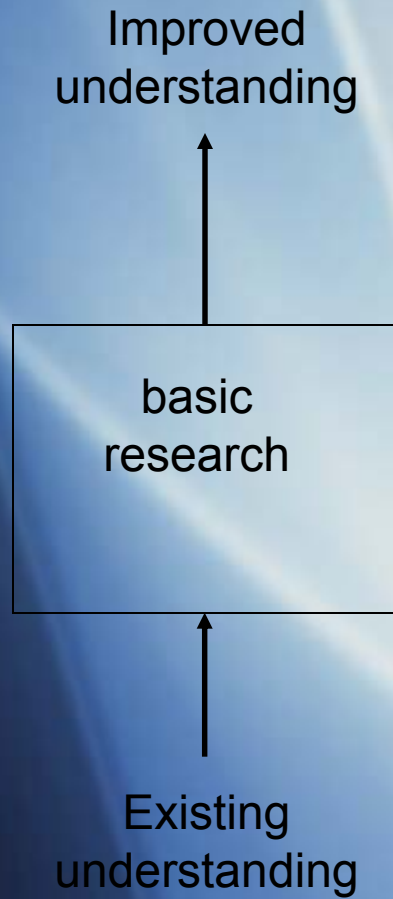


Existing
technology



(modified from Stokes, 1997)

Decision Makers



(modified from Stokes, 1997)

Improved
understanding

Improved
technology

Existing
understanding

Existing
technology

Use-inspired
fundamental
research
(*Sustainability
Science*)



Improved
understanding

Decision makers

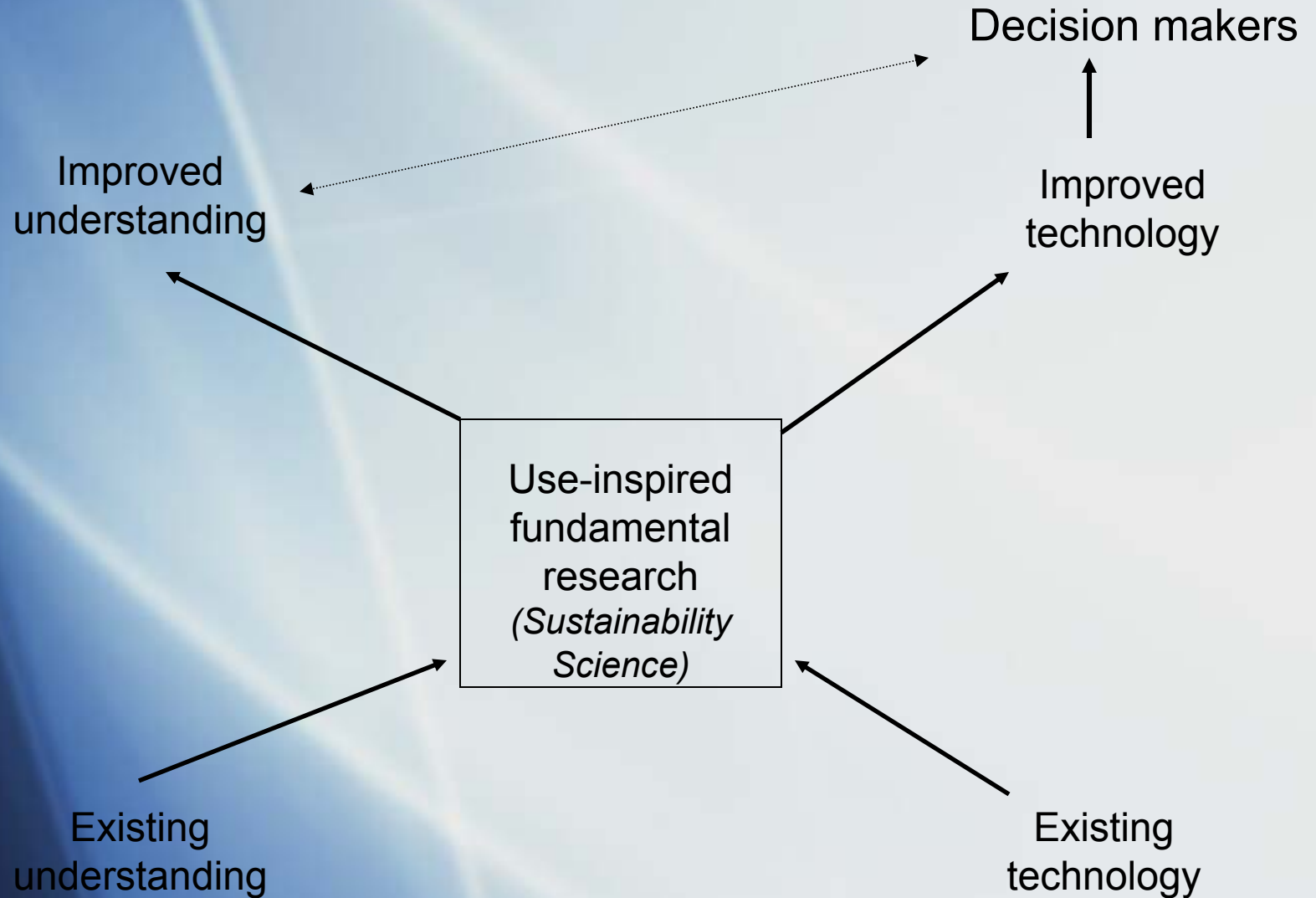
Improved
technology

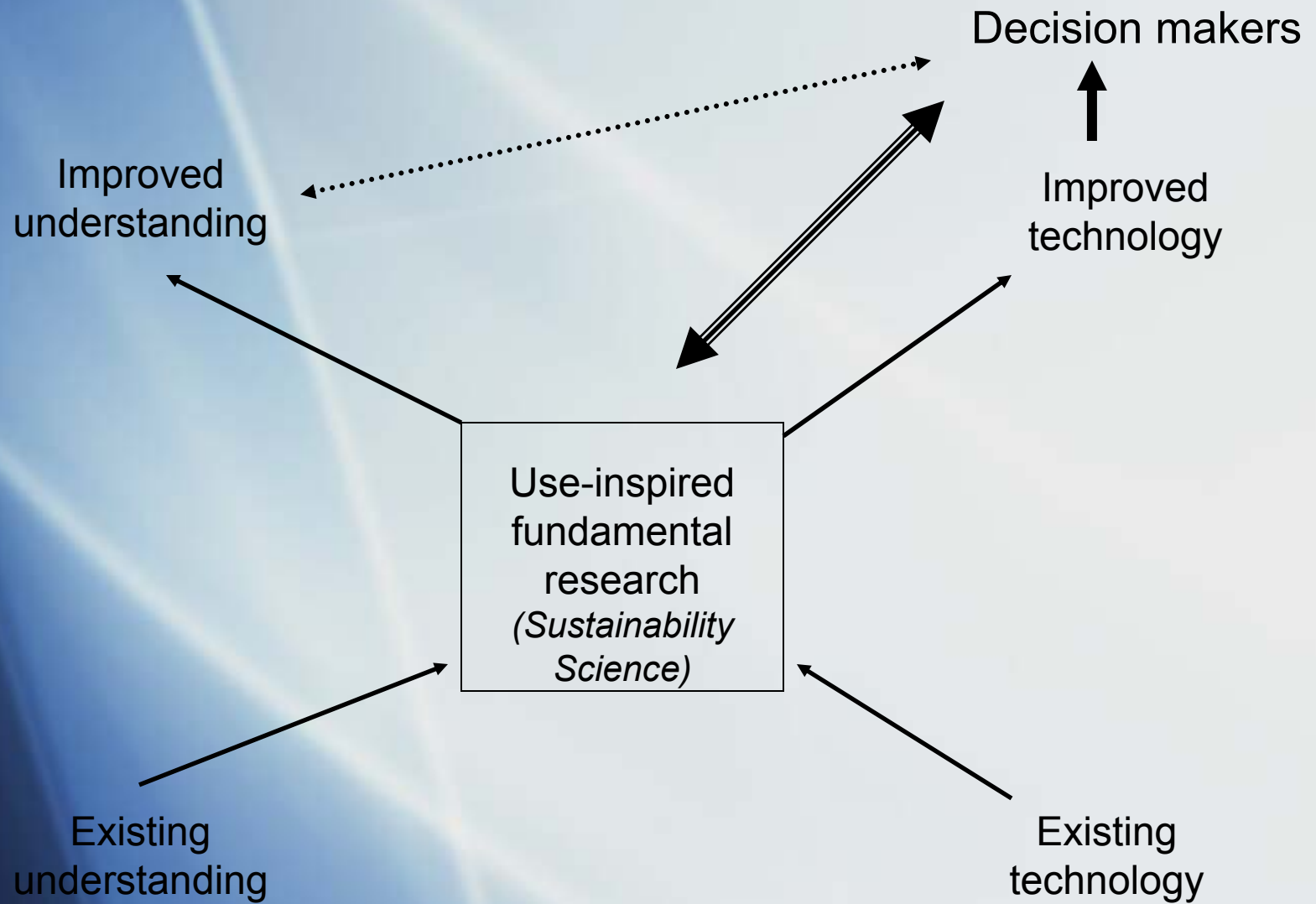
Use-inspired
fundamental
research
(*Sustainability
Science*)

Existing
understanding

Existing
technology

(modified from Stokes, 1997)





(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>

FORUM: Science and Innovation for Sustainable Development

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Welcome to the Forum

The Forum: Science and Innovation for Sustainable Development seeks to facilitate information exchange and discussion among the growing and diverse group of individuals, institutions, and networks engaged in the field of science and technology for sustainability. It seeks to provide access to emerging ideas, relevant activities, key documents and web sites. The [Editors](#) welcome contributions and suggestions for posting to the Forum. The Forum covers evolving discussions over the [core themes](#) and challenges for knowledge and action of science and technology for sustainability, [documents](#) that chart the field's aims and progress, [events](#) of special interest to the community, and [programs and institutions](#) that are playing a special role in the evolution of the field. It also includes relevant [commentary](#) on posted documents and core questions, and examples of [integrated studies of nature-society systems](#) and [courses and educational programs](#) that go beyond the study of environment and development separately and deal with the contributions of S&T to sustainable development.

What's New

Publication: Conditions for sustainability of human-environment systems: Information, motivation, and capacity

Event: Governance for Sustainable Development (Starting 05 February 2006)

Education: International Master's Programme in Environmental Studies and Sustainability Science (Lund University, Sweden)

Publication: Journal of Industrial Ecology: Special Issue on Consumption

Key Journal: Journal of Engineering for Sustainable Development: Energy, Environment, and Health

Event: Atlanta Conference in S&T Policy (Starting 18 May 2006)

Event: Science, Technology and Innovation Policy - Executive Education (Starting 12 November 2006)

Event: Science & Technology in Society: An International Multidisciplinary Graduate Student Conference (Starting 22 April 2006)

Event: S & T and Sustainability (Starting 21 November 2005)

Event: Action in Place: Promoting Community and Environmental Sustainability (Starting 06 October 2005)

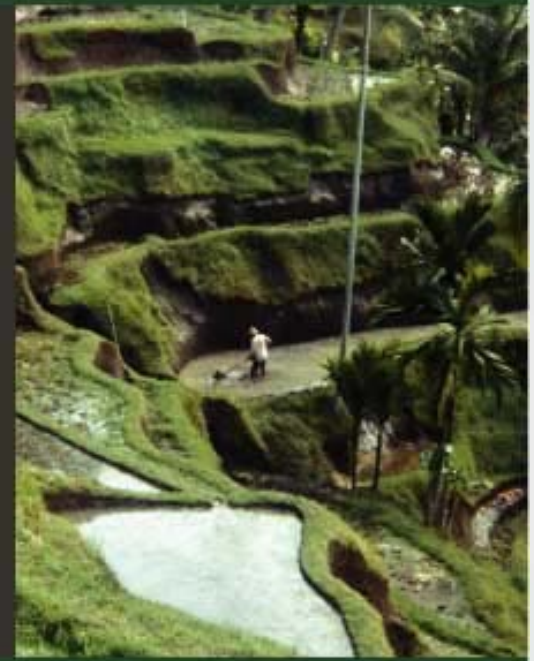
“...fundamental research on interactions between human and environment systems, as well as sustainability challenges relating to agriculture, biodiversity, cities, energy, health, and water.”

Call for Sustainability Science papers

PNAS is pleased to announce the launch of a section on Sustainability Science, a vibrant area encompassing fundamental research on interactions between human and environmental systems, as well as sustainability challenges relating to agriculture, biodiversity, cities, energy, health, and water.

Submit your manuscript today

Please contact
Dr. Jennifer Byers
at jbyers@pnas.edu
for more information.



Upcoming Sustainability Science Special Features

Knowledge for Sustainable Development
William C. Clark, ed.

Poverty and Hunger
Robert Kates and Partha Dasgupta, eds.

Ecosystem Services: From Theory to Implementation
Pamela Matson and Gretchen Daily, eds.

Beyond Panaceas: Crafting Diverse Institutional Arrangements for Governing Diverse Social-Ecological Systems
Elinor Ostrom, ed.

Tipping Elements in the Earth System: Toward Understanding and Management
John Schellmeyer, ed.

Sustainable Health
Barry Bloom, ed.

www.pnas.org/misc/sustainability.shtml

PNAS

Proceedings of the National Academy of Sciences of the United States of America

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?