Some Thoughts Regarding SBE Support for Environmental Research

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The Funding Mix

- Most SBE awards for environmental projects always have come from regular competitions in the standing programs.
- Many special competitions have focused primarily on the SBE sciences.
- More recent special competitions have aimed to foster interdisciplinary research spanning the natural and SBE sciences.
- SBE scientists use a broad range of methods when conducting scientific research.

Support in Standing SBE Programs

- Some programs actively support environmental research because of major theoretical emphases in their communities.
  - Geography; Decision, Risk, and Management Sciences; Anthropology
- Other programs tend to see the environment as an "application domain."
  - Economics; Social Psychology
- A third group of programs provides some support for theoretically driven work in environmental settings
  - Sociology; Developmental and Learning Sciences

Special Competitions Focusing Largely on the SBE Sciences

- Mid-1990s to early 2000s: Human Dimensions of Global Change (HDGC), centers and teams
- 2004-: Decision Making Under Uncertainty (DMUU), centers, part of the Climate Change Research Initiative
  - Major centers at Arizona State, Carnegie Mellon, and Columbia.
  - Smaller centers at RAND and Colorado, Boulder.

- Ongoing support from the 1990s to the present for program and project offices of major international collaborative activities
  - International Human Dimensions Programme (IHDP) secretariat
  - Land-Use/-Cover Change (LUCC) Focus 1 project office
  - Institutional Dimensions of Global Environmental Change project office
  - New IHDP Urbanization project office

Special Competitions Integrating the SBE and Natural Sciences

- Methods and Models for Integrated Assessment competition in the late 1990s.
- Support for SBE science involvement in work of the Long-Term Ecological Research (LTER) sites and network.
  - Core support for Urban LTER sites, supplemental support for other integration-building activities
- Participation in Biocomplexity in the Environment special competitions in the early 2000s
  - Dynamics of Coupled Natural and Human Systems (CNH) and Materials Use: Science, Engineering, and Society (MUSES)

- Human and Social Dynamics (HSD) priority area competitions since 2004.
  - About one-third of all HSD awards have environmental links.
- Establishment of Dynamics of Coupled Natural and Human Systems (CNH) as a standing, multi-directorate program.
  - Jointly sponsored by BIO, GEO, SBE; other directorates/office may join.
- Longer-term visions include effectively integrated activities, initiatives, and possibly campaigns to engage more SBE scientists in research that has significant environmental implications.

SBE Scientists Use a Broad Range of Methods

- Monitoring patterns of human activity
  - From remotely sensed imagery to records of utility use and other non-obtrusive measurement strategies
- Laboratory and field experiments
- Surveys and interviews
- Ethnographies
- Analyses of textual and other archival records
- Collection and analyses of artifacts
- Statistical modeling, data mining, visualization, and other statistical approaches
- Simulation modeling, including agent-based and cellular automata modeling
- Frequent use of multiple methods to "triangulate"

Some Major Lessons Learned

- Ground activities firmly in theory
- Experience with "big science"
- Experience with large-scale data-collection activities
- Heed our own advice

Ground Activities Firmly in Theory

- The most significant advances in SBE research related to the environment have resulted when research and related activities are firmly grounded in and contribute to the enhancement of fundamental theory in and across the SBE sciences.
- Narrowly applied or "reactive" research may serve short-term needs but often fails to contribute to sustained community engagement.
- SBE environmental research projects may have a range of theoretical motivations that are separate from specific environmental issues.

Experience with "Big Science"

- SBE sciences traditionally have been "cottage industries" rather than "factories."
- Experience with HDGC, DMUU, and other centers as well as international collaborative programs like LUCC has shown synergies and contributions of participating in larger-scale coordinated activities.
- The most successful activities have been those whose origin has been grounded in fundamental theoretical inquiries.
- Activities focused on serving the immediate needs of stakeholders, decision makers, and/or other "users" have worked only when strong theoretical emphasis has been maintained (often with external pressure from NSF).

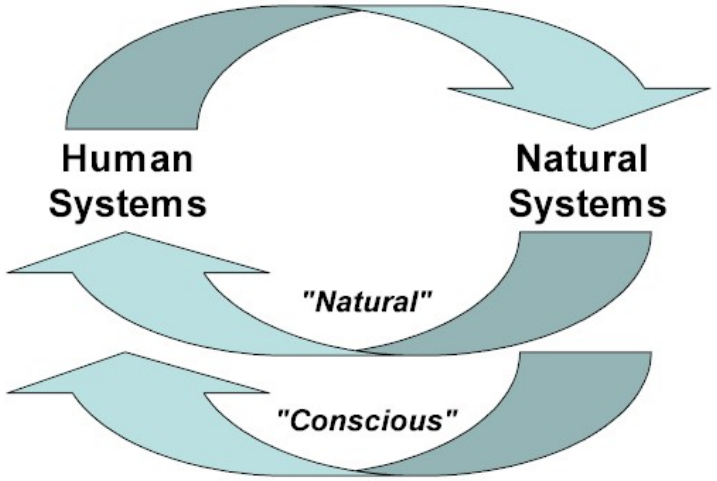
Experience with Large-Scale Data-Collection Activities

- SBE sciences have long experience with long-term, large-scale data-collection activities:
  - U.S. Censuses and other federal statistical programs
  - Within SBE, long-term support for the Panel Study of Income Dynamics, General Social Survey, and the American National Election Studies
- Archiving of data from individual projects has long been an emphasis in SBE
  - A major archive is the Inter-University Consortium for Political and Social Research (ICPSR).

- SBE-supported activities have been most successful when they have emphasized collection of data to answer core questions that are firmly grounded in sound theory. Sound scholarship requires collection of data in ways that are consistent with the kinds of analyses for which they will be used.

Heed Our Own Advice

- General paradigmatic approach for many of the SBE environmental thrusts for nearly 2 decades has been:
  - People do things that impact on natural systems.
  - Natural system do things that lead people to respond in "natural" ways.
  - Natural system do things that lead people to respond through consciously planned responses.



- This approach may be descriptively accurate, but it may not be intellectually stimulating, especially with respect to core theoretical issues in the SBE sciences.

What Are Theoretically Compelling Questions About the Environment for SBE Scientists?

- Topics and perspectives that seem to excite SBE scientists include:
  - Dynamics of human activity
    - Population, resource consumption, technological capabilities
  - Cognition, attitudes, perceptions, values, and beliefs
  - Informal arrangements, formal structures, and organizations
  - Interactions across scales: spatial, temporal, and organizational
  - Adaptation, resilience, robustness, sustainability
  - Uncertainty
  - Quality of life and environmental management options
  - Inter-generational equity