

Lessons Learned from the International Workshop on Science, Technology and Sustainability: Harnessing Institutional Synergies

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Organized by the
Third World Academy of Sciences
as part of its contribution to the international
Initiative on Science and Technology for Sustainability

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I. The Workshop

From 6-9 February, 2002, the Third World Academy of Sciences, as part of its contribution to the international Initiative on Science and Technology for Sustainability, convened a workshop to explore how to better harness science and technology to reach goals of sustainable development. Fifty participants represented a broad range of experience in designing research, observation, monitoring, assessment and decision support systems. They were chosen through a nomination process that identified individuals and organizations with rich experience in successfully constructing and maintaining institutions which link science, technology and sustainable development. Such a nomination process provided a unique workshop environment for providing, sharing, and learning from extensive experience in dealing with problems that spanned global through local levels. Regional representation was broad, with participants coming from: South, North, and Central America; western, eastern and southern Africa; Europe; east, southeast, and southern Asia; Oceania; and the Middle East.

II. Lessons Learned

The growing concern with making development more sustainable and the accompanying realization that issues affecting the welfare of humankind span all the way from the global to the local level have raised new challenges both for science and technology. Members of the scientific community are becoming increasingly aware that they are not in a state of “normal science” or “business as usual”, but rather in one of transition, if not revolution. Many of the assumptions on which science has been conducted are being challenged. For example, analysis of a single scale, cause, or hypothesis is seen as inadequate and is being replaced by an integrative approach assuming multiple scales, causes and hypotheses. Interdisciplinarity is viewed as an important complement to disciplinary focus. There is also a greater readiness to accept that indigenous knowledge is a valuable source for solving problems. The interest in sustainable development, therefore, is encouraging a change in some of the basic parameters of how science is being carried out. Asking the right questions is becoming as important as providing the right answers. Doing the right things becomes as significant as doing things right.

These emerging emphases raises crucial questions about the institutional readiness and capacity to bring science and technology to bear on development in new ways. Institutions are

typically created to solve specific problems through the adoptions and implementation of policy. They grow and sometimes reinvent themselves in response to changes and challenges in specific social, environmental, economic, political, cultural, and legal contexts. Harnessing institutional synergies for bringing science and technology closer to sustainable development, therefore, inevitably involves a varied approach.

Participants spent three full days examining, reflecting upon, and suggesting ways, many of them new and challenging, to (1) ensure better integration of disciplinary perspectives, different forms of knowledge, science and policy, as well as issues of scale and time disparities; (2) enhance learning and adaptation through various types of feedback, including institutionalized evaluation processes; (3) identify how participation can best be institutionalized under what conditions; and (4) overcome resource and capacity constraints. Such lessons learned are based on specific cases illuminated by participants as part of the proceedings of the workshop (See Appendix for a list of cases.) The rest of this report elaborates on the more specific issues raised under each of these four themes.

A. Solving challenges of integration

Integrating across numerous dimensions is an enormous challenge in creating robust systems of science to support sustainable development. The underlying premise is a perceived need to move beyond the current approaches which view human-environment interactions from the perspective of a single discipline (e.g., economics), a single functional agency (e.g., the Department of Forestry), a single level (e.g., a nation), a single source of knowledge (e.g., western science), a single skill set (e.g., model building), a single interest (e.g., the energy industry), or a single issue (e.g., water quality). Grounded in a wide range of examples, participants in the workshop identified a variety of lessons learned about institutional mechanisms for addressing challenges of integration:

- **Clearly define problem and expected outcome[s]**
Clear definition of the problem highlights the potential linkages across issues and the potential complementary contributions of multiple disciplines.
- **Engage Relevant skills, knowledge and interests**
The project must contain, or have ready access to, the skills and knowledge needed to attack the defined problem. This will not just involve relevant academic disciplines but also the appropriate local knowledge, craft skills or indigenous understandings, and links between public and private sector efforts. Where there are significant different interests, such as foresters and farmers, or fishers and irrigators, or developers and conservationists, or producers and regulators, it is important to ensure that the competing interests have access to the process. (See Participation section below.)
- **Appropriate organization and management: co-production**
An integrated approach requires organization appropriate to the task and skilled management, ideally involving leadership by people with the intellectual and personal capacity to ensure coherent working on the problem. It also requires iterated communication, agenda setting, problem-framing, and analysis such that “producers” and “users” of information co-produce knowledge that is useful for problem-solving.
- **Institutionalize mechanisms for conflict resolution**
The process must include mechanisms for resolving conflicts arising from different disciplinary backgrounds or competing interests, recognizing that such conflicts can be useful or even creative.

- **Develop common language**
A key step to success is the developing of a common language for discussion of the problem. Articulation of alternative story-lines or development of different future scenarios can be a useful way to tease out the implications of competing approaches to the problem.
- **Recognize the limits of integration**
Integration requires tradeoffs, for example, between efficiency and specificity, and explicitly addressing such tradeoffs should be part of the process.
- **Appropriate institutional arrangements, and ability to adapt.**
There is no universal model or agreed best structure to support integrated approaches to complex problems. It is clear, however that the institutional structure must be both durable and robust, with the capacity to learn and adapt to changing needs, possibly growing organically to tackle new challenges. (See Adaptiveness section below.)

B. Solving challenges of adaptiveness, learning, and evaluation

Given rapidly changing external environments and the potential identification of novel approaches to produce problem-solving knowledge, institutional constraints must be overcome before science and technology systems can adapt. In fact, a balance must be struck between stability/continuity and flexibility/ability to change. Lessons about how to achieve such a balance and provide an institutional environment that is amenable to learning include:

- **Achieve institutional stability necessary for learning:**
 - Attain long term funding;
 - Embed science and technology and R&D efforts in long-standing institutions (e.g., Universities);
 - Provide mechanisms for leadership transfer (e.g., mechanisms for succession, 2-tier leadership structures, shared leadership);
 - See Resources and Capacity section below for related lessons.
- **Institutionalize communication between users, producers of S&T:**
 - Empower users to evaluate services, set demands (e.g., set research agendas);
 - Hold producers of S&T accountable to users;
 - Assure that users are representative; and
 - Provide institutionalized and periodic venues for communication.
- **Balance the need to stay focused and need to think outside the box:**
 - Benchmark with others doing similar jobs;
 - Form new partnerships (N-S; S-S);
 - Design incentive structures to cross-fertilize; and
 - Engage outside review boards (e.g., to compare mission to actual activities).
- **Institutionalize mechanisms for self-reflection:**
 - Formally set goals;
 - Articulate measures of performance;
 - Create transparency of agenda setting, processes, and partnership relationship; and
 - Build in suitable evaluation/ review mechanisms, such as:

External, donor-driven evaluation;
Internally commissioned external (peer) review;
Internal on-going reviews (e.g., rotating panel of internal reviewers);
Engaging dissenters, skeptics, and deviants in the process; and
Utilization of market signals.

C. Solving challenges of participation

An emerging understanding of the implications of deciding *who* participates, *when*, and for *what purpose* frames the challenges of participation when harnessing science to address issues of sustainable development. In addition, there is relatively little understanding of the tradeoffs involved in participation decisions (e.g., how increasing public participation might increase political legitimacy, but might decrease the scientific credibility of the research designed to support the decision making.) Lessons learned to address these challenges include:

- **General framing of participation:**
 - Participation: can be a mechanism for trust building and consensus building; can be a podium for interactions to occur; can enhance accountability; can protect from political change; and is a prerequisite for sustainability.
 - Participation is important for reasons that are: ethical/normative (right to participation and empowerment); pragmatic (more likely to produce effective and politically legitimate results; and it is a way to deal with integration, support and funding); and epistemological (access to different constructions of knowledge).
 - Participation can be used to avoid conflict: Conflict arises at three levels: differences about facts (usually due to ignorance or misinformation); differences about theories or belief systems (which cannot be resolved in any easy way, but must certainly be taken into account); disagreements of values (more difficult to solve).
- **Clearly articulate the beginning of the process, what type of participation is needed:**
 - information disclosure;
 - consultation (getting feedback on ideas and actions periodically);
 - engagement (more collaboration in forming ideas and actions);
 - negotiation (greater decision making contestation, although no guarantee of political sharing authority);
 - deliberation/joint decision-making involves sharing of authority.
- **A long-term, dynamic view of participation is required.**
 - Create multiple points of entry and departure at different stages in the process.
- **Empower participants by building local institutional capacity.**
 - Provide access to information and knowledge transfer (e.g., translate into local languages, and have multiple media of participation);
 - Institute a transparent process of choosing processes of representation;
 - Support younger scientists so that they can develop knowledge of comparable situations elsewhere.
- **Integrate indigenous/traditional knowledge through participation.**
 - Include indigenous knowledge early on in project design.

- **Costs of participation need to be compared to costs of not having participation.** Effective participation requires resources, time and building of trust. There can be political and social costs as well. How are these costs balanced with the advantages (outlined above) of having participation?

D. Solving resource and capacity constraints

Resource and capacity constraints are chronic to sustainable development challenges. Given these constraints, however, it may be possible to more effectively allocate resources and target investments in capacity development that addresses the most critical problems of a sustainability transition.

Resourcing

- **Strategic partnerships underpin most success stories.**
 - Importance of “alignment of interests” among partners;
 - Clearly defined roles and rules of engagement;
 - Effective leveraging;
 - Equitable contributions and benefit sharing;
 - Shared ownership in successful outcomes.
- **Catalysts (organizational and individual) play a critical role in success stories**
 - Catalysts are often third parties (not necessarily donors or recipients);
 - Catalysts identify or create windows of opportunity and broker partnership agreements.
- **Create innovative funding mechanisms, such as “autonomous funds” programs, which are:**
 - Public, but politically independent;
 - Caters to civil society and government;
 - Focuses on funding, not operations;
 - Aggregates funding from multiple sources; and
 - Brings donors and recipients together in new ways.

Capacity Building

- **University systems are the backbone of robust knowledge systems.**
 - Cannot build capacity around them;
 - Best conceived as both nodes and networks;
 - Avoid duplication and build regional scale competencies in priority areas;
 - Systems should feed into and renew vital national academies of science.
- **ICTs are a transformative tool.**

- In effective education;
- For universal access to knowledge systems;
- For distance learning.
- **Capacity building must include successful strategies for reversing brain-drain.**
- **Capacity building must include successful strategies for educating political leaders.**

Synergies

- **Focus on developing individuals core competencies**
 - Leadership
 - Technical Expertise
 - Institutional re-engineering skills
- **Complementary focus on organizational and network development**
 - Linking strong individuals to strong organizations and networks
 - Successful international networks are built upon successful local and regional ones

E. Cross-cutting issues:

- 1. Leadership**
- 2. Transparency**
- 3. Communication**
- 4. Networks**
- 5. Sufficient political will a necessary condition**

Appendix: Cases

Dam management in Nigeria
Bangladesh Centre for Advanced Studies
Tarahat.com: A rural portal for India
Honey Bee Network
Improving climate services for society in Costa Rica
Mainstreaming indigenous knowledge for sustainable livelihoods: Gujarat, India
Interactions between science and policy: Human stem cells in the UK
World Commission on Dams
The Latin American World Model
The Flood Action Plan in Bangladesh
The National Environment Management Action Plan, Bangladesh
The Science and Technology Diplomacy Initiative, UN Conference on Trade and Development
Development of Fish Base: Global encyclopedia of all finfish
Enhancing development policy in Nigeria
Oil spill sensitivity mapping in Greenland
University initiatives: professional studies in education
International cooperation in mathematics education: African mathematics programme
International Foundation for Science
Capacity building in air quality management/air pollution sector in Thailand
Information and communication technologies in capacity development: the case of India
Sustainable health and education: the case of Cuba
Caribbean Ocean Reserves Estimation (CORE)
Inter-American Institute: A successful international network
Wageningen University Sandwich Program: Capacity building for developing country PhD students
Sustainable uses of medicinal plants: Institut Malgache de Reserches Appliques, Madagascar
Climate OptiOns for the Long Term, the Netherlands
Azraq Oasis Conservation, Jordan
Tree Growing in Northern Nigeria
Controlling transboundary air pollution in Europe
Alternatives to Slash and Burn Program and CGIAR
Dissemination of solar panels: Shell Solar
El Nino forecasting and southern Africa
The SPIDER program in Argentina
International Research Institute for Climate Prediction, USA
Leadership for Environment and Development