

Initiative on Science and Technology for Sustainability

Final Progress Report to the David and Lucile Packard Foundation Covering Activities from October 2001 – October 2004

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1 Overview

This document constitutes the final progress report on activities of the *Initiative on Science and Technology for Sustainability (ISTS)* during the period from October 2001 to October 2004. In particular, it reports on activities initiated under the initial grant from the David and Lucile Packard Foundation [Grant number 2001-19235], plus a supplemental grant [2002-22081 "Support for a science and technology for sustainable development workshop"]. Related work funded through a number of smaller grants from other organizations leveraged to support the work initiated under the Packard awards is also included.

The report is organized in five sections plus this introduction. The first three sections report work done in pursuit of the *Initiative's* three goals (see below). The fourth section deals with our evolving relations with other groups seeking to advance science and technology for sustainability, and our thinking about the future. A final section summarizes key documents produced by the *Initiative* and its members.

The international *Initiative on Science and Technology for Sustainability (ISTS)* was founded in 2001 in response to the call of the October 2000 Friibergh Workshop on Sustainability Science for a flexible means to pursue three broad and interrelated goals:

- **expanding and deepening the research and development agenda** of science and technology for sustainability;
- **strengthening the infrastructure and capacity** for conducting and applying science and technology for sustainability; and
- **connecting science and policy** more effectively in pursuit of a transition toward sustainability.

The Initiative has evolved as an open-ended network of individuals committed to these goals. Initial Co-Conveners for the Initiative are Robert Kates (Independent Scholar, USA) and Akin Mabogunje (Development Policy Centre, Nigeria). The international Steering Group responsible for setting Initiative strategy includes:

William Clark, Harvard University
Robert Corell, American Meteorological Society
Gilberto Gallopín, Economic Commission for Latin America and the Caribbean
Mohamed Hassan, Third World Academy of Sciences
Jill Jäger, Sustainable Europe Research Institute
Narpat Jodha, International Centre for Integrated Mountain Development
Robert Kates, Independent Scholar
Calestous Juma, Harvard University
Louis Lebel, Chiang Mai University
Jane Lubchenco, Oregon State University
Akin Mabogunje, Development Policy Centre
Pamela Matson, Stanford University
James McCarthy, Harvard University

Jose Sarukhán, Universidad Nacional Autónoma de México
John Schellnhuber, Potsdam Institute for Climate Impact Research and the
Tyndall Centre for Climate Change Research.

Day-to-day support for the Initiative has been supplied by a small Secretariat based at the Third World Academy of Sciences and Harvard University. Funding for the Initiative has come from the David and Lucile Packard Foundation and the U.S. National Oceanic and Atmospheric Administration's Office of Global Programs, with additional support from numerous governments and institutions around the world.

2 Expanding and deepening the research and development agenda of science and technology for sustainability

2.1 User-defined challenges

In pursuit of the first goal set out by the Friibergh Workshop, the Initiative pursued the Workshop's finding that existing global discussions on the challenges of harnessing science and technology to sustainability needed to be complemented with more localized, place-based perspectives of users.

2.1.1 Regional workshops

To gain a better appreciation of these place-based user perspectives, the Initiative ran a series of regional workshops. Each of these locally organized workshops brought together from their respective regions individuals involved in research, development, and environmental protection. Each asked participants to assess regional priorities for harnessing science and technology in efforts to promote sustainability, to characterize obstacles that impeded progress, and to identify priorities for action. A steering group under the leadership of Dr. Robert Corell and consisting of the workshop chairs provided for overall coordination of the workshop series. The five initial regional workshops engaged 235 participants from 39 countries. They are listed immediately below. Several follow up "roundtables" have been conducted or planned. These are described under Goal 3.

- **Abuja, Nigeria:** 13-15 November 2001, organized locally by the Nigerian National Committee on Sustainability Science, chaired by Professor Akin L. Mabogunje [Development Policy Centre, Ibadan, Nigeria].
- **Chiang Mai, Thailand:** 4-6 February 2002, organized locally by Chiang Mai University and University Kebangsaan Malaysia, co-chaired by Dr. Louis Lebel [Faculty of Social Sciences, Chiang Mai University and Science Coordinator for the Southeast Asian Regional Committee (SARCS) for START, Bangkok, Thailand] and Dr. Mohd Nordin Hasan [Institute for Environment and Development (LESTARI), University Kebangsaan Malaysia, Bangi, Malaysia]. A series of small follow-up

working group meetings on Sustainability and Human Settlements in Asia were held 29-30 July 2002, at the Rama Gardens Hotel, Bangkok, Thailand.

- **Bonn, Germany:** 27 February - 1 March 2002, organized locally by the International Human Dimensions Programme on Global Environmental Change (IHDP), chaired by Dr. Jill Jäger [Executive Director, International Human Dimensions Programme on Global Environmental Change, Bonn, Germany], with support from the German Federal Ministry for Education and Research.
- **Santiago, Chile:** 5-7 March 2002, organized locally by the Economic Commission for Latin America and the Caribbean (ECLAC), chaired by Dr. Gilberto Gallopín [Regional Advisor on Environmental Policies, Division of Environment and Human Settlements, Economic Commission for Latin America and the Caribbean, UNESCO, Santiago, Chile] and Armando Rabuffetti [Director, Inter-American Institute for Global Change Research, São Paulo, Brazil].
- **Ottawa, Canada:** 25-26 March 2002, organized locally by Environment Canada, the Policy Research Institute, and the North American Free Trade Agreement Commission for Environmental Cooperation, co-chaired by Prof. Elizabeth Dowdeswell [University of Toronto], and Dr. Stuart Smith [Chair, National Roundtable on the Environment and the Economy]. This workshop focused on regional-scale issues of science and technology for sustainability in Canada, Mexico, and the United States.

A summary of the findings from these regional workshops is provided in Annex 2 of "Science and Technology for Sustainable Development: Consensus Report of the Mexico City Synthesis Workshop, 20-23 May 2002." Cambridge, MA: ISTS (report at http://sustainabilityscience.org/ists/synthesis02/output/ists_mexico_consensus.pdf; cited here as ISTS et al., 2002; described more fully immediately below). A consolidated record of the regional workshops is available at <http://sustainabilityscience.org/ists/events.htm>.

2.1.2 Mexico City Synthesis Workshop on Science and Technology for Sustainable Development

It became clear during the Initiative's first intensive year of regional workshops that a synthesis effort would be required to bring the results together in a coherent and comparative whole. When we discussed the need for such an effort with our grant officer at the Packard Foundation, Helen Doyle, she urged us to collaborate with other groups exploring some of the same issues in setting up the workshop, thus producing an integrated perspective for use by the community and the upcoming World Summit on Sustainable Development (WSSD). The result was a joint proposal by the ISTS, TWAS and ICSU for supplementary funding to host what turned into the Mexico City Synthesis Workshop on Science and Technology for Sustainable Development. This was held 20-23 May 2002 and hosted by the National Autonomous University of Mexico on behalf of

a joint Organizing Committee from ICSU, TWAS, and the ISTS.¹ The Workshop brought together leaders of, and participants in, more than a dozen fact-finding studies, discussions, conferences, and workshops conducted over the two years leading up to the WSSD by the international scientific and technology community. Each of these contributing sessions had addressed the question “How can science and technology contribute more effectively to achieving society’s goals of sustainable development?” from a particular perspective. These perspectives included global views from international science organizations, regional views grounded in grass-roots efforts to harness science and technology in support of sustainable development, assessments of potential contributions from global change science, and critical analyses of experience in designing institutions and financing for science and technology directed toward solutions to sustainability problems. Thirty-six (36) people from 18 countries attended the workshop. Findings of the individual sessions were summarized in a background paper for the Mexico City Workshop (see Annex 2 of ISTS et al., 2002). Participants in the Workshop reviewed the background paper and the individual contributing reports in addition to bringing their own rich backgrounds of experience to the table. They then formulated a consensus report (ISTS et al., 2002). This was presented to President Vicente Fox of Mexico at the close of the Workshop and tabled by ICSU at the fourth Preparatory Workshop for the WSSD, immediately following the Mexico City Workshop. It was subsequently published by ICSU in their Series on Science for Sustainable Development, No. 9 (see http://www.icsu.org/Gestion/img/ICSU_DOC_DOWNLOAD/70_DD_FILE_Vol9.pdf).

2.2 Use-inspired basic research

Emerging from our regional and synthesis workshops were a series of use-inspired basic research challenges for sustainability science. We summarize below a comprehensive set of "core questions" grounded in the original Friibergh Workshop, before turning to a set of more focused studies motivated directly by the Mexico City synthesis.

2.2.1 Core science questions

Emerging from the workshops described above are a number of core conceptual challenges for sustainability science that are also beginning to appear on emerging agendas for other more established fields such as global environmental change:

- **Models and Conceptualizations**
How can the dynamic interactions between nature and society – including lags and inertia – be better incorporated in emerging models and conceptualizations that integrate the Earth system, human development, and sustainability?

¹ The Organizing Committee consisted of Jose Sarukhán, William Clark, Robert Corell, Gisbert Glaser, Mohamed Hassan, Calestous Juma, Robert Kates, Akin Mabogunje, and Thomas Rosswall. Further information on the Mexico City Workshop, including copies of the background papers prepared for it, and the material presented there, is available at <http://sustainabilityscience.org/ists/synthesis02.htm>.

- **Long-Term Trends and Transitions**
How are long-term trends in environment and development, including consumption and population, reshaping nature-society interactions in ways relevant to sustainability?
- **Vulnerability and Resilience**
What determines the vulnerability or resilience of the nature-society system in particular kinds of places and for particular types of ecosystems and human livelihoods?
- **Scientifically Meaningful Limits or Boundaries**
What determines the vulnerability or resilience of the nature-society system in particular kinds of places and for particular types of ecosystems and human livelihoods?
- **Incentive Structures**
What systems of incentive structures – including markets, rules, norms and scientific information – can most effectively improve social capacity to guide interactions between nature and society toward more sustainable trajectories?
- **Monitoring and Reporting**
How can today’s operational systems for monitoring and reporting on environmental and social conditions be integrated or extended to provide more useful guidance for efforts to navigate a transition toward sustainability?
- **Institutions for Research, Observation, Assessment, and Decision Support**
How can today’s relatively independent activities of research planning, observation, assessment, and decision support be better integrated into systems for adaptive management and societal learning?

Initial essays and bibliographies for most of these core issues have been developed and posted on the ISTS Forum (see <http://sustainabilityscience.org/questions.htm>). Activities to advance a program of sustainability science research focused on these questions are moving forward on a number of fronts and at scales from the global to the local. These are described in the following sections.

2.2.2 Focused research topics

- **Values, attitudes and behaviors**
Relatively little is known about the long-term global trends in values, attitudes and behaviors that will both help and hinder a sustainability transition. A team composed of Robert Kates; Anthony Leiserowitz, Decision Sciences; and Thomas Parris, iSciences analyzes efforts to define sustainability values, including the U.S. National Academy of Sciences, the Earth Charter, the UN Millennium Declaration, and the Global Scenario Group (Leiserowitz et al, 2004). Their paper summarizes empirical trends in sustainability values, attitudes, and behaviors, as measured by multinational and global-scale surveys, related to human and economic development, the environment, and the driving forces of population, affluence, technology and entitlements. It summarizes trends related to the values identified by the Millennium Declaration as essential to international relations (e.g., freedom and democracy, equality and shared responsibility) and

broader contextual values (e.g., capitalism, globalization, institutional trust, and social change) that have sustainability implications. It then identifies several important attitude-behavior gaps and barriers. Finally this review draws several conclusions regarding future research needs and the value, attitude and behavioral changes needed to achieve sustainability. The research for this paper is jointly funded by ISTS and Decision Research.

- **Production-consumption systems**

Enabling sustainable production-consumption systems was the focus of a web-based electronic conference and workshop organized by Louis Lebel, Chiang Mai University. There are two key reasons for framing the challenge as one of sustainability of "production-consumption" systems rather than the more conventional focus on production technologies and regulation. The first is the need to bring attention to the processes closer to the decisions and actions of final consumers when undertaking analyses of the underlying reasons for environmental impacts at remote, more primary, "production" parts of commodity chains. The second is that a commodity chain itself can be thought of as a series or network of many production-consumption relationships. The web-based electronic conference held 15 September – 31 October 2003 discussed the concept of sustainable consumption to stimulate dialogue that will lead to better framing of research and suggest new important areas of inquiry. 125 participants registered for the meeting that was organized into 4 week-long themes, each with their own moderator, and a final 2 weeks open to synthetic and forward-looking comments. The themes included: sustainable consumption (key concepts, terms and issues); final consumption (drivers of changes in consumption behavior of individuals, households, governments and corporations); chains and webs (effect of systems' structure and organization on sustainability, interaction of consumption with other parts of a commodity chain or web); and leverage points (making consumption-production systems more sustainable, trade-offs). An international workshop on "Sustainable Production-Consumption Systems: Research Frontiers" was held 1-3 October 2004 and hosted by Chiang Mai University. The workshop produced a framework and agenda for research on the sustainability of production-consumption systems (Lebel et al, forthcoming).

- **Scale and cross-scale dynamics for research and management**

An effort to synthesize current practice and theory about scale and cross-scale dynamics in assessing and addressing sustainable development and environmental change has focused on several activities organized by David Cash, Harvard University. Representative members of a working group on scale presented papers at the Millennium Ecosystem Assessment (MA) conference, "Bridging Scales and Epistemologies" held in Alexandria, Egypt in March 2004 . The working group organized a panel: "Governance and Information in a Multi-level World: Linking S&T and Decision-making for Ecosystem Assessment and Management". Many of the papers have been submitted to *Ecology and Society* for publication in a special issue on scale and cross-scale dynamics edited by David Cash (Cash et al., forthcoming).

- Sustainable development in Ijebu-Ode, Nigeria**

The role of social capital, participation, and science and technology in Ijebu Ode, Nigeria is the focus of a paper by Akin Mabogunje and Robert Kates (2004). Ijebu-Ode is a small city of 200,000 inhabitants in southwest Nigeria, which, through a participatory city consultation process chose to reduce poverty through a set of local and sustainable livelihood activities. They describe the setting, the participatory process, the poverty reduction activities, and the results to date. They attribute the success to the large stock of social capital, the participatory process that drew upon this stock, and the scientific and technological community that both serves as a boundary spanner to link Ijebu-Ode to the national and the global as well as a resource for local technologies and advice.
- Globalization and a transition toward sustainability**

In the “The Nexus and the Neem Tree: Globalization and a Transition toward Sustainability,” Robert Kates (2003) explores the transition to sustainability, the context in which it will take place, and the ways in which the new-old phenomenon of globalization affects it. Kates explores the conflicts between economy and environment and between the present and the future. In looking at the successes and failures of past and contemporary globalization, he concludes that while globalization has allowed the world community to attack certain problems effectively, to date its harms have overwhelmed its benefits. He argues too that those of us who aspire to a transition to sustainability cannot be against globalization and that our best hope now comes from the “bottom up,” through popular movements and groups working to “humanize” globalization.
- Epistemological challenges to science and technology**

A workshop on epistemological challenges to science and technology for sustainable development was chaired by Gilberto Gallopín and hosted at the Economic Commission for Latin America and the Caribbean’s (ECLAC) headquarters in Santiago, Chile 13-15 October 2004. Experts met to discuss a set of epistemological challenges to science and technology for sustainable development, including: the basic unit of analysis; integration of research; dealing with multiple scales; criteria of truth; dealing with uncertainty; incorporation of other knowledges; interparadigmatic dialogues; science-policy interface; stakeholder involvement; and inclusion of qualitative variables. A background paper was prepared by Gilberto Gallopín (2004) and a synthesis paper is expected in January 2005 that will be published by ECLAC.

2.2.3 Review and synthesis paper on the sciences of sustainable development

The research efforts described above are now being reviewed and synthesized by William Clark and a number of other ISTS participants in a review paper for the *Annual Review of Environment and Resources*. This paper, tentatively titled “The sciences of sustainable development,” will highlight a selection of the best work on sustainability science from around the world (Clark et al., forthcoming).

2.3 Consultations and outreach to the scientific community

Members of the Initiative have worked to shape the international agenda on the issue of science and technology for sustainable development via consultations with many organizations. Some of these are reported below:

2.3.1 U.S. National Academies

Akin Mabogunje and Calestous Juma were members of the U.S. National Research Council's Committee on Geographic Foundations of Agenda 21 that helped to guide the formulation of the position of the United States at WSSD on the role of geographical information sciences in the implementation of Agenda 21 in Africa. The results of this effort are reflected in the WSSD Plan of Implementation. The report on Geographical Information for Sustainable Development in Africa is available at <http://www.nap.edu/books/0309084784/html/>.

Calestous Juma serves on a U.S. National Research Council's Committee that has prepared a "Survey and Analysis of Scientific Advice on Sustainable Development to International Organizations" (see <http://www4.nationalacademies.org/webcr.nsf/5c50571a75df494485256a95007a091e/6a2cd15812aae9e485256b120072937c?OpenDocument>).

William Clark and Pamela Matson serve on the Academies' Coordinating Committee on Global Change, which has overview responsibility for integrating sustainability and global change work in the National Research Council.

2.3.2 Third World Academy of Sciences

The Third World Academy of Sciences' General Conference was held 16-19 October 2004 in Beijing, China and attended by approximately 300 scientists from over 70 countries. The "Beijing Declaration" states that TWAS "should continue to expand its interaction with the social science and economic development communities as part of its larger effort to increase the impact of science on society." TWAS is working with Leadership for Environment and Development (LEAD) International and ISTS to develop a broad-based training program to help diplomats and trade negotiators achieve a better understanding of science and its potential role in decision-making and to help scientists achieve a better understanding of the development challenge. It has initiated roundtable discussions between the developing world's leading scientists and ministries of science and finance, nonprofit organizations, and the private sector to explore ways for better integrating science into broad sectors of society that lie beyond the scientific community. It is preparing a series of reports for policymaking communities in the developing world that examine critical problems facing the South.

William Clark spoke on "Investment in S&T Capacity" at the TWNSO Ministerial Session on Government Investment in Science and Technology Capacity Building that

was part of the Third World Academy of Sciences General Conference held in Beijing, China in October 2003.

2.3.3 Dahlem Conference on Earth System Analysis for Sustainability

A Dahlem workshop, “Towards Earth System Analysis” was held 25-30 May 2003 in Berlin, Germany and co-chaired by William Clark; Paul Crutzen (Max Planck Institute for Chemistry) and Hans Joachim Schellnhuber (Tyndall Centre for Climate Change Research). The resulting book (Schellnhuber, Crutzen, Clark et al., 2004) explores the question of whether the unprecedented human-originated changes transforming the ecosphere today will end a 10,000-year period of climate stability. The book focuses on four topics: long-term geosphere-biosphere interaction and the possibility of using extrasolar planets to test various geophysical hypotheses; the Quaternary Earth System's modes of operation; current planetary dynamics under human pressure; and transition to global sustainability. It analyzes the driving forces behind global change and uses this knowledge to propose principles for global stewardship.

2.3.4 AAAS Symposium on “Science and Technology for a Transition toward Sustainability”

William Clark organized an American Association for the Advancement of Science Symposium on “Science and Technology for a Transition toward Sustainability” at the AAAS Annual Meeting held in February 2002. Speakers included: Robert Kates on “Globalization: Emerging Interactions Among Global Environmental Changes and Social Transformations,” B.L. Turner II on “Vulnerability in Human-Environment Relationships,” Gilberto Gallopín on “Epistemological Issues in Sustainability Science,” Robert Corell with a “progress report on a series of regional workshops around the world designed to broaden and deepen an agenda for science and technology for sustainability,” and Jill Jäger on “Implementing a Sustainability Science Research System.” Their talks are available at <http://sustainabilityscience.org/events/aaas02.htm>.

3 Strengthening the infrastructure and capacity for conducting and applying science and technology for sustainability

In pursuit of its second goal, the Initiative – in partnership with TWAS and the International Council for Science (ICSU) – undertook a critical evaluation of the capacity of existing international, regional, and national research and development systems (including private sector businesses and foundations) to support the more effective harnessing of science and technology for sustainability.

3.1 Fostering institutions that govern science and technology for sustainability

ISTS conducted three workshops that address how the institutions that govern science and technology would need to be reformed as part of a larger process for realizing the potential of S&T to promote sustainable development around the world.

The first two workshops brought together a cross section of entrepreneurs who had been especially successful in building such linkages with a goal of sharing lessons and identifying common needs. A total of 68 participants from 34 countries attended the Trieste and Cambridge workshops.

- Trieste Workshop organized locally by the Third World Academy of Sciences under the auspices of the ISTS on *Science, Technology and Sustainability: Harnessing Institutional Synergies* (Trieste, Italy, 6-9 February 2002), co-chaired by Mohamed Hassan, Calestous Juma, and William Clark.
- Cambridge Workshop organized locally by Harvard University's Weatherhead Center for International Affairs under the auspices of the ISTS, ICSU, and TWAS on *Mobilizing Science and Technology for Sustainable Development* (Cambridge, Massachusetts, USA, 10-12 April 2002), co-chaired by William Clark, Mohamed Hassan, Gisbert Glaser, and Calestous Juma.

This continuing dialogue has enabled a good characterization of what is needed, and constitutes an audience of policy makers and practitioners for any insights that may emerge from serious analysis of the institutional design question. But it has not yet managed to engage much of the relevant social science community in its work.

- In the fall of 2003 William Clark convened a research seminar on *Knowledge for Development* that surveyed the state of social science scholarship on research systems in a wide range of individual sectors including agriculture, energy, health, environment, manufacturing, and defense see http://www.ksg.harvard.edu/sed/k4dev_sem.htm. This culminated in a workshop on "International Knowledge Systems for Sustainable Development" held at Harvard's Weatherhead Center for International Affairs in the spring of 2004 in which experts from each of those sectors compared challenges, solutions, and needs for further research. A modest number of background papers were prepared with the intention of eventual publication in the peer-reviewed literature, see <http://www.wcfia.harvard.edu/conferences/sustaindev>.

3.2 Fostering research and training institutions

Steering Group members have initiated and been participants in a series of "Sustainability Days" annual conferences on sustainability science and the Temozon Retreat on Institutions for Sustainability Research and Education.

3.2.1 The "Sustainability Days" Annual Conferences

The "Sustainability Days" conferences both celebrate institutions that have developed major commitments to the field, and serve as a forum for reporting on completed research. Steering Committee member John Schellnhuber organized the "First Sustainability Days" conference at the Potsdam Institute for Climate Impact Research in

Germany in October 2001. Steering Committee members Jane Lubchenco and John Schellnhuber were keynote speakers at the “Second Sustainability Days: State of the Planet” conference held at Columbia University’s Earth Institute in May 2002. William Clark was a keynote speaker at the “Third Sustainability Days” conference organized by the Tyndall Centre at the University of East Anglia, UK in September 2003. Steering Group member Pamela Matson hosted the fourth Sustainability Days at Stanford’s new Institute for the Environment program in the fall of 2004.

3.2.2 The Temozon Retreat on Institutions for Sustainability Research and Education

Michael Crow of Arizona State University and John Schellnhuber of the Tyndall Centre convened a two-day meeting at in May 2004 at Hacienda Temozon in Yucatan, Mexico to explore issues faced by leaders of institutions dedicated to sustainability research and education, and ways institutions can best collaborate to meet the challenges of bringing science and technology to bear on sustainability issues. The idea for the Retreat came out of discussions between Crow, Schellnhuber and Clark who recognized that the small but growing number of research and teaching institutions now grappling seriously with the science and technology of sustainability are a global asset, yet need to be better coordinated. To explore how such joint efforts might best be designed and implemented, a small group of creative leaders in the emergence of the field were brought together for exploratory discussions. Bill Clark chaired the meeting, that was attended by nine people including ISTS Steering Group members José Sarukhán, UNAM; Hans Joachim Schellnhuber (co-convenor), Tyndall Centre for Climate Change Research; and Pamela Matson, Stanford University (Buizer, 2004). The Retreat organizers framed the discussions around four themes and sets of questions:

- **Sustainability Science:** What is emerging as the domain of sustainability science – its central questions, methods, goals and, more generally, challenges? What changes in the current character of its domain should be especially encouraged over the coming decade?
- **Institutional Structure:** How have the institutions with which the participants in this retreat work, and other institutions with which they are familiar, organized themselves to address the challenges of sustainability science? What has worked well? What hasn't? Looking to the future, what are the core principles and values that an institution dedicated to sustainability science might embrace in order to define itself?
- **Partnerships:** What practical steps might the participants in this retreat take to strengthen our respective institutions through specific partnerships and collaborations? With one another? With others leading institutions?
- **The Way Forward:** How can we, as early leaders in the field, strengthen other nascent institutions and programs that are beginning to emerge in both the earlier- and later-developing parts of the world? How can we link these emergent programs and others yet to be established into a purposeful network or community?

3.3 Fostering the careers of young scientists working on sustainability

A major objective of ISTS is fostering the next generation of scientists working on sustainability. This was done by providing internships, presentation opportunities, and organizing career fairs.

3.3.1 International Institute for Applied Systems Analysis

The Young Scientists Summer Program (YSSP) at the International Institute for Applied Systems Analysis (IIASA) offers young scholars the opportunity to spend three months (June - August) at the Institute, working within the projects there to enhance their postgraduate skills. With the financial support of ISTS and in collaboration with the Third World Academy of Sciences, 4 young scholars from developing countries were selected from about 100 applicants to participate in the YSSP in June-August 2003. Unfortunately, one of the scholars (from Ghana) was unable to get a visa, so the core group was reduced to three. The three scholars and their projects that were funded by ISTS were:

- Riziki Shemdoe, Sokoine University of Agriculture, Tanzania
“Local Knowledge on Ecosystem Management Practices and Human Plague Problems in West Usambaras, Tanzania” (Shemdoe, 2004)
- Juan Bernardo Cruz, University de Los Andes, Colombia
“A Sustainable Policy Making- Energy System for Colombia” (Cruz, 2004)
- Sharda Mahabir, The University of the West Indies, Trinidad and Tobago
“Integrated Water Resource Management in Trinidad and Tobago” (Mahabir, 2004)

The students were supervised by Jill Jäger. Jäger organized and ran a seminar series in June-August 2003 on “Harnessing Science and Technology for Sustainable Development.” Lecturers in the series included members of the ISTS Steering Group, IIASA staff, and invited speakers. Many of the 57 YSSP scholars picked up the issues of sustainable development in their work over the summer. The young scholars expanded their case studies to consider stakeholders and their linkages, the nature of the science/policy interface, and the challenges of interdisciplinary research on sustainable development issues. On 16-17 July, the YSSP scholars presented their preliminary findings at the Midsummer Workshop held at IIASA. On 21-22 July the students visited TWAS in Trieste, Italy and presented their case studies. Each student produced a working paper (Shemdoe, 2004; Mahabir, 2004; Cruz, 2004).

The Advanced Training Institute on Vulnerability to Global Environment Change was held at IIASA in May 2004 and co-directed by Jill Jäger. The Training Institute, funded by a grant from the Packard Foundation to START, brought together 20 young scholars from developing countries and countries in transition for a 3-week intense training, with lectures, hands-on exercises and group discussions on a key issue for sustainability science. The scholars have now embarked on their research projects and Jill Jäger is supervising five of them. One important side product of the training institute was a comprehensive bibliography on vulnerability literature, compiled by Jill Jäger with input from a very broad range of scholars, which will be published in 2005.

3.3.2 Third World Academy of Sciences

The Third World Academy of Sciences sponsored three summer interns to work at centres of excellence in the South. The interns tried to understand how the host institutes linked their research agenda, outputs and extension to local and national priorities and how these related to overall goals of sustainable development. The three scholars and their projects that were:

- Inder Singh interned at the Medical Biotech Laboratory, Uganda hosted by Thomas Egwang
“Understanding the Knowledge System and Institutional Landscape Surrounding HIV/AIDS and Malaria in Uganda” (Singh, 2003)
- Darshana Zaveri, National Chemical Laboratory, India
“A integrated approach to drug discovery from medicinal plants: A case study of National Chemistry Laboratory in India” (Zaveri, forthcoming)
- Sheila Reiss interned at the Malagasy Institute of Applied Research in Madagascar hosted by Prof. Suzanne Ratsimamanga
“Controlling its own destiny: The unique elements and challenges of the Malagasy Institute of Applied Research” (Reiss, forthcoming)

3.3.3 Harvard’s Center for International Development

Harvard’s Center for International Development also sponsored research opportunities for Harvard students:

- Sissi Lui, Harvard University interned at the Alternatives to Slash-and-Burn Programme, Consultative Group on International Agricultural Research in Nairobi, Kenya hosted by Tom Tomich (Lui, 2004)
“Tracing Strategic Typology of Natural Resource Management Impact Pathways: A Case Study of the Alternatives to Slash-and-Burn Program”
- Elta Smith, Harvard University interned at Chiang Mai University, Thailand hosted by Louis Lebel
“Upland Development Discourses: Sustainability in Northern Thailand”
- Nicole Szlezak, Harvard University conducted research on “Linking Health Research and Policy: Experiences from Developing Countries: A Literature Review” (Szlezak, forthcoming)
- Vanessa Timmer, University of British Columbia, Canada and pre-doctoral Research Fellow at Harvard’s Center for International Development was supervised by Calestous Juma, Harvard University
“Community-based Conservation and Leadership: Frameworks for Analyzing the Equator Initiative” (Timmer, 2004)

3.3.4 Tyndall Centre for Climate Change Research

To further support the development of young scientists, ISTS Steering Group member John Schellnhuber agreed to include presentations by young scientists in a session on “Governance and Sustainable Development” held as part of Sustainability Days in

September 2003 at the University of East Anglia, UK. ISTS supported the participation of:

- Sylvia Karlsson, International Human Dimensions of Global Change Programme on “From Multi-level to Multilayered Governance of the Environment” (Karlsson, 2002); and
- Frank Biermann, Vrije University on “Global Governance and the Environment.”

Together with Professor Timothy O’Riordan of the Tyndall Center, UK, Jill Jäger organized a two-day workshop for young scientists, funded by the European Science Foundation on Managing Transitions to a Low Carbon Economy in Europe. The workshop was held as a side event at the EuroScience Open Forum in Stockholm, August 2004. The 15 young scholars who were selected to attend the workshop are now working, under the guidance of the organizers, to produce ideas for a joint project that could be funded under the EuroCores initiative of the ESF.

3.3.5 American Association for the Advancement of Science

As part of the AAAS Annual meeting, Shere Abbott, AAAS is organizing a career fair on 19 February 2005 that aims to connect scientists, engineers and health experts with a commitment to solving problems related to sustainable development with local projects in developing countries needing outside assistance. Representatives from aid agencies, Julia Marton-Lefevre, LEAD International, and Mohamed Hassan, Third World Academy of Sciences will describe the knowledge, experience, training and other skills required of scientists and the types of projects in developing countries where scientific knowledge could be deployed to assist local communities. Several LEAD fellows (from China, India, Brazil, and perhaps other countries) will be on hand to respond to questions. The session will provide participants with a sense of where volunteerism and other work options on behalf of societal goals for sustainable development can fit with individual career goals.

3.3.6 Forum on Science and Technology for Sustainability

The Initiative on Science and Technology for Sustainability has devoted substantial attention to integrating its own multiple strands of work, and to facilitating the emergence of a mutually supportive network linking the many individuals and organizations involved in efforts to better harness science and technology to sustainability goals. In support of this goal, the Initiative operates the web-based Forum on Science and Technology for Sustainability (<http://sustainabilityscience.org/>). The Forum seeks to provide a common point of access to evolving discussions over the *core questions* and challenges for knowledge and action of S&T 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 last year added new sections highlighting good 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. The table below provides a synopsis of the sections currently found on the Forum.

<i>What's on the Forum on Science and Technology for Sustainability</i>
Introduction: Information and background on the Forum, the Initiative on Science and Technology for Sustainability (ISTS), and the Network for Science and Technology for Sustainability
Core Questions: Fundamental research questions about the dynamic interactions between nature and society (includes relevant essays, resources, and commentary)
Integrated Studies: Selection of multidisciplinary integrated studies of the dynamic interactions characterizing particular nature-society systems
Education and Training: Selection of courses and educational programs that go beyond the study of environment or development separately and deal with the interaction of environment and development and the contributions of S&T to sustainable development
Documents: A collection of papers with special significance for sustainability science; a half dozen that provide an essential overview of the current state of discussion as well as a longer list of additional documents that constitute particularly relevant contributions to deepening and broadening the debate
Events: Conferences, workshops, and meetings relevant to sustainability science
Programs: Institutions and programs doing research, study, and related activities that contribute significantly to the field of sustainability science
Commentary: Submitted comments on any aspect of S&T for sustainable development, including but not restricted to the documents, essays, and core questions found on the Forum
Newsletter: Monthly updates highlighting what's new on the Forum, available online or via email
Network: People and projects engaged in science and technology for sustainability

The Forum also serves as the entry point for the Network for Science and Technology for Sustainability (<http://sustainabilityscience.org/network.htm>), the Initiative's effort to build a virtual community linking disparate scholars, managers, and decision makers, and to promote the sharing of knowledge, ideas, and goals among a community working on science and technology for sustainability. Individuals interested in these issues may join the Network as a means of telling others about their work and interests. The Network allows others to learn of the diversity of research efforts at all scales of endeavors (local, regional, and global), to identify new themes to explore and new collaborators to relate to, and to devise meaningful ways, beyond chat rooms and email lists, to make the promise of web-initiated relationships useful. It supports a Network of more than 200 individuals representing 41 different countries who use the facilities of the Forum to exchange information on their respective efforts to harness science and technology to sustainability. Descriptions of 98 of their projects are available on the Forum. 58% of Network members are outside the United States, from both developed and developing countries.

The audience for the Forum continues to grow, with an average of 354 visits on any given weekday in October 2004 (up from 40 in December 2001, 143 in December 2002,

and 225 in December 2003). The Forum's monthly e-newsletter announcing new content goes out to nearly 1250 subscribers from over 75 countries. More than 130 web sites in at least 17 countries link to the Forum.

The Forum is unique, because it is the only web site providing in-depth, selective content to a community working on S&T for sustainability. While other web sites (e.g., SciDev.net) seek to provide access to ongoing research, and still others (e.g., the SD Gateway) focus on sustainable development in general, the Forum is the only one focusing strictly on science and technology for sustainable development, and engaging both the research and policy communities in this area.

Plans are underway to migrate the Forum from Harvard's server to the American Association for the Advancement of Science under the supervision of Shere Abbott, Director of AAAS' Center for Science, Innovation and Sustainable Development.

4 Connecting science and policy more effectively in pursuit of a transition toward sustainability

In pursuit of its third goal, the Initiative collaborated with a variety of other organizations in efforts to bring together knowledge and action in pursuit of sustainability.

4.1 Activities related to the World Summit on Sustainable Development

Members of the Initiative participated actively in the preparation of the ICSU-World Federation of Engineering Organizations (WFEO)-led effort to provide perspectives on science and technology for sustainability in the preparatory process for WSSD, in proposals for Summit-based partnerships, and at the Forum on Science, Technology and Innovation for Sustainable Development. Leadership was provided by Mohamed Hassan, a member of the Initiative Steering Group as well as Executive Director of TWAS, and by Calestous Juma of Harvard through his advisory work to the UN.

4.1.1 Preparatory Committee Meetings for WSSD

During the second Preparatory Committee meeting in the lead-up to the United Nation's WSSD, Calestous Juma presented a side event seminar on "Science and Technology for Sustainable Development: Proposals for WSSD." This event was highlighted in the *Earth Negotiations Bulletin* that is distributed widely amongst the UN WSSD Secretariat, government delegates, and stakeholder participants, and is said to have had a substantial impact on framing the substantive agenda deliberations for the WSSD.¹

Mohamed Hassan, the Executive Director of TWAS, and Calestous Juma from Harvard incorporated the results of the Mexico City Workshop in their statements and dialogue papers that were discussed at the meeting of the Fourth Preparatory Committee for the WSSD held in Bali in June 2002 and at the WSSD in August. Presentations were made both at the Plenary and at the High Level Roundtables with the Heads of State. Opinions

and answers from the S&T community were conveyed in the six thematic Plenary Sessions of the Johannesburg Summit, in particular about the WEHAB areas (water, energy, health, agriculture, and biodiversity) highlighted by Secretary-General Kofi Annan.

4.1.2 Partnership Initiatives (Type II Agreements)

ISTS participated in the discussion and drafting of numerous partnership initiatives (Type II Agreements), including:

- “Science and Technology for Sustainable Development,” a proposal that was reviewed by participants in the Mexico City Synthesis Workshop and revised by ICSU and its partners (see http://sustainabilityscience.org/ists/synthesis02/output/st4sd_type-II_icsu.pdf);
- “Mobilizing the New Social Contract on S&T for Sustainable Development: the United Nations University/Institute for Advanced Study Higher Education Fellowship Initiative on Science for Sustainability” between TWAS and UN University; and
- “Connecting Communities: linking science and technology research to the needs of sustainable development” between TWAS and LEAD.

4.1.3 WSSD Forum on Science, Technology and Innovation for Sustainable Development

In cooperation with ICSU, WFEO, and the South African Ministry of Science and Technology, Mohamed Hassan of TWAS helped to organize the Forum on Science, Technology and Innovation for Sustainable Development (Science Forum) that took place at Ubuntu Village, South Africa as part of WSSD. TWAS organized panels on “Capacity Building in Science and Technology” and a “High Level Discussion on the Role of S&T for Sustainable Development in Africa.” Jill Jäger presented the Mexico City Synthesis report on the opening day of the Forum. Robert Corell, Mohamed Hassan, Jill Jäger, Calestous Juma, and ISTS fellows Diego Malpede (TWAS) and Vanessa Timmer (Harvard) represented the Initiative at the Forum.

4.1.4 WSSD follow-up activities

Calestous Juma is currently assisting the United Nations systems in exploring how to effectively integrate science and technology in the implementation of the outcomes of WSSD. Juma serves as Chair of the United Nations Millennium Development Goals Task Force 10 on Science, Technology and Innovation. Its objective is to develop operational strategies on how science, technology and innovation can help achieve the Millennium Development Goals. He is also working with other UN agencies such as the United Nations Industrial Development Organization (UNIDO) in Vienna, the United Nations Conference on Trade and Development (UNCTAD) in Geneva, and the United Nations University (UNU) in Tokyo.

William Clark participated in a panel discussion on “Sustainable Development, Science, and Technology” held as part of the United Nations General Assembly “2nd Committee” meeting on 5 November 2003 at the United Nations Secretariat in New York.

4.2 Moving toward solutions

One of the strongest messages emerging from the ISTS workshops is that if science and technology is to make a greater contribution to sustainability, the research community will need to complement its historical role in *identifying problems* of sustainability with a greater willingness to join the development and conservation communities in *designing solutions* to those problems. This means bringing science and technology to bear on the highest priority goals of a sustainability transition, with those goals defined not by scientists alone but rather through a dialogue between scientists and the people engaged in the practice of “meeting human needs while conserving the earth’s life support systems and reducing hunger and poverty.” Such goals clearly relate to the core WEHAB areas (water, energy, health, agriculture, biodiversity) identified at the World Summit on Sustainable Development, plus the longstanding challenges of providing adequate housing and transportation. It has become clear, however, that agenda setting at the global, continental, and even national scales will miss a lot of the most important needs. The transcendent challenge is to help promote the relatively “local” (place- or enterprise-based) dialogues from which meaningful priorities can emerge, and to put in place the local support systems that will allow solution-driven work on those priorities to be implemented.

To promote a closer engagement of private sector and development stakeholders in sustainability science, the ISTS has begun to foster “Roundtables” on science and technology for sustainable development. The most advanced of these is:

4.2.1 United States Roundtable on Science and Technology for Sustainability

The U.S. National Academies have initiated a high-level Roundtable on Science and Technology for Sustainability. The Roundtable serves as a high-level forum that brings together leaders from the business, government, NGO and academic communities to identify priority areas for research and action on sustainability. Though this Roundtable is not formally a function of the ISTS, it was created in response to a recommendation from a working group chaired by ISTS co-convener Robert Kates, is co-chaired by ISTS Steering Group member Pamela Matson, and counts among its members two other ISTS Steering Group members (Calestous Juma and William Clark) (see http://www7.nationalacademies.org/sustainabilityroundtable/Sustainability_Roundtable_Homepage.html). The Task Force on Linking Knowledge with Action, chaired by William Clark, will participate in and oversee a series of comparative analyses of decision support systems in order to identify generalizable features of success and failure that might inform initiatives in harnessing S&T for sustainability (see http://www7.nationalacademies.org/sustainabilityroundtable/Linking_Knowledge_Main.html).

4.2.2 Arab States Roundtable

The Third World Academy of Sciences organized a planning meeting for an Arab Sustainability Roundtable held 12-13 June 2003 in Trieste, Italy jointly supported by a grant from the Kuwait Foundation for the Advancement of Science in cooperation with the Middle East Initiative at Harvard's Kennedy School of Government and ISTS. The planning meeting concluded that the objectives of the Arab Roundtable would be to: strengthen the contributions of science and technology for sustainable development; develop partnerships; focus on thematic priorities that are consistent with the UN Millennium Development goals; and examine cross-cutting themes of governance and policy for science and technology. The full Arab Roundtable is scheduled to take place in Dubai, United Arab Emirates from 16-18 April 2005 and will be hosted by the Zayed International Prize for the Environment. The Islamic Development Bank and the UN-ESCWA have expressed willingness to co-sponsor the meeting.

4.2.3 Pan-African Roundtable

The Third World Academy of Sciences convened a planning meeting for a Pan-African Roundtable that was held 27–28 May 2004 in Nairobi, Kenya and hosted by the African Academy of Sciences. The meeting helped to define the scope, objectives, priority themes and indicative partnerships and participation for the future African Roundtables. TWAS produced a brochure for dissemination and solicitation of partnerships in organizing the roundtables. Four Roundtables are envisaged in Africa – in Eastern, Southern, Western and Central Africa during 2005-06. The first African Roundtable will be held in mid-2005 in Eastern Africa (Ethiopia). Efforts and consultations are underway to identify a host and co-sponsors.

4.2.4 International Scientist-Practitioner Dialogue on Science and Technology for Sustainability

The February 2005 American Association for the Advancement of Science (AAAS) Annual Meeting focusing on "The Nexus: Where Science Meets Society," opens a dialogue between the science and technology community and those engaged in development issues on linking S&T capacities to the needs of sustainable development. Shere Abbott, AAAS and William Clark are organizing the symposium "Scientist-Practitioner Dialogue on Science and Technology for Sustainability." The symposium will address questions such as: How do the science and development communities deal with problems of environment and development such as agriculture and global health? What are the best mechanisms for ensuring that knowledge and know-how get to the communities that need it? How can we train the next generation of scientists for public service in these areas, and how can the development community best use these experts? The dialogue will contribute ideas about how these communities can work together toward shared goals, and discuss the professional enhancement of science-practitioners for sustainable development.

4.2.5 Public-private partnerships

Parallel to the national “Roundtable” efforts described above, ISTS supported a pilot project to engage practitioners at the regional (i.e., subnational) level in sustainability science. Novatlantis, a joint activity of the Swiss ETH-Board and its four research institutes, formed an alliance with the authorities of the metropolitan region of Basel, Switzerland centered around the idea of the “2000-watt-society,” using the current global average of energy use as a rough yardstick for fairness in resource use between developing and developed countries. Projects are conducted and planned ranging from mobility to renewable energy supply and construction. A paper on lessons learned from the collaboration between universities and practitioners in the Novatlantis-pilot region of Basel includes lessons about the design and function of boundary organizations linking research and practice through public-private partnerships (Lienin, Kasemir, and Stulz, 2004).

5 Reflections on the Initiative’s niche and future

The international ISTS is a direct outgrowth of the renewed interest around the world in implementing knowledge-based strategies for meeting human needs while preserving the life support systems of the planet. The Initiative had its origins in a range of activities including the program of the Scientific Committee on Problems of the Environment (SCOPE), several initiatives of the Third World Network of Scientific Organizations (TWNISO), the U.S. National Academy of Science report *Our Common Journey: A Transition Toward Sustainability*, the World’s Scientific Academies’ Conference on a *Transition to Sustainability in the 21st Century* (May 2000), the Friibergh Workshop on *Sustainability Science* (October 2000), and the Global Change Communities’ Open Science Conference on *Challenges of a Changing Earth* (July 2001). Today the Initiative joins the active involvement of many organizations and groups including the Earth System Science Partnership projects on carbon, food and water; the Inter-Academy Council efforts on scientific capacity for development and food security in Africa; the Science and Technology for Sustainability program of the U.S. National Academies; the LEAD-TWAS effort to develop scientists and technologists for environment and development; and the program on Science for Sustainable Development adopted at the ICSU’s 2002 General Assembly.

In the midst of such growing interest and involvement, what ought to be the role for the Initiative over the next several years? The Initiative was conceived as a means of complementing efforts, such as those listed above, through its roles as convener, facilitator, and advocate for sustainability science and technology. The aim was and remains:

- to serve as a boundary organization that facilitates the dialogue about science and technology needs for achieving the goals of sustainable development by bringing individuals working in science and technology, development, and environmental protection to the same table on an equal basis;
- to enable the rapid establishment of global-regional linkages;

- to encourage disparate scientific disciplines to come together in order to contribute solutions to the challenges of sustainable development; and
- to nurture the next generation of young sustainability scientists and technologists.

The Initiative was always intended to be just that, an *initiative*, with much flexibility but with limited life and function, supportive of – but not conducting – actual R&D. The three-year duration of our initial proposal to the Packard Foundation was specified with this limited mandate in mind. We have engaged in a number of activities to explore what sort of a second incarnation, if any, the ISTS should consider. A crucial point in this process was our decision, prompted by the Packard Foundation, to collaborate closely with TWAS and ICSU in jointly hosting the Mexico City Synthesis Workshop on Science and Technology for Sustainability (described earlier in this report).

5.1 The ISTS/TWAS/ICSU Consortium for S&T for Sustainable Development

The sponsors of the Mexico City Synthesis Meeting (ISTS, ICSU, and TWAS) agreed to meet after the WSSD to review needs and opportunities for further collaboration in harnessing science and technology for sustainability. Results of the ISTS Steering Group review were carried forward to this larger meeting on overall strategies for advancing sustainability science that brought together leadership of the Initiative, ICSU, TWAS, and the Global Environmental Change programmes in Paris on 14-15 November 2002, under the chairmanship of Prof. Jane Lubchenco, President of ICSU. The participants agreed that further efforts to develop and implement the action agenda shaped at Mexico City were still needed in the wake of the Summit. They also agreed on the need to engage a broader community in exploring priorities for such work, and on the importance of thinking broadly about the best ways of harnessing their own and other organizations' efforts to achieve those priorities. As a temporary means for exploring this next stage in the evolution of sustainability science, TWAS, ICSU and ISTS formed an *ad hoc* Consortium for Science and Technology for Sustainable Development.

The Consortium members agreed to move forward on two parallel tracks. The first track continues to pursue the short-term goals of the three founding organizations, with coordination provided through informal consultations and, when warranted, formal collaborations. As a second track, the partners agreed to set up an *ad hoc* Advisory Group to work over the following 24 months to help shape longer-term goals and strategy for the Consortium and its members. Terms of Reference of the Advisory Group were agreed to in May 2003. The goal of the Advisory Group is to help the Consortium members explore options for long-term strategy. Robert Corell (USA) and Hebe Vessuri (Venezuela) chair the *Ad Hoc* Advisory Group. The Advisory Group has met 5 times (July 2003, September 2003, January 2004, June 2004 and October 2004). It has produced a draft report, which was circulated widely among the constituencies of ISTS, ICSU and TWAS. The final report will be available at the beginning of 2005. It will describe a number of options for harnessing science and technology for sustainable development, possible modes of operation for Consortium members and other groups working in this area, and address potential partners and funding issues. ISTS Steering Group members will review the final report in early 2005 and consult with ICSU and

TWAS on the longer-term strategy for the Consortium. Jill Jäger is the ex-officio representative of ISTS in the Advisory Group. Jill Jäger led a group from other Consortium partners to prepare a proposal to the U.S. National Science Foundation's Division of Social and Behavioral Sciences for partial support of the activities of the Advisory Group. This was submitted via ICSU and approved by NSF in July 2003. Jill Jäger and Robert Corell prepared a funding proposal to the European Union Commission, Directorate-General Research, for supplemental funding of the final workshop of the Advisory Group. This proposal was not funded.

As the Advisory Group develops options for a long-term strategy, members of the Consortium are committed to maintaining and building on the world-wide momentum of sustainability science that has built up over the last several years. Which parts of this ongoing agenda will be implemented through the individual activities of the Consortium's founding organizations and the increasing number of other groups now active in the field, and which as coordinated activities, remains to be seen. ICSU's Executive Board decided in November 2004 that it does not want to continue as a partner in the Consortium. In so doing, ICSU is adopting one of the options for 'organizing future programs on sustainability science' outlined in the draft report of the *ad hoc* Advisory Group on S&T for Sustainability set up by the Consortium. The final version of this report will be available in early 2005, but the draft poses one option, which argues that in light of the breadth of activities and approaches relating to sustainability science being pursued around the world, more is to be gained by fostering multiple agendas than by prematurely seeking to arrive at a common (and potentially 'lowest common') set of shared goals. ICSU as an organization will continue to develop its agenda in support of sustainability science, while other organizations (including TWAS and ISTS) develop theirs. ISTS and TWAS will not ask their membership for a formal decision on the nature of their future collaboration with one another and with other organizations on the sustainability science agenda until after publication of the final Advisory Group report.

In the meantime, to maintain momentum a new project on "Sustainability Science and Technology: Linking Knowledge with Action" continues to develop partnerships and dialogues to link sectors and regions in science-based, action-oriented initiatives to promote sustainability. The project contains two closely related elements: a set of focused Partnership Team efforts to link knowledge with action in emerging areas of sustainability science (vulnerability and resilience, and production-consumption systems) and a larger Scientist-Practitioner Dialogue to catalyze significant increases in the quantity and effectiveness of knowledge/action partnerships for sustainability. The project's support is from a core grant from the David and Lucile Packard Foundation given to Harvard University on behalf of ISTS and TWAS. The project period is December 2004-November 2006.

5.2 New partnerships for an ISTS Phase II

Discussions underway are considering a round II in which ISTS becomes a professional association for science and technology for sustainable development with the following attributes: open to membership by scholars and practitioners interested in harnessing science and technology for sustainable development and institutions centrally committed to the same; for the purpose of providing mutual support, recognition and networking; dedicated to fostering periodic "Dialogues" to bring the communities together; providing an association publication; and having occasional special projects. ISTS is evaluating potential roles with a number of institutions including, but not limited to:

- American Association for the Advancement of Science's Center for Science, Innovation, and Sustainable Development
- Arizona State University's International Institute for Sustainability
- Harvard's Center for International Development
- LEAD International
- Sustainable Europe Research Institute
- Third World Academy of Sciences
- Tyndall Centre for Climate Change Research

A proposal for a LEAD International-TWAS-AAAS-Harvard Joint Programme on "Engaging Science in Sustainable Development" has been prepared and has been sent to potential funders. These partnering organizations have long and deep experience in the relevant fields and strong connections with the development community. Key elements of the program include:

- Targeted training for scientists and development practitioners on how to engage each others' expertise in their programs;
- Career-oriented measures such as awards, the recognition of 'pro bono' work by scientists, and the establishment of a research fund for trans-national science for development issues;
- Exchange visits and joint faculty appointments between universities in the North and the South and support for solution-driven research;
- Establishment of a network of S&T and development practitioners and the convening of dialogues for joint agenda-setting;
- Establishment of a research program focused on more effectively engaging science in sustainable development and recruitment of an international team of post-doctoral fellows from the S&T and the development communities to work together on selected themes; and
- Encouragement of appropriate research by various partner institutions.

6 Key documents produced by the Initiative and its members

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