Support to Science, Technology, and Knowledge for Development: A Snapshop of the Global Landscape (Summary Report)

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Preface

On 1 December 2000, heavy rain began falling in Mwanza city, Mabatini, Nyakato, Uhuru, Rufiji, Gonja and Kirinjiko villages. For 31 days it continued, the water rising daily through the entire month of December. The flooding the rains induced left more than 3,600 in the Kilimanjaro Region dead (Dartmouth Flood Observatory 2004). Without the infrastructure, knowledge-dissemination technology, and research systems necessary to predict and prepare for this disaster, thousands of Tanzanians lost their lives and thousands more were displaced.

At the time of the flood, almost 18 bilateral donors in addition to the World Bank and other Regional Banks actively supported development projects in Tanzania. In fact, Tanzania benefited from 1371 different development projects from bilateral donors alone. Although some countries, such as Switzerland, committed USD30 million through just five projects, others, such as Ireland, spread their support across hundreds of projects (offering roughly the same amount of total aid, the Irish sponsored 404 different projects). But, the staggering number of individual projects, designed with Tanzania's development in mind, failed to prevent the unnecessary death and destruction caused by a flood with a magnitude of 4.7. In contrast, a November 2004 flood in Texas with a magnitude of 8.9 resulted in just three casualties.

Even with so many active projects, important opportunities were lost. Whereas donor coordination could have mustered a coherent strategy to prepare and respond to this natural disaster, such action had not occurred to a sufficient degree to save the many lives taken in this one event.

Examining the content of the 1371 projects, if even 1% of the funded projects had effectively supported research and knowledge for development, would the same outcome have occurred? If 10 years earlier, 2% of the projects had trained S&T human resources — engineers, researchers, and scientists — to build infrastructure, monitor local weather patterns, develop information and communication technologies, and introduce environmentally sustainable land-use techniques, would the same outcome have occurred?

The importance of science, technology, and knowledge for development cannot be understated. Their centrality for the wealth and health of individuals is undeniable. "Capacity" is not well defined, but the ability of individuals, organizations, and societies to meet their needs is central. Without sufficient knowledge and skills in many areas, including in science and technology, developing countries will find it difficult to meet their needs effectively. Without coordination around science, technology, and knowledge for development, donors will find it impossible to help them in their pursuit.

This study seeks to provoke thought and discussion around the degree to which donors — foundations, bilaterals, and multilaterals — emphasize science, technology, and knowledge for development in the provision of development assistance. Beginning with an exploration of the particularities of the current state of science and technology and the international context in which the products and processes of science and technology are funded, created, used, adapted, and disseminated, the paper provides a brief description of the origins of the approach to this study followed by a synopsis of the key trends in donor support to science, technology, and knowledge for development that emerged from the interviews encapsulated in the stand-alone

chapters. Finally, individual chapter summaries are provided corresponding to each of the longer foundation, bilateral, and multilateral donor profile chapters not included in this summary.

Readers familiar with this topic often approach the terms science and technology capacity building, science and technology for development, knowledge for development, and research for development with a considerable supply of assumptions. For some, S&T refers to the diverse investments made by governments, the private sector, and academia in the basic research, applied research, development of equipment and standards, data collection, and analysis needed both to increase knowledge about the natural world and to help the sponsors of research in their various missions [Wagner 2002]. For others, the thrust is on outcomes and the use of science, technology, and knowledge as tools for economic growth.

The United Nations Millennium Project report *Investing in Development* presented to UN Secretary General Kofi A. Annan on 17 January 2005, asserts that the long-term driving force of modern economic growth has been science-based technological advance. That same report also presents science and technology for development as encompassing a range of activities that bear on poverty eradication. Noting the potential for science and technology to increase crop yields and lead to vaccines and medicines for malaria and HIV/AIDS, the report notes the central role that the international science community — led by national research laboratories, universities, and national academies of science — must play in developing the global public goods to respond to these challenges. Of the report's 10 main recommendations, one compels international donors to "mobilize support for global scientific research and development to address [the] special needs of the poor in areas of health, agriculture, natural resources and environmental management, energy and climate." Notions of human and institutional capacity-building, policy and planning issues in engineering, science, and technology, the creation of products and processes that fuel a knowledge-intense global economy each come into play in the construction of definitions for these terms. These subtle yet striking differences are evident in the definitions elicited from the participating bilateral and multilateral donors and foundations profiled here. It is the opinion of the author that the activities germane to science, technology, and knowledge for development exist along a spectrum and that more important than agreement on the establishment of precise boundaries is a heightened global appreciation for the requisite actions needed for the generation and application of scientific and technological knowledge to meet the many challenges associated with poverty, sickness, and economic underdevelopment in many parts of the developing world. The shorthand used in this paper for this collection of ideas is S&T for development, abbreviated S&TFD.

Introduction — A Moment in Time

The forces of globalization, rapidly changing technology, and the increasing importance of knoweldge have raised the cost of having low capacity in science, technology, and knowledge for development (S&TFD) in developing countries. Although technological change and globalization represent opportunities to achieve poverty-reduction goals, the challenges posed by globalization can create barriers to the enhanced productivity and economic competitiveness that S&TFD can otherwise make possible.

Global disparities in S&TFD capacity are acute, and differences in growth due to the distribution, use, adoption, adaptation, and generation of knowledge are widening. Global differences in S&TFD capacity are startling: R&D spending by the 29 wealthy countries of the OECD in 1998 was greater than the combined economic output of the 61 poorest countries. Beyond investments in R&D, investments to cultivate the necessary enabling environment in which knowledge, entrepreneurialism, industry, and creativity thrive and flourish — appropriate tax policies and incentives, monitoring and evaluation, government procurement, technical norms and standards, customs, academia-industry linkages, finance and banking, intellectual and other property rights — are woefully inadequate in many parts of the developing world (Aubert 2004). More troubling is the apparent misalignment between two trends: the rate of global knowledge production and the rate at which change agents acquire the ability to distribute and use both new and existing knowledge.

Many developing countries are succeeding in building their national innovation systems — the complex people–policy–institution networks through which S&TFD is translated into improved products and processes. Developing countries want to invest in strengthening their knowledge economies and harnessing science, technology and knowledge for development. Not all North–South partnerships have experienced the same level of achievement in fostering endogenous capacity as have the South-driven programs. Often the focus of international research agendas has been defined by the partners who hail from the more scientifically advanced countries. Some donors are beginning to focus on a more basic goal, that of helping countries develop endogenous national innovation systems, in the widest sense of that term, which entails support to centers of excellence, university-academia linkages, basket funding for research, and much more. Still needed is a richer understanding of how developing coutries can leverage existing research cooperation schemes and design new ones for their benefit.

Proximity matters: S&TFD capacity results from the creation of successful clusters, networks, and webs of actors. The increasing number of linkages between researchers in scientifically advanced and developing countries is reflected in the growing number of co-authored papers. The proliferation of various types of research arrangements (e.g., virtual laboratories) has allowed practitioners to conduct parallel research in their home laboratories and share results in real time (Wagner et al. 2002). However, despite the decreasing cost of travel and abundant information technology to facilitate exchange, the likelihood of scientists collaborating is directly correlated with the level of science and technology capacity in each country as well as proximity (Wagner et al. 2001). The key to effective collaboration for a range of S&TFD functions is the proximity of potential collaborators to local entrepreneurs and innovators (Aubert 2004). Although insights into the nature of knowledge production and

application, which are themselves the product of accumulated research and practical experience, have improved the linking of knowledge to outcomes, much more work is required on the transfer, sharing, and management of knowledge for development.

The International Community Responds

> *In the world of the 21st century, critical issues related to science and technology (S&T) confront every nation. How can we stimulate growth in an information economy? How can we prevent global and regional environmental damage? What is the best way to introduce beneficial new technologies, thwart acts of terrorism, or respond quickly to the rapid spread of new diseases? Today, no nation that wants to shape informed policies and take effective action on such issues can afford to be without its own independent capacity in S&T* (Annon 2004).

Eight days before his editorial in *Science*, United Nations Secretary-General Kofi Annan presided over the official launch of the InterAcademy Council's first global report to the United Nations. The InterAcademy Council — a grouping of national science councils from both rich and poor countries — has argued forcefully in *Inventing a Better Future* that every country should have a minimum scientific research capacity to face today's development challenges. This capacity will enable countries both to innovate and grow and to absorb and benefit from existing technologies. *Inventing a Better Future* recognizes that enhanced cooperation among the S&T communities of the developing and developed worlds is especially important to harness science, technology, and knowledge for development (IAC 2004).

These messages have been echoed in other reports, such as the Millennium Project's reports from Task Force 10 on Science, Technology and Innovation and the World Bank's Strategic Approaches to S&T document. Ubiquitous across these reports is the shared view that meeting the Millennium Development Goals (MDGs) will require a substantial reorientation of development policies to focus on key sources of economic growth, especially those associated with the use of new and existing scientific and technological knowledge, and on related institutional adjustments (Juma and Yee-Cheong 2004).

Beyond their role in making possible the attainment of such sectoral challenges as those embodied in the MDGs, investments in science and technology are a key contributor to economic growth. Three approaches most often cited are those of:

- Robert Solow, who concluded that a residual or unexplained portion of US economic growth stemmed from technological advances and that this residual far outweighed changes in capital or labour;
- Edward Denison, who estimated that research and development accounted for 20% of US economic growth between 1939 and 1957; and
- The return-on-investment analysis conducted by Zvi Griliches and Edwin Mansfield, who showed that rates of return for investments in research and development could be as high as 40% (Wagner 2001).

A growing appreciation for the theories of the aforementioned economists and the apparent validation of these theorists as a result of the S&T-driven success stories of Singapore, Hong Kong, South Korea, and Ireland, has fuelled new interest on the part of donors to further understand the activities of their peers in support of science, technology, and knowledge for development. Precipitating in a general shift within the donor community toward increasing funding for science and technology for

development, many of the major donors are now interested in strengthening and/or retooling their approaches to harnessing science, technology, and knowledge for development in response to the challenges posed by the InterAcademy Council, the Millennium Development Goals Task Force, and many voices in the developing world.

Origins of the Approach

The International Development Research Centre, the Rockefeller Foundation, and the World Bank suspected that a fresh look at donor support to S&T for development could provide valuable information to development partners seeking to learn from their peers. Previously, a short study had been conducted by a small World Bank team interested in assessing support to S&T for development as an input into the institution's S&T Strategic Approaches paper, the results of which were a thin document and a deep understanding of the difficulty of this kind of exercise. To initiate this undertaking, a small steering group (Janet Maughan, the Rockefeller Foundation, Paul Dufour, IDRC, Robert Watson, the World Bank, and Sara Farley the Rockefeller Foundataion and the World Bank) decided to approach a group of international partners from the bilateral, multilateral, and foundation communities with a set of questions germane to S&T for development.

In preparation, those involved approached the International Forum of Research Donors (IFORD) at their meeting in Leiden, The Netherlands, to elicit reactions and endorsement. The overwhelming majority of comments affirmed that the information would be useful, but that the task of collecting it would be difficult. The approach taken was to view the task as a series of steps. The first step was to pose a set of seven questions to senior staff from various bilateral and multilateral donors and foundations. The intent was to produce information that would be more the product of a discussion than a desk study, with an emphasis on information — emerging trends and future perspectives — less likely to be available in secondary sources.

This approach had some limitations, and this first-cut study could be enriched in the near future if resources were available for these additions:

- *More entities profiled*: Some very important bilaterals (e.g., those in Japan, Germany, and The Netherlands), foundations (e.g., the Wellcome Trust and Howard Hughes Medical Institute) and multilaterals (e.g., the African Development Bank) were not included, but would certainly contribute to a richer and more global understanding of donor support for S&TFD.
- *More questions*: A number of important questions were not included. Five more questions have already been agreed to by the steering group, and dozens more interesting and illuminating questions could be included.
- *A comparative analysis*: This first-cut analysis allows the findings from the interviews and the secondary sources to speak for themselves. A comparative analysis would provide some new insights.
- *Further depth to facilitate agenda-setting*: A further level of detail is required to move from landscaping to agenda-setting. Questions pertaining to distinct trends and directions specific to individual subsectors would be useful.
- *Better figures*: The mandate for this analysis was to avoid the pitfall of comparing numbers. At this time, only a general understanding of the trend in support to S&TFD was sought.

This methodology yielded information from seven European and US bilaterals, five multilateral and regional institutions, and two foundations. Taken together, the data that were provided make two main points:

- ***Support to science, technology, and knowledge for development, as defined by the institutions profiled, is increasing across the donor community and resulting in a wide array of activities and modalities of support.***
- ***This increase in support appears to be driven largely without a parallel increase in strategic guidance within the donor institutions, or between them, although their attention is now turning toward this oversight.***

In addition, eleven trends were identified. They illustrate the diversity and complexity of donors' challenges and tendencies in pursuit of support to S&TFD.

Trends

Rectifying the lack of strategy: Most institutions do not have a guiding strategy to orient their S&TFD activity. Although "knowledge for development" has entered the strategic language of their governing policies, few have an explicit vision to provide a coherent architecture, methodology, and set of objectives for S&TFD activities. There is a trend toward recognizing this deficit and committing resources to rectify it.

Looking to coordinate: In almost every institution, there is a desire to coordinate with other donors to learn more effective approaches and to benefit from lessons learned and effective practices in supporting S&TFD. The membership of many of the institutions in the International Forum of Research Donors (IFORD), and their participation in such donor harmonization bodies as the InterAcademy Council and the Organisation for Economic Co-operation and Development, demonstrate a willingness within the international community to work more closely to harness science, technology, and knowledge for development. However, serious opportunities to coordinate S&TFD activities in this way have been limited suggesting interest in cultivating greater partnership in the future. Meanwhile, the limited success in linking demand for research in developing countries to national strategies has resulted in misalignment between demand and output in S&TFD. The degree to which local demand for S&TFD, national development strategies, and donor strategies diverge further illustrates the need for enhanced coherence and coordination in the future.

Putting more punch in PPPs: Many respondents cited increased investment and attention to public–private partnerships, which explains the significant increase in product R&D activity of a diverse and multi-organizational nature (Ridley 2004). Confident that the private sector is increasingly willing to engage in such partnerships, the Rockefeller Foundation, DfID, the World Bank, the EU, USAID and many of the other institutions listed are placing greater emphasis on building these partnerships, strengthening the ones that exist, and asking questions regarding their value, capability, advantages, and limitations with respect to S&TFD.

Small is still beautiful: Programs such as Denmark's program on Enhancement of Research Capacity (ENRECA), which was transferred to the Department for Development Policy, and the Carnegie Corporation of New York's and the Rockefeller Foundation's African university support programs demonstrate the achievements that are possible in building and strengthening capacity through small, concentrated efforts that address discrete S&TFD activities. Contrary to this trend toward small and

targeted funding, there is an increasing tendency toward basket-funding due to the growing recognition that the pooling of funds enhances donor coordination.

ST&K for competitiveness: Many donors reported a lack of clarity in their institutions around the terms *science*, *technology*, and *knowledge*. However, developing and developed countries alike increasingly speak of the importance and relevance of S&TFD in moving industries higher up the value chain with the deepening of technology and knowledge content. The success with which the ideas behind these terms take hold will determine both the speed with which countries shift from technology adoption and imitation to technology creation stages and the type of investment that is attracted. Increasingly, donors such as the World Bank and the InterAmerican Development Bank are folding their S&TFD activities into the competitiveness lexicon. The "competitiveness for development" message lies at the heart of this year's World Development Report, *A Better Investment Climate For Everyone*, which focuses on the importance of encouraging innovation as a route to economic growth. The report suggests that the most effective strategies for achieving S&TFD capacity are those that provide a supportive environment for individuals, institutions, and enterprises that are dedicated to finding the best ways of putting research results into practice (i.e., using science, technology, and knowledge to promote competitiveness) (Dickson 2004).

Looking for the S&T in PRSPs: The funding activities of many bilateral and multilateral agencies are predetermined by the Poverty Reduction Strategy Papers (PRSP) their countries use to organize their approach to promoting economic growth and achieving the Millennium Development Goals (MDGs). Many respondents noted the challenge of mainstreaming S&TFD when country strategies fail to include these themes (Adubifa 2004). With a range of explanations for this oversight, respondents at various institutions profiled indicated that there exists a growing interest in addressing the need to better integrate S&TFD into both the PRSPs and Country Assistance Strategies. Attention to this area appears to be mounting.

Support for technology to disseminate and use knowledge: Seen as critical to the ability to transmit, diffuse, and use knowledge for development, information and communication technologies (ICT) are receiving increased funding, described by many respondents as the requisite mechanisms to ensure that scientific knowledge is put to effective use. Eliciting greater contributions from donors in all three profiled communities (e.g., SIDA, the Carnegie Corporation of New York, IDRC, DfID, SDC, World Bank, etc.) support for the construction of ICT infrastructure and training and skills development in ICT is now construed as essential to the facilitation of linkages between the creators and users of knowledge. Also receiving a great deal of funding and discussion is the parallel "virtual infrastructure," linking universities, corporations, and policymaking bodies in ways that ensure scientific results and technological information reach their intended targets effectively.

Extending the knowledge agenda beyond the organization: Many donors reported initial strides in mainstreaming the phrase "Knowledge for Development," (K4D) but for many of the organizations, the result has been an emphasis on moving information more efficiently within the institution itself. With notable exceptions, the K4D agenda has stalled at the level of marshalling knowledge within organizations to improve performance. Insufficient attention is given to knowledge dissemination, use, adaptation, and generation beyond the donor institutions themselves. More attention is needed on the role that developing country governments can play as facilitators of

the generation, use, and diffusion of knowledge for development (King and McGrath 2004).

Africa beginning to elicit the attention it needs: Except for the Asian Development Bank, all of the profiled donors are supporting S&TFD in Africa, with a great deal of focus on Nigeria and Uganda. Donors increasingly believe that science, technology, and knowledge are critical for the development of Africa and that associated resources should be channelled there first. For example, Canada's IDRC reported that more than 54% of its resources go to Africa.

Enter the new Southern donors: The donor community is just beginning to respond to the emergence of some of the newly industrialized countries. In October 2004, the President of the Chinese Academy of Science offered to send experts to train local technicians in African countries, host training classes, and sponsor African experts to learn about Chinese agriculture, water power and renewable energies (Masood 2004). The recent USD50 million contribution from the Government of Korea for a Technology and Innovation Fund for developing countries in Latin America further demonstrates the emergence of new partners with which traditional donors may collaborate. Moreover, S&TFD will likely be of great interest to these new players out of recognition of the role played by science and technology in their own successful national development strategies.

Internal bipolarity: An examination of the S&TFD portfolios of the profiled donors reveals a level of bipolarity in the manner in which support for technology is conceived. In contrast to those programs that support "technology for technology's sake," there are those that support a more holistic, systems level approach that prioritizes the social innovations associated with the introduction, adoption, and dissemination of new technologies. Other donors reported a transition from the former style to the latter, such as Canada's IDRC that provided significant support for technology and technological systems in its early years only to later switch to a system more focused on national innovation and knowledge systems and governance. Across the donors profiled an internal tension exists between these two orientations for support for technology development.

Evolutions in capacity building: In many developing countries, a new context for capacity building is challenging donors to respond appropriately to: the revitalization of universities; an emphasis on capacity to generate knowledge that is locally appropriate and relevant to the private sector (as well as to the world beyond); new global forces for ICT, privatization, commercialization; and a large expansion in research and training networks. For funding agencies, these phenomena are resulting in a shift from programs aimed at damage control (efforts to interrupt brain drain, compensate for research failure of universities, or shield research and training from excessive political interference) to ones responding to emerging opportunities. In particular, some donors are turning their attention to strengthening local institutions rather than using institutions in the North as intermediaries. Capacity building in this context moves from a supply-driven approach to one that is demand-based and entails a shift from training and study to a concentration on application and accomplishment (Mooke 2004).

Other areas of increasing attention within the S&TFD milieu:

- Information and communication technologies (ICT) for development;
- Support to S&TFD within the education sector and a greater emphasis on tertiary education and the linkages between tertiary education and its role in the national innovation system (NORAD, World Bank, Rockefeller Foundation, Carnegie Corporation of New York);
- Knowledge management and knowledge sharing; and
- Support for research capabilities (e.g., the InterAmerican Development Bank and the Asian Development Bank have both established research departments within their organizations in addition to previously existing research-focused programs in Denmark, Sweden, and Switzerland).

Data Presentation

The following detailed tables summarize the input received from the participating bilateral and multilateral donors and foundations. The information in the tables is structured according to the seven-question template (Table 1) used to collect the data. The institutional responses that were used to compile the summary tables are available as discrete chapters from the author or on the IDRC website.

Table 1. S&TFD question template used to gather donor input

1. How does your institution define science, technology, and knowledge for development?
2. What is considered inside and outside the milieu of your institution's support for S&TFD?
3. How does your institution support S&TFD in its client countries/grantees?
   a. How does this support take form — grants for technical assistance? Human capacity building? Technology extension services? Support for research? In other words, what types of activities are supported?
   b. In which regions, countries?
   c. In which sectors?
4. Does support follow a systematic approach to S&T capacity building? [i.e., Is the manner of support organized by an articulated vision or strategy specific to S&TFD?]
5. Do you quantify the level of support for S&TFD? If so, what is the level, both in real terms and as a percentage of your institution's overall budget? How does this level compare to that of 5 years ago? 10 years ago?
6. Do you have a sense of where support for S&TFD is headed at your institution, both by level and type of support?
7. Where do you see the challenges and opportunities for your institution with regard to S&TFD?

Britain, Department for International Development (DfID)

S&TFD Definitions	DfID's orientation to support for S&TFD is driven by its dual focus on poverty reduction and sustainable development. From the Research Funding Framework 2005–2007, "Knowledge and resources are the two great weapons against poverty…Research, the process that generates new technologies and ideas, is one of the driving forces behind gains in human development and poverty reduction." Science and technology for development may be considered components of the larger Knowledge for Development framework through which governments, producers, and users transfer, access, disseminate, and use the knowledge needed for a broad range of development functions.
Activities to support S&TFD	Considered within the milieu of DfID support to S&TFD is: Support for S&T systems strengthening and capacity building and support to research; Various scholarship programs, including that of the Chevening scheme and the Commonwealth Scholarship and Fellowship Plan — with split-site and distance-learning awards; Information and communications technology capacity building; Support for laboratory equipment and infrastructure; Further support to be provided for technology transfer and capacity building in the private sector; Activities to stem the brain drain; Support to centres of excellence; Support to Higher Education Links scheme to foster UK–developing country university collaboration; Support to Health Knowledge Programme with 15 disease-specific projects. In determining whether a particular activity would be appropriate for S&TFD support DfID considers how germane the activity would be to partner goals, MDGs, and poverty reduction.
Types of S&TFD support; regions; sectors	Its main instrument is direct budgetary support to developing countries to help them implement their Poverty Reduction Strategy Papers, which have historically included almost no mention of S&TFD. DfID support to S&TFD capacity building occurs mainly through fellowships and research programs based in both the UK and developing countries. Support is also provided through: Technical assistance; Training S&T human resources (PhD fellowships); Support for infrastructure and laboratory equipment; Support to international research networks and institutions (e.g., CGIAR); Support to Engineering Knowledge and Research Programme; and Support for social sciences research. DfID has been a major pioneer of public–private partnerships and is looking to take forward PPPs in agriculture and health. Regionally, DfID supports programs in more than 98 developing countries worldwide, with considerable more financial support to the poorest among them. The central Policy Division has five groups that address: Development Effectiveness, Governance and Social Development, Growth and Investment, Human Development, and Sustainable Development. The Central Research Department has been transferred from the Policy Division and now reports to the Director General for Corporate Performance and Knowledge Sharing.
Strategic guidance for S&TFD support	Criticized for having "little systemic approach to S&T capacity building [for developing countries]," DfID has responded with the DfID *Research Funding Framework 2005-2007*; *Research Strategy*; the Efficiency Technical Notes, which states that DfID will deliver efficiencies of at least 2.7% a year, equivalent to GBP422 million in efficiencies by 2007–2008; and the Surr Study, which was commissioned by DfID to put forward proposals to guide its research work. Beyond research explicitly, DfID's new Science Advisor will be drafting a Science, Technology, and Innovation Strategy paper to in the near future. PRSPs provide strategic guidance at the country level to orient DfID's approach to support for S&TFD as well.
Level of S&TFD support	No precise figures for historic support to S&TFD are available. Four percent of total development budget spent on knowledge and research — GBP80 million/year spent on research, which will increase to at least GBP100 million in 2006–2007 with possibility for funding up to GBP120 million in the future. Other S&TFD expenditures: in 2002, GBP12 million to the Commonwealth Scholarship and Fellowship Plan, 51% of awards for S&T study; Support to the CGIAR increased from GBP10 million per annum to GBP20 million per annum; GBP200 million investment in a Renewable Natural Resources Research Strategy Programme.
Future directions for S&TFD support	British ODA will be increasing significantly and S&TFD support may be expected to increase in a commensurate manner. Major increases to DFID's support for S&TFD via support to research have been planned for the coming years. The recent reorganization of research funding now directs two thirds to: (1) agricultural productivity in Africa; (2) killer diseases; (3) states that work in the interests of the poor; and (4) climate change. The remainder of the funding will be spread over a wide range of themes, some identified and others yet to emerge. In the future, DfID will likely place more emphasis on working with partners to build systems-level S&T capacity and disseminating existing S&T knowledge to users. DfID will also collaborate more with multilateral and bilateral donors and foundations. In the longer-term, DfID intends to increase its impact by: focusing on the right research priorities; strengthening collaboration with other UK funders of research with applications for developing countries; contributing to better coordination among research financiers internationally; strengthening links with the private sector; and enhancing its monitoring and evaluation. In advance of his role as G8 Chair, the British Prime Minister embedded an S&TFD focus in his Africa Commission, which will likely result in greater visibility of DfID's support in advocating for funding and progress on these themes, and on climate change and the development challenges in Africa.
Challenges and opportunities	Brought on in part by a critical review by the British Royal Society and a subsequent critique by the MPs on the House of Commons Science and Technology Committee of its impact in supporting STK4D, DfID is in the midst of a major effort to strengthen its support to this area. Outlined in its strategies for the future are recommendations to respond to various challenges: (1) increase the appreciation for S&T's role in poverty reduction; (2) focus on key researchable problems; (3) provide more support for developing country research capacity; (4) give more attention to getting research into use; (5) lengthen the timeframe for anticipated results in S&TFD projects; (6) expand international funding and collaboration around S&TFD in collaboration with the private sector; and, (7) increase collaboration with other UK entities to support research. DfID has appointed a chief scientific adviser charged with refining and implementing this agenda for change.

Canada, International Development Research Centre (IDRC)

S&TFD Definitions	IDRC has a mandate "to initiate, encourage, support, and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical, and other knowledge to the economic and social advancement of those regions." Although no discrete definition of S&TFD is provided by the institution, in executing its mandate, IDRC helps developing countries use ST&K to find practical, long-term solutions to the social, economic, and environmental problems they face.
Activities to support S&TFD	IDRC supports Canadian foreign policy goals. IDRC's work is consistent with, and pre-dates, the recent commitment that Canada's National Science Advisor will work with the research community to identify additional steps to bring the benefits of Canadian research and development capacity to bear on the challenges of the developing world. It also supports the long-term goal of devoting no less than 5% of Canada's R&D investment to a knowledge-based approach to development assistance. Support is directed toward the creation of indigenous research capacity so that developing countries may sustain the policies and technologies they require to build healthier, more equitable, and more prosperous societies. IDRC S&TFD activities include those to: (1) initiate research support that draws on a broad pool of expertise to tackle complex development problems; (2) involve stakeholders in defining their problems and proposing solutions to them; and (3) use virtual research networks to share research results and communicate new knowledge. Research support provides funding for the conduct of S&TFD research as well as training, partnership building, and support for the conduct of research. IDRC engages in support to S&TFD policy formation, such as that entailed in its Africa–Canada–UK exploration. Also through its Research on Knowledge Systems (RoKS) program, IDRC promotes analysis and debate at the local, national, and international level on key issues in the evolution and functioning of "knowledge systems" in developing countries.
Types of S&TFD support; regions; sectors	IDRC's principal approach to provision of support to S&TFD is via research projects and related activities developed and proposed by developing country institutions and by Canadian institutions in collaboration with one or more developing country partners. In 2003–2004, 828 such research activities were carried out, including 444 projects. Additional S&TFD modalities are the many Centre Program Initiatives that also fund research through competitive arrangements (e.g., small grants competitions) that provide a way to identify new researchers and institutions with whom to partner. Its S&TFD support is provided to a global constituency with a regional distribution in 2003–2004 of: 54% Africa and the Middle East, 20% Latin America and the Caribbean, and 26% Asia. Thematically, the Centre's Corporate Strategy and Program Framework (CS+PF) identifies three broad areas in which IDRC supports many types of S&TFD relevant research: (1) environment and natural resource management; (2) social and economic policy; and (3) information and communication technologies for development. Simultaneously, multiple sectors are addressed in the Centre's cross-cutting programs: Research on Knowledge Systems and Biotechnology and Emerging Technologies. IDRC has supported the governments of Botswana, Chile, China, Jordan, South Africa, and Viet Nam to conduct path-breaking reviews of their science and technology policy. IDRC has also supported private-sector development through improved policy environments, through wider access to ICTs, and through the development of various technologies.
Strategic guidance for S&TFD support	The primary strategic document that provides guidance for IDRC's S&TFD activities is its Corporate Strategy and Program Framework, which outlines the broad themes and general directions of IDRC's work in five-year increments. The next CS+PF for the period 2005–2010 includes the following proposed strategic programming goals: (1) IDRC will strengthen and help to mobilize the local research capacity of developing countries; (2) IDRC will foster and support the production, dissemination, and application of research results that lead to changed practices, technologies, policies, and laws that promote sustainable and equitable development and poverty reduction: and (3) IDRC will leverage additional Canadian resources for R&D by creating, reinforcing, and participating in partnerships between Canadian and developing world institutions.
Level of S&TFD support	IDRC does not have a precise measurement for its support to S&TFD activities as a subset of total funding to research. In 2003–2004, approximately 81% of IDRC's CAD126 million in funding (both parliamentary appropriations and other) went toward either research projects or research support projects.
Future directions for S&TFD support	Parliamentary appropriations to IDRC increased to CAD119.1 million for 2004–2005 up from CAD107.9 million for 2003–2004. As indicated in its tentative Corporate Strategy and Program Framework 2005–2010, research, knowledge production, and knowledge sharing will be prioritized in the coming half decade as they are considered essential if the global community is to build a better future for humankind. In the future, IDRC intends to do what it can to ensure that research communities benefit from the potential advantages of ICTs, and to encourage others to provide support to this vital area. Thematically, the Centre intends to continue to follow new lines of inquiry such as biotechnology, private-sector development, ICT policy and governance, research and innovation systems, and telecentre support networks.
Challenges and opportunities	One challenge facing IDRC is the need to better engage the private sector in partnership activities while preparing to facilitate emerging and potential donor nations from the South. Incorporating the participation of these new players will challenge IDRC, as it will other donors, to consider both the way in which development research is conceived and how it is supported. A second challenge is the manner in which the knowledge management "business" has focused on marshalling knowledge within organizations to improve performance rather than paying due attention to some of the most important development-related aspects of knowledge dissemination, use, adaptation, and generation. IDRC will need to attain a deeper understanding on this set of issues, which lie at the heart of the Centre's effectiveness in harnessing science, technology, and knowledge for development.

Denmark, Danish Ministry of Foreign Affairs

S&TFD Definitions	Historically, DANIDA's support for research and knowledge-creation systems was underpinned by a high level of understanding of science and technology research systems, particularly on behalf of ENRECA — its program on Enhancement of Research Capacity. The Ministry of Foreign Affairs is currently seeking to increase its clarity on theses themes. At the policy level, the Ministry has articulated its commitment to promoting knowledge-based development assistance.
Activities to support S&TFD	Support to S&TFD in Denmark follows a system that promotes research in two ways: (1) several activities aimed at tying the efforts of the world-class research system in Denmark to the challenges and concerns impacting the developing world; and (2) provision of direct support for human capacity building, technical assistance, and investment in the developing world with the explicit aim of strengthening foreign research and knowledge systems. The former has traditionally constituted the thrust of DANIDA's emphasis — promoting high-level research performed by Danes and non-Danes with applications of relevance to the developing world.
Types of S&TFD support; regions; sectors	Funding instruments used for the sector programs include: grants; fellowships; support to institutions; grant components for research within support to facilities (e.g., universities and research institutions) across multiple sectoral programs; and basket-funding mechanisms that seek to leverage the support of other donors to invest in research, technical assistance, and support to international networks (e.g., CGIAR, GEF, and UNESCO). The focus of sectoral support is varied. Programs address indigenous people, health, private sector and business development, agriculture, education, fisheries, transportation, energy, and water and sanitation. Cross-cutting sectoral themes include gender, HIV/AIDS, and the environment. The trend in support for sectoral programs has resulted in a recent increase in emphasis on human capacity building and support to institutional strengthening. Danish program and project support targets 15 program countries, each of which contain several sector programs.
Strategic guidance for S&TFD support	The new system of support to S&TFD through the Ministry has yet to result in a formalized strategy for S&T capacity building across the institution, though there is an ongoing internal discussion. The general aid management guidelines for the Ministry do not address S&T explicitly, but some staff are advocating that research be incorporated formally into these guidelines. The possibility of including an annex to the guidelines to address research has been discussed.
Level of S&TFD support	Abandoning the old system, in which official development assistance (ODA) across all programs, sectors, and regions was fixed at 1% of Denmark's total national product plus 0.5% for the environment, the new system caps ODA at DKK10 billion. This revised calculation equals a decrease in real terms in funding for S&TFD because research for development, which was previously addressed through a separate agency (ENRECA) also receives its budget through the Ministry. The current level of support (DKK240 million in 2004) is a decline from the high of DKK283.6 million in 2000, but is still DKK67 million above the 1994 level of DKK172.9 million.
Future directions for S&TFD support	Support to science, technology, and knowledge for development continues to be an implicit priority of this research-oriented donor. Signs of increased commitment in the area in the coming years include an increase to sector program budgets, increased decentralization, and a strengthened degree of local control. These prevailing trends contrast with the historical paradigm in Denmark, which was characterized by the dominance of the research council that would make grants available that could then be sought by competing researchers, both Danish and non-Danish, resulting in a very non-responsive system of competition. Today the sector programs are driven by the national Poverty Reduction Strategy Paper (PRSP). Looking across the PRSPs in the countries in which Denmark has active sectoral programs, water and sanitation, agriculture, and education appear to be the sectors that are receiving increased attention and support. Within education, emphasis is mounting in projects targeting the primary and tertiary levels. Support for social science research in the education sector is growing as well. Support for sectors such as transport, which has not historically emphasized scientific research as much as engineering, show no sign of any near-term increase.
Challenges and opportunities	Funding has become contingent on increases and decreases to the national budget, meaning that no longer can multi-year projects count on fixed contributions from the Ministry. The annual contribution is now revisited after the national budget is passed, which complicates the managerial process. The exception to this new rule is the cross-sectoral Environment program, which has established an agreement at the Ministerial level that allows for the funding of programs to be established and guaranteed in year one, even for multi-year commitments. Another challenge is generating the political support needed to better integrate research into the general framework for bilateral support. The question of the Ministry's support for development-related research to Danes versus non-Danes continues to challenge the institution. Opportunities exist for more public–private partnerships between Danish institutions and foreign institutions for increased support to S&TFD in the future. Other challenges confronting the Ministry are the need to articulate a strategy for S&TFD and research priority setting, and the need to coordinate more smoothly between developing countries, donors, and the research-relevant departments within the Ministry (e.g., the Danish Research Centers, the Sectors, and ENRECA). Currently, the Ministry is too understaffed to take stock of its own interventions, let alone commit resources to understanding the activities of other donors, although that information is critical to enhanced donor coordination.

Norway, Norwegian Agency for Development Cooperation (NORAD)

S&TFD Definitions	NORAD has no definition of science, technology, and knowledge that delineates these themes within the work it undertakes. S&TFD is blended into the core functionality of NORAD because the institution's development assistance places S&TFD at the center of its activities under the rubric of capacity building.
Activities to support S&TFD	NORAD provides support for: (1) capacity-building in research at tertiary education institutions in developing countries; (2) Norwegian development research; and (3) formative research and the use of research in development cooperation. Support for human-resources development in the sector is not restricted to high-level researchers in health, agriculture, and other sectors, but covers support to training for mid-level S&T specialists, such as nurses and technicians as well. Infrastructure is also supported — when justified in the context of a project — as are information and communication technologies.
Types of S&TFD support; regions; sectors	Norwegian support to S&TFD is substantial and varied, with an emphasis on capacity building, which includes institutional strengthening, post-graduate training, and training of local stakeholders. One of the hallmark programs for support to S&TFD is in the area of post-graduate skills enhancement. The Norwegian sandwich program for research training provides support for students from developing countries; also included is assistance for teacher training programs, including vocational education. Technical assistance is provided through NORAD across a range of sectors, resulting in support for Norwegians and national agents to provide the intellectual expertise to aid counterparts with various development challenges. Other activities to receive support include those related to technology extension and technology transfer. NORAD provides assistance to 7 priority countries and 17 partner countries in the developing world. It has a policy of non-discrimination between sectors, which means that S&TFD programs could be provided in any sector in which they are relevant to the request of the client country.
Strategic guidance for S&TFD support	NORAD has no explicit S&T strategy, but two documents pertain to the area and NORAD's activities within it: *A Strategy for Research and Higher Education* and *The Information and Communication Technologies Guidelines*.
Level of S&TFD support	No precise figure for S&TFD is available. In 2003, NORAD support for all projects for which research was indicated as a component (be it a small element or the thrust of the project) was USD85 million — a figure that exaggerates the level of support because it includes support to all projects in that year that included research (e.g., the scholarship programs, many tertiary education projects, and some capacity building projects in addition to funding for Norwegian development research and support for multilateral research). In 2003, the agency provided USD47 million for capacity building projects and programs out of a total of USD2.1 billion in official development assistance (ODA).
Future directions for S&TFD support	The general trend in S&TFD support on behalf of the Norwegian government to NORAD has been a gradual steady increase on par with annual increases to ODA. In 2004, a proposal was put forward for more than NOK16 billion, up from the NOK14 billion (roughly USD2.1 billion) received for 2003. One pending application for a program addressing teacher education would further augment NORAD's funding base if granted. Sectorally, support to basic education is increasing. Simultaneously, although Norway has typically boasted a strong emphasis on tertiary education and research training, longstanding increases to this area for support are stagnating. Greater emphasis on MDG achievement is likely to characterize future funding directions.
Challenges and opportunities	Without guidelines for support at the sectoral level, resources can be spread too thinly rather than focused on those areas determined to be crucial for success in achieving NORAD's goal of combating poverty and contributing toward lasting improvements in living standards and quality of life. Another challenge for the organization is to assess the manner in which capacity building is supported by addressing the question — Whose capacity is actually built through NORAD support as it stands today? An opportunity relevant to S&TFD that NORAD hopes to exploit in the future is increased coordination, both between its own staff and between it and the other foreign development organizations with which it works — the Ministry and the Embassies — and with external partners, such as other bilateral and multilateral donors and foundations.

Sweden, The Swedish International Development Cooperation Agency (SIDA)

S&TFD Definitions	The development of knowledge — which includes scientific and technological know-how — is, in fact, included in all of SIDA's development cooperation goals, which reflects the centrality of knowledge for development as the driving theme of the bilateral's activities in the developing world. SIDA views research as one of the "most central tools for understanding causes and mechanisms behind global and local problems and for finding constructive alternatives." The 10-year evaluation of SIDA's Department for Research Cooperation (SAREC) provides additional definitions.
Activities to support S&TFD	Much of SIDA's support for ST&K4D is channeled through SAREC, though projects and programs that touch upon ST&K4D exist in other sectors within the institution (enumerated in detail in the SIDA chapter). SAREC's activities include: the provision of financial and scientific resources for producing and disseminating new knowledge; the promotion of scientific cooperation between researchers in Sweden and those in developing countries; and the allocation of special grants for Swedish research through the Swedish Research Council for Swedish-performed development research. Support to regional S&T-related networks, training of PhD students in research projects, building laboratories and modern library facilities, setting up local research funds and mechanisms for priority-setting among research proposals (e.g., peer review), promoting ICT capacity building, establishing dialogue on reform of universities and national research systems, support for research training for individuals, and curricula development are further activities considered within the purview of SIDA's support to S&TFD.
Types of S&TFD support; regions; sectors	SIDA promotes S&TFD research in 3 ways: (1) research activities funded as integral elements of development programs; (2) funding of research as a sector within development cooperation, predominantly channelled through SAREC; and (3) funding of research for internal use, e.g., to enhance SIDA's aid delivery and improve effectiveness. In addition, support to international institutions (e.g., the CGIAR) and national institutions for the advancement of human-resources development in S&TFD is provided. SIDA is active in 120 developing countries. Sectors of emphasis are many and varied.
Strategic guidance for S&TFD support	Multiple strategic documents germane to S&TFD exist: *Sweden's Policy for Global Development (2003/04)*; *SIDA Looks Forward*; *Perspectives on Poverty*; and *SIDA at Work*. Specific to research is: *Research Cooperation I — An outline of Policy, Programmes and Practice.* The SAREC policy is currently being reformulated to include a greater emphasis on capacity building and detail on how external donors can foster the strengthening of research capacity.
Level of S&TFD support	A precise quantification of the level of support for ST&K for development across all of SIDA's programs is not readily available, although a few helpful figures exist. In 1999, SIDA disbursements for research cooperation amounted to SEK510 million. By 2002, that amount increased to SEK781 million. The 2004 figure is approximately SEK900 million, or roughly USD130 million, which represents 6–7% of SIDA's budget — a near-doubling of support to S&TFD over the past 5 years in the realm of research.
Future directions for S&TFD support	Based on indications that SIDA's development cooperation will increase considerably over the next few years, the agency recognizes that the upcoming increase in volume will necessitate concentration, simplification, and prioritization to ensure that a high level of quality in aid delivery is maintained. This will entail a substantial shift to use of resources in the field (e.g., at the Embassies in the countries in which Sweden has development cooperation programs) due to the relatively small size of SIDA's professional staff. The area that is earmarked for even greater funding increases is bilateral support because it is deemed to be the most effective modality for building S&TFD capacity (e.g., research capacity).
Challenges and opportunities	The need to better understand the connection between tertiary education systems and research systems continues to drive the agency to fund studies and investigative fora to determine how to tailor support for S&TFD systems based on a more nuanced understanding of the tertiary education–research relationship. Also, the perpetual challenge of stimulating donor coordination around the S&TFD agenda increases in importance as the cost of the widening knowledge gap between the North and South grows. Furthermore, a more unobtrusive role on behalf of the donor and a greater level of responsibility on behalf of the partner country — which entails increased attention and ownership for needs formulation, planning, and implementation — will result in improved outcomes in S&TFD as in other areas. With respect to equalizing the terms of partnership within which scientific or technological research cooperation between Swedish and developing country-based researchers is forged, a new challenge for SIDA is to stimulate contacts with developing countries as a "regular feature of Swedish research funding," a change that will include reliance on building "bridges" between ongoing, already-financed research activities to enhance cooperation, cultivate a shared vision, and spawn long-term contact while broadening and equalizing the terms governing collaborative research relationships

Switzerland, Swiss Agency for Development and Cooperation (SDC)

S&TFD Definitions	At the system level, all types of science — social, natural, and engineering — are intertwined within a society's knowledge system. The Swiss Commission for Research Partnership with Developing Countries (KFPE) noted that a paradigm shift is taking place regarding the process of knowledge production, its validation, diffusion, and utilization at SDC. The historic, linear notion of science as a starting point for innovation has been updated with a more holistic approach to knowledge creation and technology development, which is advocated within the context of SDC's North–South research partnerships. "Knowledge" is construed as a foundation for economic growth and social change. In SDC's *Strategy 2010* knowledge is denoted as one of the most crucial processes for the agency's success in addressing poverty challenges.
Activities to support S&TFD	Support to S&TFD in Switzerland is driven by an increased prioritization of research in Swiss development assistance in five priority areas: (1) prevention and resolution of conflicts; (2) good governance; (3) income generation; (4) increase of social justice; and (5) sustainable use of natural resources. Addressed under the umbrella concept "Knowledge and Development." Further activities supported include those in: (1) knowledge management; (2) ICT for development; and (3) research. SDC provides support for university development and support oriented toward technology development. Such support is not solely restricted to technological improvement — it may also include support to strengthen the supply chain; activities to address the efficiencies of local markets; actions to couch resulting innovations within the complex system of basic science research; policies of support for S&T; transportation networks; linkages with the private sector; and funding for networks to disseminate research findings.
Types of S&TFD support; regions; sectors	Support for human capacity building constitutes much of the knowledge- and research–specific support of SDC. Grants to individual researchers and research institutes comprise the bulk of the support, as does support to strengthen networks — often ICT-enabled networks linking communities of practice in various fields of science or technology. Swiss are contributors to such international research networks as the CGIAR; therefore, indirectly SDC does promote the transfer of technology for development. A small amount of funding from the Agency goes to technical assistance. SDC abandoned an organizational structure demarcated by sectors in favor of one oriented around larger priority clusters. SDC cooperates particularly closely with 21 countries in the South and 13 countries and regions in eastern Europe and the Commonwealth of Independent States (CIS).
Strategic guidance for S&TFD support	SDC's primary strategic document is its *Strategy 2010* in which "Knowledge and development" is presented as one of five core pillars. The research policy *Masterplan in Research 2004–2007* serves as SDC's response to accusations of supporting research in a very ad hoc manner. Also of strategic relevance are the publications: *Guidelines for Research in Partnership with Developing Countries* and *Choosing the Right Projects, Designing Selection Processes for North-South Research Partnership Programmes*.
Level of S&TFD support	Of SDC's annual CHF1.4 billion budget, approximately 3.7% is devoted to research — roughly USD43 million on support to research. Included in that figure, SDC spends roughly USD10 million on research mandates for commissioned research. Figures on the amount spent on the other knowledge and development sub-themes — ICT and knowledge management — were not available. Compared with the 1998 figure of CHF60 million (roughly USD50 million) spent on research, it appears that SDC's support to the area is declining. However, SDC staff stated that today's figures are more accurate and that such a comparison would not yield any reliable trend data. In the near future, it is likely that stability will characterize SDC's support to S&TFD. However, if SDC's total budget is reduced, support to S&TFD is likely to decrease at the same rate as funding to all other areas.
Future directions for S&TFD support	With S&TFD funding projections likely to remain stable, SDC appears well equipped to provide more knowledge for development assistance. Although it is unlikely that science and technology per se will inspire a paradigm shift toward reorientation around these ideas as the central themes of SDC, as the Millennium Development Goals (MDGs) become more and more decisive in the construction of bilateral strategies for aid delivery, research as a key component of knowledge for development is likely to become a critical input for their achievement. Science and technology as the topics of research and knowledge for development will thus gain greater visibility in the push toward capacity building for MDG achievement. With an increasing sense of a shared S&TFD vocabulary and a trend toward greater staff consensus around these themes, a deeper understanding and prioritization of S&TFD will become more likely.
Challenges and opportunities	Further awareness and recognition of the importance of research for development within client countries, and the central role of research in the achievement of the MDGs, is required. The agency appears to be asking some difficult questions within the domain of knowledge and development that will require strategic thinking and clarification if this bilateral agency is to refine its S&TFD practices into a coherent policy for change and effective aid delivery. In addition, the modalities used to foster research capacity building in the South — research partnerships and the strengthening of research institutions through bilateral cooperation —need to be examined and optimized. Staff question: "How can we make certain that African research systems, for instance, are not only developing but that they are doing so independent of the North in the context of our support?"

United States, US Agency for International Development (USAID)

S&TFD Definitions	In June 2003, the agency released a strong statement validating the instrumental role of S&T in reducing poverty, increasing competitiveness, and delivering results in key sectors, specifically agriculture: "Science and technology are levers for increasing agricultural productivity: increasing yields and protecting them from drought, pests, and disease; lowering costs; and improving food storage and nutritional qualities. Investments in agricultural research and the development and application of a wide range of technologies accelerate the discovery of solutions to agricultural problems."
Activities to support S&TFD	S&TFD activities include USAID's actions to: provide technical services that support economic and social development activities; carry out research and development, technology transfer, technology adaptation, and technology application activities; produce industrial goods and agricultural products based on suitable technologies and modern management methods; assess the technical and economic merits of technologies being considered for use in client countries; prepare and monitor implementation of economic trade, industrial, agricultural, health, education, environmental, and other policies that have technical dimensions or that influence the acquisition and use of technical resources; develop, manage, and disseminate information of importance for all aspects of development, including S&TFD; participate in international trade negotiations, environmental treaty discussions, and other types of dialogues involving S&T issues; conduct programs that heighten public awareness of the potential of modern technologies to improve the well being of the public; and develop an appropriate physical infrastructure, the human resources, and educational and training institutions to support the foregoing activities.
Types of S&TFD support; regions; sectors	The portfolio of S&TFD projects and programs is weighted heavily in the provision of technical assistance. Advice, policy analysis, and strategic input for the formulation of funding priorities are all entailed in USAID's provision of technical assistance. The agency also promotes: public–private partnerships; support to high quality technical universities, medical research centres, and regional and international research networks; support to technology transfer centers for the commercialization of promising technologies and the extension of new knowledge and technologies; and strengthening funding and policy advice to enable the environment in which business — SMEs and large-scale manufacturing — thrives. USAID maintains country-based Missions Offices in more than 70 countries worldwide, any of which could theoretically request support to S&TFD. An additional 20 countries receive development aid from the US but do not house an official USAID Mission Office. Sectorally, staff contacted reported that the bulk of S&TFD projects are in the education sector, and specifically tertiary education, with many others in agriculture, health, energy, and ICT.
Strategic guidance for S&TFD support	Critique raised in the preliminary National Research Committee (NRC) report to USAID's Adminstrator Natsios addresses the dearth of strategic guidance for S&TFD activities provided by any of the agency's strategic documents. Although several strategy documents are currently in various stages of development, the NRC asserts, "There is little recognition in these documents of the importance of S&T as an integral component of activities in many development sectors. Since these documents are widely distributed throughout the agency and provide an important conceptual framework for programs, they should at least acknowledge that S&T are critical components of programs needed to achieve many of the objectives set forth in the documents." The agency does have a K4D Strategy (8 July 2004) that provides strategic objectives for how the agency should disseminate and manage knowledge, further, the recently released agriculture strategy includes more detail on the importance of S&T for development.
Level of S&TFD support	Staff interviewed explained that no precise quantification of USAID support to S&TFD exists. Proportionally, the amount of USAID funding to S&TFD is known to be a small portion of its total budget.
Future directions for S&TFD support	USAID's support to S&TFD is likely to increase in the future. The creation of the President's Millennium Challenge Account is expected to result in an increase of aid by 50% over 3 years, an annual increase of USD5 billion by fiscal year 2006. Although it is unclear the extent to which MCA funding will constitute an increase in support to S&TFD, its emphasis on competition and the business-investment climate bodes well for promotion of the enabling environment in which innovation takes place. Support to agricultural has been increasing over the past 4 years and this increase is likely to continue. Because of reconstruction efforts in Iraq and Afghanistan, aid for infrastructure, engineering, and other such projects is also likely to continue to increase. Regionally, the Department of State–USAID strategic document reports that USAID intends to increase its attention and support toward failed and failing states.
Challenges and opportunities	The challenge of fostering the creation of a strategic document to guide S&TFD activity within the institution is high on the list of challenges. Second, the lack of S&T leadership within USAID is a problem with severe implications for the agency's performance in this area. The NRC report suggests that senior officials in USAID be encouraged to recognize and champion S&T. A challenge facing the institution with respect to its personnel relates to the staff shortage that has resulted in the limited supply of development professionals with the technical expertise that S&T issues demand. Finally, the lengthy time-frame in which transformation of S&TFD systems occurs necessitates the expectation of long-term results with commensurate long-term commitments on behalf of the institution.

The Asian Development Bank (ADB)

S&TFD Definitions	"In recent decades, knowledge has become the most important asset for most economies in the world. In their quest to gain faster growth by using resources more efficiently, countries and businesses around the globe are driven by the generation and distribution of knowledge. Knowledge-based countries and organizations increasingly encourage their people to pursue life-long learning, investing heavily in research and development, and technology to promote knowledge exchange and to drive innovation." The prevailing definitions of science and technology are those forwarded by the OECD's Frascati Manual.
Activities to support S&TFD	Despite the fact that the ADB has no science and technology sector or theme as such, many of the ADB's activities emphasize the importance of developing trained S&T human resources for careers in R&D-related or other technical fields. Additional activities include: science education components incorporated into education sector projects; research networks that connect practicing researchers within the region; support to existing S&T institutes such as the Asian Institute of Technology; scholarships for graduate students to pursue S&T-related study at various regional tertiary education institutions; support for completion of PhD study; and skills upgrading and training for personnel in the health and other S&T-related sectors. Much support is also offered in the education and ICT lending portfolios.
Types of S&TFD support; regions; sectors	The types of S&TFD support provided by the ADB include: knowledge and technology transfer; technical assistance projects that foster the promotion of knowledge sharing; project components across a range of sectors (e.g., health, agriculture, water, and infrastructure); funding to mainstream the institution's own knowledge management agenda for improved incorporation of knowledge for development as a central theme within its work; technology extension; support to research institutions; support to research networks; and support for international research. Multiple sectoral areas are addressed through ADB's support to S&TFD. Six sector and thematic committees have been identified as pilots for implementation of the ADB's knowledge management applications (KMApps): water; urban development; governance and capacity building; regional cooperation; private-sector development; and nongovernmental organizations. Regionally, the ADB provides assistance to more than 40 Asian countries.
Strategic guidance for S&TFD support	The ADB has crafted a number of strategic documents to commit itself to becoming a "learning institution and a primary source of development knowledge in Asia and the Pacific." These include the *Long-Term Strategic Framework for 2001–2015 (LTSF)* and the *Medium-Term Strategy (2001–2005)*. Additional strategic direction is provided by a recently convened Capacity Building Working Group that was assembled in 2004 to give clarity to capacity building initiatives supported by the ADB in a number of fields, including science and technology.
Level of S&TFD support	Precise figures for S&TFD lending and project support are not available due to the limited staff working in the area and the lack of a mandate for such statistics internally. In 2003, projects slightly decreased to 63 from 72 in 2000, but over the same time frame, technical assistance projects increased from 169 in 2000 to 177 in 2003. Across all of the research-related projects supported by the ADB, more than USD100 million is provided, although the proportion of that figure allocated to S&T-related research components is not available. With respect to support to science components in education and health-sector projects, figures were not available. Annual support to the CGIAR totals approximately USD1 million.
Future directions for S&TFD support	A few clues point toward a future increase in ADB support to S&TFD in select areas. First, a report was recently released that assessed the Bank's funding to ICT, revealing an increase from USD1.7 million in 2001 to USD60 million in 2004, which signals a likely continuation in ICT growth. Depending on the degree to which activities embodied within the Knowledge agenda appear to have been effective in strengthening national innovation systems and building knowledge societies, an increase to the modalities called for in the Knowledge Strategy would be likely in the future. In addition, an internal inventory exercise is underway to assess the ADB's impact in support to research during 2002–2004 with the aim of improving impact and effectiveness during 2005–2007. At the same time, the recommendations of a Capacity Building Working Group may yield heightened prioritization for S&T capacity building projects over the coming years, depending on the orientation of the group's forthcoming work plan. Topically, a specific S&TFD-related issue gaining staff interest is the manner in which S&T human-resource clusters develop.
Challenges and opportunities	Challenges emerging for the ADB include: (1) more harmonization of effort and coordination among staff within the Bank around S&TFD is necessary if the institution is going to succeed in garnering the attention required to harness science, technology, and knowledge effectively for development; (2) improvements to the delivery of university education bear on the quality of S&T training systems and the research capacity of the countries in which they are located, offering the ADB another entry point into S&TFD strengthening at the country level through project lending, technical assistance, and analytic work (an area that requires continued ADB attention); (3) while reconfirming the need for a formal approach to more effective knowledge management in the ADB, the formulation of its Knowledge Management Framework identified several specific challenges that require attention.

The European Union (EU)

S&TFD Definitions	Several definitions underpin the EU's various agencies with respect to S&TFD. According to one group, "Scientific research and technological development are heterogeneous activities that do not have the purity that some philosophies of science have assumed in the past. Scientific knowledge is constructed in laboratories, on the land of small farmers, in the offices of funding agencies, at international conferences and in editorial offices. It is not a matter of asking clever questions to Nature, which then shouts back a clear 'yes' or 'no.'" The authors of that piece further support the notion that science penetrates the technological realm through a complex process consisting of several components that do not occur in any determinate order, and that often, technological developments influence science and vice versa.
Activities to support S&TFD	A host of S&TFD activities are subsumed across the many networks, directorates, committees, and quasi-independent entities within the EU and EC. The Union engages in and supports the conduct of research, both upstream — training and information exchange — and downstream — stimulating innovation that enables research results to be translated into tangible benefits for society. Sectors of support to research are wide-ranging, from ICT and agriculture to health and energy. The EU is engaged internationally in both the EU member states and in the African, Caribbean, and Pacific (ACP) countries. The most visible area of overlap between the EU, developing countries, and support for S&T and knowledge systems is that of RTD (research and technology for development) with: support for graduate and post-graduate fellowships; large transnational research projects, such as the Earth Observation system; human capacity building; information and communication technologies (upgrading and capacity building); and support for the establishment and maintenance of centres of excellence both within the EU and abroad.
Types of S&TFD support; regions; sectors	Three dominant kinds of support to S&TFD may be extrapolated from the EU's programs: (1) the Research Framework Programme; (2) ACP capacity building; and (3) support for international scientific mobility, which consists most often of support to graduate students from the EU seeking to perform research in the developing world, or to students from developing countries interested in spending time at an institution within the EU. The current 6th Research Framework Programme for 2002–2006 is described as the main instrument of the European Union for the financing of research in Europe with 7 areas: (1) genomics and biotechnology for health; (2) information society technologies; (3) nanotechnologies and nanosciences; (4) aeronautics and space; (5) food safety; (6) sustainable development; and (7) citizens and governance in an open European knowledge-based society. The EU also provides S&TFD technical assistance and support to centers of excellence in ACP countries. Regionally, the EU provides S&TFD support world-wide in most S&T-related sectors.
Strategic guidance for S&TFD support	Science, technology, and innovation policies within the European Research Area are formulated at regional, national, and EU levels. In 1999, the ACP–EU Assembly adopted a new resolution, guiding support for ACP research and technology programs: *Scientific and Technology Research — A Strategic Part of the European Union's Development Co-operation With Developing Countries*. Although somewhat ambiguous, it asserts the importance of research and technological development and access to technology for economic progress and for the "smooth integration of the ACP countries into the world economy." Many other ACP-EU activities have failed to yield a coherent ACP–EU S&TFD framework, although three other S&T-related agreements have given some structure and guidance to EU activities within the S&TFD domain: The Science and Society Action Plan, the Cotonou Agreement, and the Research Framework Programme Agreement.
Level of S&TFD support	During the most recently completed Framework cycle, EUR14.96 Billion was allocated to the various thematic and horizontal program areas. The expenditure specifically targeting research in developing countries across the sectors of health, environment, and agriculture during the years 2002–2006 will total between EUR160 and EUR180 million, only a tiny proportion of the total Research Framework Programme budget.
Future directions for S&TFD support	Support to S&TFD appears poised for an increase across select EU programs: On June 16, 2004, the EU proposed to increase its research funding to an average of EUR10 billion a year for the next Framework Programme. Increased financing will be made available to promote six major objectives, including the creation of European centres of excellence, the launching of technology initiatives in industrial fields of growth, and the creation of a European "agency" to support European basic research teams. Also, North–South research partnerships will pay increased attention to developing the capacity for demand-led research that will enable the South to formulate its own policies and strategies for development. Regarding support to larger, transnational research projects, there is a sense of increased interest in and legitimization of these kinds of projects.
Challenges and opportunities	The opportunities and challenges confronting the EU are many: (1) due to the recent enlargement of EU membership, an historic opportunity exists to positively influence the strengthening of the national innovation systems of several middle-income countries through the various instruments available to EU member states; (2) among the challenges facing the EU in its quest to generate enhanced support for S&TFD is the difficulty facing ACP countries seeking funds for S&TFD from the EU. Knowing the extensiveness of delays before actually receiving funds from the EU after applying for them, many would-be recipient countries simply refrain from seeking EU funds; (3) other challenges include — the lack of policy frameworks for RTD in ACP countries, which has muted the impact of dispersed, often excellent RTD work, and the absence of a clear vision of the role that RTD could play in supporting sustainable development among both European donors and most ACP governments.

The Inter-American Development Bank (IDB)

S&TFD Definitions	From its S&T Strategy 2001: "Technological progress leads to and results from innovations, which are broadly defined as the processes by which firms master and put into practice product designs and processes which are new to them. National innovation systems (NIS), a term now much employed in the current literature (but not always well understood), can be defined as a network of institutions in the public and private sectors whose activities and actions initiate, import, modify and diffuse new technologies."
Activities to support S&TFD	Activities supported include those relevant to strengthening and improving: the macroeconomic conditions and regulatory frameworks that provide the conducive environment for innovation in the private sector; national systems managing and coordinating S&T institutions; the capacity to monitor and assess relevant information; mechanisms for linking academic institutions with society; scientific and technological services and mechanisms to promote and facilitate the diffusion and transfer of technology, such as metrology, norms and standards, information services, and technological consulting; operating conditions and procedures; R&D capacity to generate knowledge and techniques; programs to educate and train personnel; the scientific and technological know-how of the labour force; financial intermediaries and resources; scientific training to form the basis of the human resources needed to understand and adapt technology. There are also many S&TFD-related components in sectoral projects in education, health, and agriculture.
Types of S&TFD support; regions; sectors	Three main instruments — loans for projects, technical assistance, and funds for the creation of regional public goods — constitute the primary modalities of IDB's S&TFD assistance. The recent creation of a USD10 million fund for the promotion of Regional Public Goods boosts the resources available for knowledge creation of a public goods nature. Also, the USD50 million Technology and Innovation Fund that was created through a contribution of the Korean Government provides a new mechanism for S&TFD support. Although the IDB continues to fund human resources (e.g., centers of excellence) and physical infrastructure (laboratories and research institutions), growing awareness that the Bank serves as an effective convener around the S&TFD agenda has resulted in an array of new services. Regionally, the IDB is active throughout Central and South America. Emphasis on providing better S&T support to the smaller countries in the region has become a priority. InterAmerican Development Bank S&TFD projects address a wide range of sectors.
Strategic guidance for S&TFD support	The IDB has a history of S&T strategy preparation and policy guidance to orient its work in S&TFD. The most recent version of the S&T Strategy is that of the year 2001, although the time may be near to "freshen the document." The main elements of the strategy are: (1) a systems approach; (2) an increased emphasis on technology; (3) continued support of science research and training with increased emphasis on critical areas; (4) increased support to smaller, poorer countries; and (5) a parallel increase in support for education and training. The Bank also has a science and technology policy and the Senior Science and Technology Advisor is now chairing an S&T Working Group that is currently preparing an action plan. IDB staff collaborate with various country stakeholders, working together at both the country level and at the regional level to achieve a consensus as to how to refine the approach articulated in the Bank's S&T and ICT for development strategies. The objective is to increase the impact of IDB's influence in transmitting and diffusing knowledge for development. The "Information Age Technologies and Development Strategy" articulates the Bank's action plan for ICT for development.
Level of S&TFD support	Depending on the definition of S&T used, between 1962 and 2003 the Bank provided approximately USD1.8 billion in S&T loans, supporting over 50 S&T projects in 15 countries. Using a broader definition, which includes explicitly S&T projects as well as "related investments" in tertiary education and training and agricultural research, the figure increases to USD4 billion. Since 1991, support to S&T as a percentage of the total IDB portfolio has dramatically decreased; however, an increase in S&T investment has begun to take hold in the last several months.
Future directions for S&TFD support	Taken together, the establishment of a new sub-department for S&T, the creation of the Korean Technology and Innovation Fund, the preparation of an ambitious action plan, and the observed recent increases in support to S&T lending all signal an upward trend in attention to this area. S&TFD has clearly become a much bigger priority for the institution, which is evidenced by recent commitments for more technical assistance, more lending, and more opportunities for convening stakeholders around the S&TFD agenda. With respect to the area of Knowledge for Development explicitly, staff express optimism that the evolving Knowledge Strategy will provide the necessary guidance for Bank operations in the area.
Challenges and opportunities	Challenges shared include: (1) the difficult yet critical goal confronting the institution to help position the region to invest more in S&TFD capacity building by raising awareness of the nexus between economic growth and endogenous science and technology capacity; (2) with respect to human resources development, only through improved private-sector absorption of trained human resources will the region be facilitated to staff the entire spectrum of S&T-jobs entailed in a robust national innovation system; (3) within the institution, the difficulty of pinpointing specific targets for the strengthening of innovation capacity is an ongoing challenge for the IDB; and (4) improvements to the manner in which staff collaborate on the S&TFD agenda continue to challenge staff aligned to this movement.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

S&TFD Definitions	UNESCO construes the human and institutional capacity-building, policy, and planning issues in the engineering sciences and technology as important priorities in the development and application of knowledge. It asserts that the development and application of knowledge in engineering and technology is a driving force of sustainable social and economic development and an important factor for poverty eradication. These issues were underlined at the World Conference on Science in 1999 and the World Engineers' Convention in 2000.
Activities to support S&TFD	A technical agency of the UN system, UNESCO responds to member states' requests, not to provide project financing, but to serve as an intellectual hub for the UN system in educational, scientific, and cultural matters. Providing support to activities for capacity building, policy, and advocacy, UNESCO supports a host of programs and projects considered to be within the milieu of S&TFD. With respect to S&TFD capacity building explicitly, UNESCO promotes networking, the sharing of information and good practices, and the development of innovative curricula, education, and training, with an applied, interdisciplinary focus on applications to address the Millennium Development Goals (MDGs). Activities are also funded to provide support for the creation of national, regional, and international research networks, promote science education, and more generally, popularize science. Through its many efforts to strengthen S&TFD capacity and provide technical assistance and advocacy, UNESCO has identified support to centres of excellence as a key mechanism for the achievement of its mission.
Types of S&TFD support; regions; sectors	Resulting from its advocacy, support, and cooperation to promote engineering and S&T human and institutional capacity building, UNESCO has contributed to enhanced awareness and prioritization of S&T and engineering excellence and participation, human and institutional capacity building, and the application of S&TFD for sustainable development and poverty eradication through international cooperation and sharing of good practice. Sectorally, UNESCO has programs in the following areas within its Natural Sciences division: Fresh Water; People; Biodiversity and Ecology; Oceans; Earth Sciences; Basic and Engineering Sciences; Coastal Regions and Small Islands; and Science Policy. UNESCO maintains a number of intergovernmental and international programs including the International Geoscience Programme and the International Hydrological Programme. Regionally, 190 member states are currently active in UNESCO.
Strategic guidance for S&TFD support	UNESCO's Medium-Term Strategy 2002-2007 constitutes the core strategic document for the entire UN organization and includes some guidance and detail in the area of science. This document provides three strategic objectives specific to S&TFD: (1) promoting principles and ethical norms to guide scientific and technological development and social transformation; (2) improving human security by better management of the environment and social change; (3) enhancing scientific, technical, and human capacities to participate in knowledge societies.
Level of S&TFD support	UNESCO's total program and staff budget during the 2002–2003 2-year period was USD544 million. At USD610 million the current budget represents a real-growth budget for the first time in many years. Of UNESCO's total budget, USD56 million is dedicated to the area of natural science. Although the budget has begun to rebound in comparison to 5 years ago, support to the engineering sciences has decreased tremendously, as has that group's share of UNESCO human resources.
Future directions for S&TFD support	Although the return of the United States to UNESCO signals impending increases to the resource base of the institution, it also suggests looming changes on the horizon with respect to the thematic orientation taken by the institution, which is responsive to the interests of its Member States. The current Medium-Term Plan is focused on water and the environment to a great extent. This orientation is likely to change when the next general conference determines future priorities for the subsequent Medium-Term Plan. Two general guiding themes are likely to play an even larger role in the orientation of that plan: a greater emphasis on the Millennium Development Goals and a basic-needs orientation. UNESCO may see an increase in support for its International Basic Sciences Program and Engineering for a Better World.
Challenges and opportunities	A debate regarding UNESCO's comparative strength persists: one camp perceives UNESCO's forte to be its knowledge in several S&TFD areas and the intellectual leadership it provides (e.g., technical assistance, advisory functions, and support for policy analysis and formulation), others assert that the institution's strength lies in its ability to provide technology and knowledge for infrastructure and capacity building. Another challenge relates to the process through which UNESCO defines its thematic priorities. Historically, the two landmark programs within UNESCO's science division were engineering and support to the basic sciences. Now support to the earth sciences receives the lion's share of resources. A tension exists between narrowing further UNESCO's emphasis on S&TFD and promoting a more integrated and egalitarian approach to UNESCO's S&TFD support in which breadth is prioritized over depth. A final challenge relates to the process of incorporating S&TFD challenges into developing country strategies (e.g., PRSPs), and the best approach for UNESCO to impact this process. Perceived as an opportunity by staff, the moment has come for UNESCO to integrate its S&TFD activities with those of other multilateral, bilateral, and NGO partners.

The World Bank

S&TFD Definitions	The Bank's "Strategic Approaches to Science and Technology in Development" argues that "development will increasingly depend on a country's ability to understand, interpret, select, adapt, use, transmit, diffuse, produce and commercialize scientific and technological knowledge in ways appropriate to its ambitions and level of development." The institution uses the term knowledge economy as a macro framework for assessing how well placed economies are to take advantage of domestic and global knowledge for their economic and social development. Although no authoritative single definition is used, the Bank perceives ST&K as critical elements for the stimulation of economic growth through increased productivity as a result of innovation and as necessary inputs for the reduction of poverty and for the achievement of the Millennium Development Goals. This is why the President of the institution has dubbed the Bank a Knowledge Bank.
Activities to support S&TFD	Neatly bracketing the World Bank's support for S&TFD is an extremely difficult task for an institution that has yet to agree on a single guiding definition of S&T. According to previously performed analysis, projects and project components are considered S&T operations — and therefore included in aggregate lending totals — if they provide funding for research or explicitly seek to increase scientific and technological capacity. S&T operations may be viewed as two distinct groups: Agricultural and Non-agricultural S&T projects. Projects that include various S&TFD components are found in the sectors of health, education, environment, ICT, private sector, and a few others. In the knowledge for development portfolio, four main types of activities are supported: (1) policy services; (2) knowledge economy studies; (3) learning events; and (4) the Knowledge Assessment Methodology (KAM) tool.
Types of S&TFD support; regions; sectors	World Bank support to S&TFD can be disaggregated into three large categories: (1) policy work; (2) country-level interventions; and (3) global-level interventions. The provision of economic and sector work and analytical inputs for the creation of policy constitute an area of support to strengthen the S&TFD capacity of developing countries. Beyond the agricultural sector, country-level project lending is characterized by a diverse set of development objectives and a plethora of components that cut across many sectors. A new type of instrument is the Millennium Science Initiative that supports high-level scientific and technological research by creating funding mechanisms that provide competitive grant support to individuals conducting research of the highest possible quality and relevance to their societies, and maximize training opportunities and private-sector linkages. Global S&TFD initiatives also receive support — e.g., the Special Program for African Agricultural Research (SPAAR), IAVI, and the CGIAR. Although global membership to the World Bank Group totals 184 member countries in the case of the International Bank for Reconstruction and Development (IBRD), the S&T lending analysis shows that since 1980, lending for S&T is disproportionately concentrated in a handful of client countries with a heavy bias toward the East Asia region, which had 29 of the 75 major non-agricultural S&TFD projects.
Strategic guidance for S&TFD support	"Strategic Approaches to S&T and Development" presents four policy pillars to foster capacity building and the strengthening of national innovation systems. The K4D team also articulated a strategy that echoes many of the same themes presented in the S&T paper. At the country level, strategic documents, including the poverty reduction strategy papers (PRSPs) and the country assistance strategies (CASs), rarely make mention of the relationship between investments in S&T and economic growth and poverty.
Level of S&TFD support	Between 1980 and 2004, the World Bank lent USD8.6 billion to directly support S&T activities in 647 projects. Annually, average lending for S&T totalled USD343 million with 26 S&T projects per year — 5 projects a year providing major support for S&T (greater than USD10 million) and 21 projects a year providing minor support for S&T (less than USD10 million). Overall, 41% of all projects that provided more than USD10 million in support for S&T went to the agricultural sector.
Future directions for S&TFD support	On November 29, 2004, the President of the World Bank convened an internal S&T Stocktaking Meeting to: (1) assess the activities constituting current Bank support to S&TFD; and (2) brainstorm ideas to move the Bank's S&TFD agenda forward. Agreeing that actual support to S&T capacity building has not reflected its importance, and that several opportunities for S&T capacity building have been missed due to the stove-piped model of S&T activity within the institution, senior management agreed that more aid and attention to the area need to be provided. Suggestions included: provisioning of IDA grants for S&T; a start-up fund for new science, technology, and innovation related projects in those smaller and poorer countries yet to take on S&TFD projects; and a CGIAR-style system to foster knowledge generation and transmission in the developing world and Africa in particular.
Challenges and opportunities	The Bank is currently considering ways to confront its biggest S&TFD challenges: (1) improve its ability to work cross-sectorally to build synergies for the promotion of S&TFD; (2) enhance lending and support to S&T at the regional level; and (3) leverage global partnerships for the provision of global public goods. Further, the need for coordination around the S&TFD agenda at a global level remains a desired but, as of yet, unattained goal. The need for a clearer strategic vision and a more coherent framework for S&T support also present challenges for the Bank. With no single institutional home for S&T and a disjointed group of actors working across the organizational networks and regions with very little coordination, institutionally, the Bank still struggles to refine its approach to S&TFD.

Carnegie Corporation of New York

S&TFD Definitions	The Foundation achieved general consensus regarding S&T on two points: (1) modern economies are dependent on national capacity to conduct scientific research, especially research that can develop technologies to increase economic productivity; and (2) national policies are required to sustain support. The Corporation's choice to address the importance of S&T for development vis-à-vis human capacity development programs at universities and libraries reflects the institution's recognition that the production of research for knowledge and the manufacturing of PhDs, MAs, and MScs serves as an important contribution to a society's ability to increase its stock of knowledge.
Activities to support S&TFD	Five years ago the S&T-themed program at the Foundation was discontinued. Its international development support to S&T and knowledge entails a focused emphasis on African knowledge-building and dissemination institutions, specifically universities, public libraries, and scholarship programs targeting women — activities explicitly related to developing human capacity. The Corporation's International Development Program (IDP) grantees in the African university sector receive funding for such activities as: (1) improved access to information technology: (2) provision of local area networks: (3) technology training: (4) laboratories: and (5) strengthening of science faculties. Support takes the form of grants, technical assistance, and scholarship programs that may include money for events such as conferences and networking opportunities and provision of assistance to bolster organizational effectiveness that may include support to management systems and information management systems.
Types of S&TFD support; regions; sectors	All of the supported projects are directly connected to a vision of capacity strengthening. In the case of Makerere University, for example, within the institution's list of priority areas are such goals as improved skills for fund-raising and the need for skilled individuals to set up research administration units. Geographically, Carnegie's IDP program operates only in former Commonwealth countries in Africa, which include: South Africa, Uganda, Tanzania, Nigeria, and Ghana. Although it is not a former Commonwealth country, Mozambique also receives support through a network focused on human capacity development in African universities that was established at the behest of the Ford, McArthur, Rockefeller, and Carnegie Foundations. This foundation coalition works together to coordinate support within the group of selected universities in these countries. Pledging USD100 million over 5 years, the African university partnership program, which started in 2000, supports research, communication, and a range of other priorities pertinent to tertiary education.
Strategic guidance for S&TFD support	The systematic approach to S&T and knowledge capacity building followed by the Corporation is advanced by the planning and priority-setting processes driven by the individual recipient institutions. Guiding this strategy is a commitment to the need to address the challenge of strengthening knowledge institutions and people over the long-term. In each case of IDP support to an institution, it is assumed that the timetable of operation is at least 10 years (typically institutions are awarded at least two 3-year renewals after a first 3-year commitment). The strategy that directs this support is embedded in the recipient institution's own plan.
Level of S&TFD support	Beginning in 2000, IDP has committed on average USD16 million per year to knowledge institutions in Africa; half of the annual investment by the IDP is made to universities, although this proportion is flexible and based on demand. Roughly 60–70% of this support takes the form of grants and the rest is captured in support for technical assistance, general administration (this category includes the gender sensitivity activities that strive to promote women in tertiary education and the sciences), and physical modernization for IT, libraries, and laboratories.
Future directions for S&TFD support	Since the creation of IDP, some clear lines of work have emerged that reflect both the longer-term commitment to certain key areas and the centrality of specific development themes. First, activities in the domain of information and technology have proven to be high priorities at developing country institutions and pivotal areas of investment to embed institutions in the global knowledge community. ICT in all of their dimensions — e.g., software, training, acquisition, e-books, and online journal access — seem to be trending toward increased support, increased importance, and further centrality in the IDP portfolio. Scholarships will continue to constitute a core part of how IDP provides support to S&TFD as they clearly succeed in building up the human capacity base in those countries in which the Corporation works.
Challenges and opportunities	A first challenge is the relatively small size of the grants provided by Carnegie in relation to the much larger grants needed to sufficiently address many of the S&TFD problems plaguing African universities and public libraries. A second challenge relates to sustainability beyond the horizon of Corporation support and the fear that the greater the level of support, the more unlikely a recipient institution will be able to match the level of support with self-generated funds. The Corporation faces a challenge regarding coordination at an institutional level. Collaborations with various bilateral and multilateral donors are being examined to try to leverage partnerships for knowledge exchange and improved aid delivery in the future. Determining how best to impact the international development agenda to increase funding, attention, and support to S&TFD at the level of African universities in particular, is a further challenge. Finally, the experience to date in Africa is indicative of a larger opportunity to support S&TFD in the future. By demonstrating further what has been shown to be possible in select universities, the Corporation hopes to elicit support and interest from other donors, both internationally and at the national level, including the private sector, with the hope of scaling up its success.

Rockefeller Foundation

S&TFD Definitions	As a knowledge-based global foundation committed to enriching and sustaining the lives and livelihoods of poor and excluded people throughout the world, the Rockefeller Foundation has a long history in working to bring the benefits of science and technology to address the problems of development and poverty reduction. The Foundation does not adhere to a strict definition of science and technology, but rather works to apply knowledge, especially science and technology, to key development challenges, such as rural development, health, and education.
Activities to support S&TFD	All of the Foundation's programs include within their strategies work on knowledge for development. The Foundation's S&TFD areas of focus are based on its historical involvement in the sciences of: agriculture [improved crop varieties, enhancing soil nutrients, fellowships for developing-country scientists (being phased out)], and health (disease eradication, improving health systems, including training health workers). In agriculture, S&TFD activities include: enhanced soil productivity; improved crop varieties; international public goods for poor farmers (e.g., work on intellectual property); markets to raise the incomes of farmers; strengthening policies and institutions (building national and local capacity); and fellowships. Areas of work in health include: harnessing the new sciences (to catalyze the development of drugs, vaccines, and microbicides for neglected diseases); learning health systems (strengthening systems for human resources for health, and designing effective systems of knowledge exchange and translation); and an explicit focus on HIV/AIDS. The Global Inclusion department supports work with the other divisions, such as agriculture and health, to focus on many of the complexities that must be understood if science is to be a force for development and poverty reduction (e.g., biotechnology, intellectual property, and emerging S&T areas such as nanotechnology). In the realm of S&T capacity building in Africa in specific, the Foundation provides grants for both institutional and human capacity building in the belief that "transforming African universities into vibrant institutions that stimulate enlightened, equitable, knowledge-based national development will provide a strong base for raising the productivity of the continent's highly skilled human resources."
Types of S&TFD support; regions; sectors	The Foundation uses six grant-making instruments to implement its work in agriculture and health: (1) technological innovation (e.g., development of new rice breeds, and a yellow fever vaccine); (2) experimentation (e.g., testing of new forms of agricultural extension); (3) agenda setting (e.g., more equitable intellectual property policies to promote greater fairness in the ownership and control of knowledge and the "Global Dialogues on Biotechnology"); (4) human capital development (e.g., a program at Makerere University aimed at building the professional skills and competencies needed for effective delivery of district level services in Uganda); (5) institution building (e.g., strengthening existing institutions, such as a joint foundation program to Strengthen Higher Education in Africa, and support for the Center for the Application of Molecular Biology to International Agriculture); and (6) public–private partnerships (combines elements of the previous five instruments, e.g., International AIDS Vaccine Initiative, Global Alliance for TB Drug Development, African Agricultural Technology Foundation, and Public Intellectual Property Resource for Agriculture). The Foundation operates globally, with a regional focus on Africa, Southeast Asia (Mekong), and North America.
Strategic guidance for S&TFD support	The Foundation does not have a strategy to strengthen science and technology as a discrete area of work. It recognizes that science and technology are tools for development and it works to strengthen and use these tools as appropriate in working toward its goals in the fields of education, agriculture and rural development, and health.
Level of S&TFD support	The Foundation does not quantify the level of support for science and technology, in part because while it is part of various strategies, it is rarely the primarily goal of a grant or program. Often the goal of a particular grant is institutional or human capacity building, part of which is capacity in science. The Foundation tracks spending by program theme (e.g., Food Security, Health Equity, and Global Inclusion) and area of work (e.g., Enhanced Soil Productivity, Harnessing the New Sciences, Rising to the Challenge of AIDS, and Global Dialogues on Plant Biotechnology). Specific to capacity building, between 2001 and 2004 USD13 million was earmarked for the Africa University Initiative, which includes the I@Mak project that is being used to remodel Uganda's Makerere University through participatory decision-making. As the titles used to aggregate these figures are broad and changing, it is difficult to determine actual support for specific activities over time. Tentative 2004 estimated figures for support to "science-based development" (e.g., health, agriculture, and global inclusion) reveal USD49 million in support (37% of the Foundation's total budget). In 2000, that figure was 50% of the Foundation budget of USD70 million. Since 1995, funding to these categories as a proportion of total Foundation support has declined.
Future directions for S&TFD support	The Foundation recognizes that its historic commitment to the application of science and technology for development is one of the institution's core strengths. At the same time, it has begun to pay greater attention to the social, political, and ethical issues relevant to its S&TFD work. With the arrival of a new president, the Rockefeller Foundation will necessarily examine its current work and explore ways to increase its effectiveness and impact.
Challenges and opportunities	Future challenges identified considered germane to the S&TFD work performed by the Foundation include: (1) increased privatization of scientific knowledge and enabling technologies; (2) the need to ensure that the benefits of knowledge and innovation reach those who need them in forms they find useful; (3) the need for institutions and systems to develop and disseminate useful and affordable innovations; (4) scepticism among the public of the benefits of technological innovation; (5) the increasing costs of the regulation of new technologies that could benefit the poor, e.g., genetically modified crop varieties and pharmaceuticals; and (6) the cost of ICT in Africa.

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