

Draft Proposal
September 2003

ICT and Internet Support for Scientists in Sub-Saharan Africa



ICT and Internet Support for Scientists in Sub-Saharan Africa

Brian Porter, IFS

Contents:

1. Summary	2
2. Rationale	2
Background – the need	2
What has already been done?	4
Getting connected in Africa	5
3. Targeted Institutions	6
4. Expected outputs	7
5. Implementation	7
6. Sustainability/follow-up issues	8
7. Evaluation	8
8. Budget	8
9. Funding	9
10. Proposed Partners and their Roles	10

Appendices

1. Technical details: LANs and Internet connections	11
2. Staff training programme at chosen institutions	11
3. Some Examples of Scientific Content on the Internet	12
1. INASP – PERI Project	
2. SciDEV	
3. eJDS	
4. ‘Okinawa Statement’ from Science Council of Japan conference on <i>IT-Based Capacity Building in Science</i>	15
5. Presentation of partner organisations	18
IFS	
INASP	
ICTP	
IFDC	

1. Summary

ICT and Internet Support for Scientists in sub-Saharan Africa

This project proposes that, at chosen smaller scientific research institutions in sub-Saharan Africa:

- LANs (Local Area Networks) and Internet connections will be installed [see detailed specification in Appendix 1.]
- the installations will be followed by a comprehensive training programme for the different staff groups at the institutions [see details in Appendix 2.]
- support and encouragement will be given to the institutions to participate in on-going Internet-based collaborative projects (e.g. digitalizing libraries, cataloguing of natural resources, etc) relevant to their field of work

For a scientific research institution which has neither a working library nor a good Internet connection, unimpaired access to scientific literature via the Internet would mean a quantum leap in that institution's ability to do research.

The primary rationale for the Internet connections and ICT training proposed in this paper, is, therefore, the scientific research capacity building effect they would have for the scientists and institutions involved.

2. Rationale

Background – the need

IFS has been giving research grants to young scientists in developing countries for 30 years and to date has supported well over 1000 researchers in 45 African countries. These scientists are distributed in some 700 institutions – about 2/3 at faculties and departments of public universities, 1/3 at National Research Institutions - throughout the continent and are working under a wide variety of conditions – often conditions which make serious research difficult.

The entry point for IFS support is the individual scientist who receives a grant of up to \$12,000. It is realized however, that the type of Internet connectivity proposed in this paper cannot be given to individuals other than in an institutional context and that this project is therefore a departure from the traditional practice. As motivation for this, we contend that without the proposed Internet connectivity the ability of the individual to do effective scientific research is limited.

In 2000, within the framework of the MESIA Project (Monitoring and Evaluation System for Impact Assessment), IFS undertook a survey of both IFS grantees and INCO-Dev grantees in Africa in order to learn, among other things, about the state of science and research in Africa and the working conditions of the researchers.¹ This survey was followed in 2002 by a detailed study in Tanzania.² Questions were posed concerning the perceived hindrances to scientific research work, and in both these studies, the reason *poor library facilities or lack of access to scientific literature* was placed third in importance after *lack of funding* and *lack of equipment*. In these surveys over 50% of the IFS grantees answered that they did not have access to Internet. By way of contrast, in Mexico, where 95% of interviewed scientists report they have unimpaired access to Internet, *lack*

¹ Gaillard J. and A. Furó-Tullberg, *Questionnaire Survey of African Scientists*, IFS MESIA Report No. 2, Stockholm, 2001. (available at <http://www.ifs.se>)

² Gaillard J., E. Zink and A. Furó-Tullberg, *Strengthening Science Capacity in Tanzania: An Impact Analysis of IFS Support*, IFS MESIA Report No. 4, Stockholm, 2002. (available at <http://www.ifs.se>)

of access to scientific literature was ranked eighth in importance among factors limiting grantees' research work and was only listed at all by fewer than 10% of the scientists asked.³

On this critical issue of access to scientific literature, these surveys only corroborate what had already been noted at the IFS Secretariat – applications for research grants coming from African countries were much weaker with respect to references to recent scientific journals and publications, than were applications from many other parts of the developing world. It is well known that for many years African libraries have not had the economic resources to subscribe to journals.

After a decade of Internet development, there are new possibilities. Almost all publishers of scientific journals today have their publications available on the Internet. Access to journals via the Internet is, of course, still controlled by subscriptions, but delivery is easier, providing one has access to a computer connected to the Internet. Furthermore a number of very significant projects have been instigated on behalf of scientists in the developing world, to alleviate the subscription costs. Most notable among these is the PERI Project (Programme for the Enhancement of Research Information) by INASP (International Network for the Availability of Scientific Publications – www.inasp.info) which gives scientists, researchers and students in many developing countries free access to full-text of many journals.⁴ One could also mention the eJDS Project (eJournals Delivery Service - <http://www.ictp.trieste.it/ejournals>) – a Donation Programme by ICTP/TWAS (International Centre for Theoretical Physics / Third World Academy of Science) in Trieste, Italy. Another initiative is SciDev.Net which is a joint effort by the publishers of Nature and Science to provide scientific content of particular relevance to developing country scientists (<http://www.scidev.net/>). [See more details of scientific content on the Internet in Appendix 3.]

With a vast amount of scientific literature now available via Internet, connectivity has become imperative for anyone aspiring to scientific research, especially in those countries where paper journals are not available in libraries.

What does exist in many of these libraries though, is unpublished local research material – scientists in many countries have been doing research for many years and the results of this work exist as 'grey literature' in libraries all over the continent. The risk that researchers repeat work that has already been done or use wrong methodology is high, both because of the lack of contact with relevant recent scientific literature and the low availability of local research results. For these reasons and also because of the lack of more advanced computer-based research tools (such as statistics, modelling) the level of research remains static at a lower-than-satisfactory level. Those research institutions that are connected to Internet not only have the possibility of accessing global scientific literature, but also of making their own research results available globally. Working with available data in more advanced ways and participating in international, regional or national projects which coordinate research in specific fields, will be further possibilities. One example of this is the Forestry Research Institution of Ghana (FORIG – <http://www.forig.org>) in Kumasi which is one of the African nodes in the global GFIS (Global Forestry Information System – <http://www.iufro-gfis.net>) and also the West African Anglophone node for the PROTA project (Plant Resources of Tropical Africa – <http://www.prota.org>). This institution has also participated in the Digital Library programme run by INASP and is producing both digital library catalogues and databases of their own research projects. It is a fairly small institution, with 37 computers connected in a LAN (Local Area network) and with a 64 kbps radio connection to a local ISP (Internet Service Provider). They also host web servers for the GFIS and PROTA projects.

³ Gaillard J., J.M. Russell, A. Furó-Tullberg, N. Narvaez-Berthelemot and E. Zink, *IFS Impact in Mexico: 25 years of support to scientists*, IFS MESIA Report No. 3, Stockholm, 2001. (available at <http://www.ifs.se>)

⁴ Sub-Saharan African countries eligible in the PERI project are: Angola; Benin; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Comoros; Congo, Kinshasa; Congo, Brazzaville; Côte d'Ivoire; Equatorial Guinea; Eritrea; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Mauritius; Mozambique; Niger; Nigeria; Rwanda; São Tomé and Príncipe; Senegal; Seychelles; Sierra Leone; Somalia; Sudan; Swaziland; Tanzania; Togo; Uganda; Zambia; Zimbabwe.

In a broader context also, Internet connectivity has been identified as an essential component of any developmental initiative. NEPAD (New Partnership for Africa's Development) has identified the need for further development of ICT infrastructure in Africa:

Information and communication technologies (ICTs), driven by the convergence of computers, telecommunications and traditional media, are crucial for the knowledge-based economy of the future. Rapid advances in technology and the diminishing cost of acquiring the new ICT tools have opened new windows of opportunity for African countries to accelerate their economic growth and development. The goals of achieving a Common Market and an African Union can benefit immensely from the revolution in information technology. In addition to fostering intra-regional trade, the use of ICTs could also accelerate Africa's integration into the global economy.⁵

It is universally accepted in development circles that sustainable development must be science-based and technology-driven. IFS research on the age factor of African scientists (the majority are over 40) and recent recruitment history of universities, etc. (greatly reduced recruitment of young scientists during the last decade) would indicate that there is a 'missing generation' of scientists in Africa. This fact together with the realization that the sustainable development goals defined are going to require a considerable increase in the scientist population, makes it obvious that an improvement in the scientific research capacity of the present research community is absolutely necessary. Since the relevant scientific content is now in place, what is lacking for a large number of researchers is the infrastructure to access it. As ICSU (International Council for Science) noted in its *Report of the Scientific and Technological Community to the World Summit on Sustainable Development (WSSD)* in 2002:

Despite important efforts to promote the availability of knowledge by groups such as ICSU's Committee on the Dissemination of Scientific Information, INASP and the World Data Center (WDC), providing the infrastructure, training and affordable access to updated scientific information to developing countries lacking adequate telecommunications networks, reliable electricity supplies, technological training, and other key infrastructure, has been particularly difficult.⁶

Those research institutions that manage to combine dynamic leadership with creative science, ICT capacity and Internet connectivity will be the ones who not only produce the science that African and world leaders have called for, but will also be the ones who attract the highly competitive research funding in the international and regional arenas. Or to put it plainly, those research institutions that remain unconnected are wasting their time; they will be (or are now!) in an isolated situation with under-utilized competence. The real question is not *if* research institutions should be connected to the Internet, but rather *how to get connected?* and *who is going to do it?*

What has already been done?

Of course, a considerable amount has already been done by way of connecting academic and research institutions in Africa to the Internet. Specifically, many big projects connecting up universities have been (and are being) carried out. A typical model would be a fibre optic cable circuit around the campus, connecting the individual faculties' networks (LANs) to a common Internet connection which is often via satellite. Other models may involve radio links between the various departments, or even radio links to the ISP (Internet Service Provider) outside the campus. It would seem that today most of the major universities in Africa are connected, even though at some, not all departments have been included in the first project which has probably installed the optic fibre circuit and connected the main library and administrative departments. Some departments and faculties have had to find their own funding to connect to the system..

UNDP's SDNP (Sustainable Development Networking Programme - <http://www.sdnf.undp.org/>) could also be mentioned here as could the AISI (African Information Society Initiative) project of the Economic Commission for Africa (<http://www.uneca.org/aisi/index.htm>), both of which have contained infrastructure building elements. There are many projects, including those by CTA

⁵ *The New Partnership for Africa's Development*, October 2001, (<http://www.avmedia.at/nepad/indexgb.html>)

⁶ *Report of the Scientific and Technological Community to the World Summit on Sustainable Development (WSSD)*, ICSU Series on Science for Sustainable Development No. 1, p 15

(Technical Centre for Agricultural and Rural Cooperation) that have concentrated on non-research groups and organisations (such as farmers and other rural communities) and had considerable success in raising public awareness and use of Internet. There are today Internet cafés in almost every town and village in Africa, and the demand for their services is high. In the purely academic sphere, the African Virtual University (<http://www.avu.org>) has successfully set up computer labs at major universities in some 18 countries and conducted many courses using distant teachers.

The Abdus Salam ICTP has carried out a series of Intensive Training Activities for participants from developing countries since 1989 and established a Programme of Training and System Development on Networking and Radiocommunications with the collaboration of the United Nations University. Both radio technology and computer networking based on Linux O.S. have been used to help building up the ability of academic institutions in developing countries to access ICT. The programme activities started with a pilot project for a computer network for education and research, with the use of spread spectrum radio technology, at the Obafemi Awolowo University of Ile-Ife, Nigeria, successfully completed by June 1996 and continuously expanding till today.

Other activities of the Programme were carried out for the national University Commission of Nigeria. Furthermore, Training and Technical assistance in the use of radio for computer networking and CMS was provided to groups in Benin, Peru, Romania, Sudan and Venezuela in collaboration with the S&T Collaborium Initiative (www.collaborium.org).

Despite these and other commendable initiatives, a majority of researchers attending IFS sponsored workshops and courses in Africa in 2002⁷ reported that they do not have access to Internet at their institutions or the access they have is so unreliable they can use it at best for reading email. It would seem that many university projects are overloaded (e.g. a 2 Mbps internet connection at Makerere University in Kampala, Uganda, is serving a network with 1,800 computers) or are, understandably, student-oriented to the extent that the bandwidth is simply not enough for researchers in outlying departments. And as for research institutions not on university campuses, it seems that there are very many with no connection at all. A recent conference held in Japan⁸ summarised the situation:

In developing countries, the application of ICT in education faces great obstacles; limited access to Internet, lack of basic supporting infrastructure, lack of human resources and appropriate contents. Financial and technical supports are urgently needed from various sources such as inter- and multi-national organizations, governments and NGOs.

Getting connected in Africa

In the developed world, nearly all connections to the Internet are through the telephone cable infrastructure – a variety of different types of connection and bandwidth is available. The situation is different in Africa. The telephone infrastructure in most countries of the continent is antiquated and generally in such bad condition it does not work satisfactorily even for ordinary telephony needs – and indeed in many African countries mobile telephony, despite its cost, has now eclipsed fixed-line telephony with regard to numbers of subscribers. For these reasons, most

⁷ IFS workshops and courses in Africa 2002:

Food Science and Nutrition for Sustainable Livelihood, Dar es Salaam, Tanzania, February
Research Proposal Writing Workshop, Ouagadougou, Burkina Faso, February
Plant Pathology and Biocontrol, Agadir, Morocco, April
Research Proposal Writing Workshop, Cotonou, Benin, June
Systems Analysis and Modelling in Agriculture, Accra, Ghana, August
Research Proposal Writing Workshop, Maputo, Mozambique, November
Research Proposal Writing Workshop, Antananarivo, Madagascar, November

⁸ *International Conference on IT-Based Capacity Building in Science* held by Science Council of Japan in Okinawa, Japan, January 16-18, 2003. See 'Okinawa Statement' as Appendix 4, page

of the university and institution connections to the Internet in Africa are wireless, i.e. via radio or satellite links, since dial-up connections via modem (and telephone cables) are both unreliable and too slow.

Until recently, inflexible regulatory policies and state-owned monopoly telecoms also hindered the development of telephony and the Internet but recently though, there have been significant changes in these areas, so things now look more promising in many countries. Also there is a continuous expansion of the amount of international bandwidth available to Africa, increasing, for example, from 700 Mbps in 2001 to 1,500 Mbps in 2002.⁹ Also, in May 2002, the new 25 Gbps submarine fibre-optic cable, running down the west coast of Africa, joining the continent to both Europe and Asia, became operational – offering hope for even greater bandwidth for those countries connected to it.

Although things are improving rapidly, many problems still exist with regard to connectivity and bandwidth in Africa. Any project of the type proposed in this paper would have to choose both scale of project (bandwidth requirements) and project siting country-wise (bandwidth availability) carefully. Mike Jensen, independent telecom consultant and expert on African connectivity, has summed up many aspects of the current situation in his report *The African Internet – A Status Report* of July 2002:

Due to high international tariffs and lack of circuit capacity, obtaining sufficient international bandwidth is still a major problem in most countries, and although conditions have improved over the last year, users generally still have to contend with substantial congestion in peak times. This year Egypt overtook South Africa as the country with the most international bandwidth (550Mbps vs. 380Mbps), following the launch of government backed international connectivity provider, Nile-Online. Today 20 countries have links carrying 5Mbps or more, and 13 countries have outgoing links of 10Mbps or more - Algeria, Botswana, Egypt, Kenya, Mauritius, Morocco, Nigeria, Senegal, South Africa, Sudan, Tanzania, Tunisia and Zimbabwe. Also of note is that the range in available international bandwidths is continuing to increase, with some 8 countries still on International links that are less than the average small or medium sized business user in Europe or North America - 256Kbps (Liberia, Congo-Brazzaville, Chad, Equatorial Guinea, Comoros and Sao Tome & Principe).¹⁰

Despite some remaining difficulties in most countries, building a computer network with up to 50 computers connected to Internet with a 128 kbps connection (by radio, satellite or fixed-line technology depending on country chosen) would be technically feasible and sustainable in many countries today. [For more technical details on the proposed connections, see Appendix 1.]

An interesting project in this field is attempting to monitor Internet connectivity and bandwidth availability for the scientific community: *PingER Monitoring Project of DeveloPING Countries*. The aim of the project is to quantify the digital divide and understand connectivity performance differences between developed and less well-developed countries in order to aid the development of science. The project started Dec 2002 and is an ongoing collaboration between the Abdus Salam ICTP, Trieste (eJDS working group) and SLAC, USA (providers of the PingER measurements beyond the HEP community). The monitoring should extend, cover and include hosts in countries with low bandwidth access to the Internet. (see <http://www.slac.stanford.edu/xorg/icfa/icfa-net-paper-dec02>)

3. Targeted Institutions

Targeted Institutions in this project are smaller scientific research institutions, either free-standing or departments on university campuses, with up to 50 researchers.

Furthermore, they

- would be conducting science and technology with particular emphasis on the management of natural resources

⁹ *The African Internet – A Status Report*, Mike Jensen, July 2002 (available at <http://www3.sn.apc.org/africa/afstat.htm>)

¹⁰ Report available at <http://www3.sn.apc.org/africa/afstat.htm>

- should be in sub-Saharan African countries (excl. South Africa) that have a sufficiently developed IT sector which could guarantee supply of services and equipment and a sufficiently developed university to guarantee future needs of both technical and scientific knowledge
- should be deemed capable of high quality research, have dynamic leadership and a sufficient base of qualified scientists, including either IFS grantees or applicants
- should not be involved at present in any similar project or have received funding for Internet connections from other sources

4. Expected outputs

It is expected that the institutions and scientists in Sub-Saharan Africa will begin:

- using computers and Internet as powerful tools in scientific research
- creating their own digital library catalogue and databases of their own research projects
- using their own (and other) collections of data in new ways, e.g. with computer modelling, statistics, etc.
- writing more and better research proposals (and hopefully obtaining more funding)
- participating in national, regional or global scientific projects being conducted via the Internet (such as GFIS and PROTA, mentioned earlier)
- collection of data of institution's scientific productivity before and after ICT Support Project – usable in contexts such as the IFS MESIA Impact Studies for measuring the effects of investment in ICT.

5. Implementation

Implementation will of course be dependent on available funding. A feasibility survey will be carried out first, to establish the target institutions. A pilot/demonstration project will then be carried out, involving 5 selected institutions and taking 18-24 months. An evaluation of the pilot project will determine the form of the continued project. The subscriptions to Internet services, support, software, etc established in the pilot project, will be paid in full for the duration of the pilot project and then phased out according to initial agreements made with the institution (see Section 6: Sustainability, below).

The following implementation plan has 3 segments which could be funded separately. Conceivably the Feasibility survey could be initiated before funding for the pilot project is secured.

Part A Feasibility survey (3 months)	1	Preliminary discussions between partners to choose suitable countries and institutions. Correspondence with institutions in question. Preliminary selection of institutions. Visit to proposed institutions to evaluate feasibility on site.
	2	Detailed formulation of pilot/demonstration project including technical details of installations, budgets and timelines. Negotiations/agreements with chosen institutions

Part B Pilot project (18 – 24 months)	3	Implementation of pilot/demonstration project <ul style="list-style-type: none"> • Design of network installations • Call for tenders • Purchase of hardware and services; contracts • Installation of network and Internet connection • Training programme
	4	Evaluation of pilot/demonstration project
Part C Continued project	5	Develop plan for continued project
	6	Implementation of continued project

6. Sustainability / Follow-up

There are a number of issues which should be discussed at all stages of planning, negotiation and implementation. Some commitments would be required from the selected institutions before installations could begin.

Issues:

- continuity of technical competence
[this is an issue that will be addressed from the beginning at each institution – strategies for retention of trained technical staff; extra costs of training new staff, etc]
- continued payment of necessary subscriptions, licenses upgrades, etc
- continued development of scientific capacity at the institutions
- development of library and digitalisation of 'grey literature'

The partner organisations would maintain contact with the institutions for some time after the project was officially completed and responsibility for funding on-going costs handed over to the institutions themselves. The project will fund in full subscriptions to Internet services, hardware support and necessary upgrades or subscriptions to software for the institutions connected for the period of the project. After this time, the support for the on-going costs would be phased out in accordance with a plan agreed upon with the institution at the beginning of the project. Such an agreement would probably be in the order of 100% funding of these costs in the first year after the completion of the project, 66% for the second year and 33% for the third and last year of support.

7. Evaluation

An on-going project evaluation will be made every 12 months

8. Budget

This is a suggested budget for a feasibility survey and pilot project with 5 institutions, with between 10 and 50 scientists each. Costs in the pilot project may vary depending on the outcome of the feasibility survey in a number of respects, e.g.:

if all 5 institutions were in the same country, training programmes would be considerably cheaper

considering also the variations in cost of Internet connectivity, IT hardware and services, etc between countries, these figures must be considered approximate until specific institutions are chosen

if 'open source' software, rather than propriety software is used a considerable saving will be made, since there are no licence fees

	USD
A - Feasibility survey	20,000
B – Pilot project	
Hardware & installation:	
5 LANs (computers, servers, switches, cables)	500,000
5 Internet connections, hardware & installation	20,000
Software:	
LAN software (including operating system on 5 servers and 200 workstations)	10,000
Office software	80,000
Library software	50,000
Modelling software	20,000
Other software (e.g. anti virus; imaging; statistics; special scientific applications; etc)	50,000
On-site training	
Training of network administrators	100,000
Training in computer competence for scientific & administrative personnel	100,000
Training of librarians	100,000
Training in proposal writing for scientists	50,000
Further scientific training of scientists (statistics, modelling, etc)	50,000
Subscriptions:	
5 128-kbps Internet subscriptions at \$750/month for 4 yrs (100% cost for 2yrs, 66% for 1 yr, 33% for 1 yr)	134,550
Other subscriptions (hardware support, software, etc) for 3 yrs	30,000
Evaluation	50,000
Administration & coordination (15%)	198,683
Total (for feasibility survey and pilot project):	1,523,233

9. Funding

Funding will be sought by the partners from a variety of potential donor organisations.

10. Proposed Partners and their roles:

Organisation	Role
IFS - International Foundation for Science Stockholm, Sweden http://www.ifs.se Contact: Brian Porter brian.porter@ifs.se	Brian Porter from IFS will co-ordinate the project and conduct the preliminary survey of the proposed Institutions. Supervise the installation of network infrastructure together with ICTP and INASP Training: Proposal writing courses
INASP - International Network for the Availability of Scientific Publications http://www.inasp.org.uk/ Contacts: Carol Priestly carol.priestly@inasp.info Martin Belcher mbelcher@inasp.info	Technical competence in networks Training : Computer literacy, Librarian training
ICTP - International Centre for Theoretical Physics Trieste, Italy http://www.ictp.trieste.it Contact: Sandro Radicella rsandro@ictp.trieste.it	Technical competence in deployment of Wireless LANs and Campus-wide computer networking, including connection to Internet. Technical training on ICT for Science. Training and support for Contents Management Systems for Science. Advise on use of Open Source technologies for the project.
IFDC Africa Lomé, Togo http://www.ifdc.org/Global_Presence/IFDC_Africa/index.html Contact: Marco Wopereis mwopereis@ifdc.org	Training workshops in Computer Modelling in Agriculture

Appendices

Appendix 1.

Technical details: LANs and Internet connections

The Local Area Network (LAN) will include a server, backup-station, UPS, firewall and client computers for scientists, library and administrative staff.
[to be specified in detail]

A central connection to the Internet will be established using the most appropriate technology for that place. The bandwidth should be initially 64 kbps.
[to be specified in more detail]

The equipment will be bought from local suppliers.

Appendix 2.

Staff training programme at chosen institutions

The training programme will be carried out in the form of a number of workshops based on the following list (adapted depending on the specific institution or institutions involved)

	subject matter	designed for
Workshop No. 1	Basic computer literacy	all staff
Workshop No. 2	Using the Internet	all staff
Workshop No. 3	Electronic Journals for Scientists	scientific staff
Workshop No. 4	Electronic Journals for Librarians	librarians
Workshop No. 5	Library Catalogue and Databases	librarians
Workshop No. 6	Research Proposal Writing	scientific staff
Workshop No. 7	Computer Modelling in Agriculture	scientific staff
Workshop No. 8	Statistics for Scientists	scientific staff
Workshop No. 9	Network and Internet Administration	network administrators

Some Examples of Scientific Content on the Internet

1. INASP-PERI Project
2. SciDev.net
3. eJDS

1. INASP – PERI Project

Programme for the Enhancement of Research Information (PERI)

Acquisition of international scholarly information through application of electronic ICTs

A programme for the acquisition of scientific and scholarly information through electronic means, developed with research partners and university librarians in developing and transitional countries. This includes procurement and e-delivery of major scientific, technical, medical, social science and humanities materials from a wide range of sources.

Dramatic changes are taking place in academic and library communities. Advances in A programme for the acquisition of scientific and scholarly information through electronic means has been developed with research partners and university librarians in developing and transitional countries. This includes procurement and e-delivery of major scientific, technical, medical, social science and humanities materials from a wide range of publishers, publishing aggregators and database suppliers. Several packages also include access and delivery of the same materials in CD ROM (or DVD) format.

Three levels of information are included:

- [Current awareness](#)
- [Full text on-line journals](#)
- [Document delivery](#)

The first phase of the programme focused, in particular, on testing the logistics of selection, delivery and access and therefore the number of journals, publishing packages and electronic bibliographical services was limited. However, this period was also used to conduct needs assessments and each partner was invited to specify and prioritize their additional requirements. A number of new publishers are now being added and negotiation with other information providers will continue in response to requests. Partners participating in the programme make a selection, in line with their current needs and research priorities, and the funding available, from a range of materials:

Current Awareness

African Journals OnLine (AJOL) <http://www.inasp.info/ajol/>
TOCs and abstracts of 70+ African journals (via INASP, no licence requirement)

British Library - Inside Web <http://www.bl.uk/online/inside/>
Indexes Table of Contents of 20,000 research journals. (Institution licences available)

CAB and CAB-Health <http://www.silverplatter.com/catalog/cabi.htm>
(Institutional licenses available)

EBSCO Academic Search Premier <http://www.epnet.com/database.html#ap>,
Biomedical Collection <http://www.epnet.com/database.html#fsh>, *Health Source Plus*
<http://www.epnet.com/database.html#hp>, *ERIC, Business Source Premier*
<http://www.epnet.com/database.html#bu> (Country-wide access licences available - unlimited number of institutions)

SilverPlatter indexing & abstracting databases:
Institute de l'information Scientifique & Technique (INIST)
Pascal SciTech, <http://www.silverplatter.com/catalog/pcst.htm>,
Pascal Biomed <http://www.silverplatter.com/catalog/pbma.htm>,
MEDLINE+ <http://www.silverplatter.com/catalog/meds.htm>,
FRANCIS <http://www.silverplatter.com/catalog/fncs.htm>,

SilverLinker <http://www.silverplatter.com/silverlinker/index.htm>
(Institutional licenses available)

subito www.subito-doc.com providing access to articles from over 20,000 research journals with purchase at highly preferential rates per article.

On-line full text journal provision (with accompanying CD ROM/DVD where available) includes:

Academic Press (I-Click) <http://www.idealibrary.com>

300+ Core full text scientific, technical and medical journals
(Country-wide access licenses available - unlimited institutions & researchers)

Blackwell Publishers

340+ full text Science Technology and Medicine
<http://www.blackwell-synergy.com/Journals/member/institutions/journallist.asp>

300+ social science and humanities journals

<http://www.blackwellpublishers.co.uk/>
(Country-wide access licenses available, unlimited institutions & researchers)

The Cochrane Library <http://www.update-software.com/cochrane/>

Including The Cochrane Database of Systematic Reviews, Abstracts of Reviews of Effectiveness, The Cochrane Controlled Trials Register and Health Technology Assessments and an Economic Evaluation Database. (Country-wide access licenses available - unlimited institutions & researchers)

EBSCO Host <http://www.epnet.com/>

Full details of titles will be provided to those interested in subscribing.
For example, the *Academic Search Premier* package includes over 3000 peer-reviewed full-text journals. (Country-wide access licenses available, unlimited institutions & researchers)

Mary Ann Liebert <http://www.liebertpub.com/>

3-year license for 52 medical journals (licensed for access via Swets Navigator)

There are also many OnLine Journals and Databases available on the Internet, without cost. These can be found from <http://www.inasp.info/peri/free.html>

INASP is also able to make available print subscriptions to African journals through [African Journals OnLine \(AJOL\)](#)

Document delivery

SilverLinker provides automatic links to articles within journals for which the library holds a subscription to enable documents to be printed locally

African Journals OnLine (AJOL) <http://www.inasp.info/ajol/> - via INASP

British Library Document Supply Centre <http://www.bl.uk/> and 'subito' www.subito-doc.com providing access to articles from over 20,000 research journals with purchase at highly preferential rates per article.

SilverLinker provides automatic links to articles within journals for which the library holds a subscription to enable documents to be printed locally.

For more information contact Carol Priestley at inasp@inasp.info

2. SciDev.net

<http://www.scidev.net/index.cfm>

The overall aim of the Science and Development Network (SciDev.Net) is to enhance the provision of reliable and authoritative information on science- and technology-related issues that impact on the economic and social development of developing countries.

Our goal is to ensure that both individuals and organisations in the developing world are better placed to make informed decisions on these issues.

We seek to achieve this objective primarily through running a free-access website, but also by building regional networks of individuals and institutions who share our goals, and by organising capacity-building workshops and other events in the developing world.

The Science and Development Network (SciDev.Net) is funded by:

- UK Department for International Development (DFID)
- Swedish International Development Co-operation Agency (SIDA)
- International Development Research Centre (IDRC) in Canada
- Rockefeller Foundation

It is supported by the scientific journals *Nature* and *Science*, both of which have agreed to provide free access to a selected articles every week.

SciDev.Net also benefits from the active support of the Third World Academy of Sciences, based in Trieste, Italy.

3. eJDS - free e-Journal Delivery Service via e-Mail

The e-Journals Delivery Service (eJDS) of the Abdus Salam ICTP/TWAS Donation Programme is a concrete example of bridging the digital divide in developing countries and across the north-south divide, in terms of applying low-cost open source information technologies to allow developing-world scientists to search and download selected scientific articles using e-mail only.

Several publishing companies have joined the eJDS programme, including Academic Press, the American Physical Society and World Scientific, with rules defined by each Publishing Company. Others are being discussed. The arrangement between eJDS and Publishers represents a balance between the publishers' need to generate adequate revenue flows through paid subscriptions and their desire to make information -the lifeblood of the global scientific community- more easily available to all Scientists. Under this agreement: Developing world Scientists can now have access to a much wider range of current scientific information and findings than ever before. The publishers are able to reach researchers who would otherwise not have either the technical or financial means to read articles in their journals in a timely fashion. The Abdus Salam ICTP can transfer knowledge to Scientists worldwide.

Although eJDS is a free service, it will not give access to Web sites or on-line Documents that are not in the list of allowed e-Journals or to those e-Journals in which an eJDS user has not been granted access. To retrieve a particular e-Journal (from one of the Publisher participating in the programme), registered users simply send an e-mail to the eJDS server by writing in the body of the e-mail message a single URL that points to the eJDS page listing the e-Journals available by Publisher.

The eJDS server automatically replies with the requested information as an e-mail attachment.

There are also many different option fields to search within each Publisher/e-Journal. The eJDS procedure to follow is similar to that used when connected in real time, direct mode to any Web server. It is necessary to fulfill the required search fields within the search engine and then select their GO search button. The e-Journals, Web pages and Articles retrieved or the search results obtained using eJDS (as

attachments) can be stored in the computer and re-use it at a later stage. In this way, both Time and Bandwidth can be saved by re-using the same Web documents and making selections of articles anew and off-line from anywhere in the net.

According to the recent RECOMMENDATIONS OF TRIESTE (Oct 2002) TO HELP BRIDGING THE DIGITAL DIVIDE, where international experts gathered for an open round table sponsored by the Abdus Salam ICTP, ICSU, IUPAP, UNESCO, TWAS and WIF, it was agreed to encourage Web to e-mail access and invite more Scientific Publishing Companies to participate in the eJDS program. The goal is to expand eJDS ideas to other subjects besides Physics and Mathematics.

(For further details see: <http://www.ictp.trieste.it/ejournals>)

OKINAWA STATEMENT

Capacity Building in Science -- The Basis for Sustainable Development

The Science Council of Japan and the participants of the
International Conference on IT-Based Capacity Building in Science
convened in Okinawa, Japan January 16-18, 2003

RECOGNIZING THAT

The transition to sustainable development is the central theme of the 21st Century, and the contribution of science and technology is vital for solving a variety of difficulties faced on a global scale, as discussed in the Conference of the World Scientific Academies held in Tokyo in 2000 and in the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002,

To achieve global sustainability, every nation shall develop to the stage where all people live with dignity, free from poverty and injustice, and the most effective way to develop to such a stage is through human resource development by capacity building, especially in science and technology,

Prime Minister of Japan, Junichiro Koizumi, in his speech at WSSD proposed the United Nations for declaring a "Decade of Education for Sustainable Development", and offered 250 Billion Yen assistance over the next five years to improve education in low income countries, and UN General Assembly on December 20, 2002 decided to adopt the proposal starting from 2005,

Recent progress in information and communication technology (ICT) has dramatically expanded the horizon of human activities and provided with the tools to overcome distance, thus has become the driving force to change our society, from one's personal life to the way of business and administration,

The potential application of ICT is expected for capacity building in science, starting from education in primary school through higher education up to the training of scientists and engineers, but the effective use of ICT varies depending upon the stage of education and the available infrastructures of a given society,

Today's so-called "digital divide" is not only drawn between the rich and poor but also those educated and not-educated, thus education in ICT and its accessibility and availability have the inherent potential to narrow the imbalance due to the gap in income and infrastructure of the society,

A variety of examples of successful applications of ICT to the capacity building in science have been presented and discussed during the Okinawa Conference, leading to a common understanding of the issues concerned,

HEREBY RECOMMEND THE FOLLOWING:

General

1. Various national and international organizations have been working on the capacity building utilizing ICT. Sharing their experiences is most valuable in the pursuit of our common objectives. It is strongly urged to create various platforms to share such experiences and expertise.
2. Accessibility is a key element of ICT-based education and capacity building. While mobile technology offers a great promise, financial and technical assistance of developed countries,

non-governmental organizations (NGOs) and international organizations be provided to build infrastructure with affordable costs to developing countries.

3. Collaborative development of internationally applicable contents, database and teaching practices must be encouraged for resource sharing.
4. Quality of ICT-based education must take into account of languages and contents acceptable and relevant to local needs.
5. Proper monitoring and assessment of the outcomes must be implemented as an important component to secure greater and continuing public support and to guide project modification.
6. Virtual public libraries and laboratories accessible online are highly effective to provide knowledge and practice for all with the least cost. Introduction of such a system is recommended especially for developing countries to assist people to enter knowledge society.

On Primary and Secondary Education

1. Science and mathematics education for all is one of the prime strategic challenges in capacity building. To attain this, the educational reformation is required in curriculum, teacher training, pedagogy and assessment assisted by ICT.
2. To increase the effectiveness of science and mathematics education, the aspiration of motivation by inquiry-based, hands-on and minds-on learning be considered essential- Technology in classrooms may enhance practice for science and mathematics education, but it should be introduced in accordance with the development of students so that learning is not simply replaced by the skill of using but is stimulated to enhance individuals' creative potential.
3. Teacher training is one of the most important reformation factors in primary and secondary education. Distance learning and systematic support by the science community shall be fully exploited for "teaching teachers" in both developed and developing countries.
4. Digital divide persistent in developing countries can be most effectively bridged by training of young generation. Developed countries should step in to help improve both ICT application and facilities of primary and secondary schools of developing countries.

On Higher Education and Lifelong Learning

1. All the institutions for higher education should jointly take initiative in worldwide promotion of the capacity building in science, by applying ICT to create new contents of education, to enlarge access to information, to foster scientific research and to share scientific knowledge and information.
2. Distance learning and open university offer a variety of self-learning opportunities thus should be utilized to cope with the swelling demand for higher education, especially in developing countries.
3. It is recommended that additional educational opportunities be offered to millions of people who pursue lifelong learning and continuing professional development, in developed as well as in developing countries, on and off campus through ICT.

On International Cooperation

1. Pioneering work was initiated by the former Committee of Science and Technology in Developing Country (COSTED) to establish Open Distance Learning (ODL) Network in developing countries. This initiative is effective for the capacity building of students, teachers and young scientists in developing countries. It is essential that the International Council for Science (ICSU) takes over this initiative without interruption and further promotes capacity building in developing countries with close cooperation of scientific unions and national academies.
2. In developing countries, the application of ICT in education faces great obstacles; limited access to Internet, lack of basic supporting infrastructure, lack of human resources and appropriate contents. Financial and technical supports are urgently needed from various sources such as inter- and multi-national organizations, governments and NGOs.
3. To effectively accelerate human resource development, activities should be coordinated into an integrated agenda, of international NGOs such as ICSU through its Committee on Capacity Building in Science (CCBS), InterAcademy Panel (IAP), Third World Academy of Sciences

(TWAS), International Foundation for Science (IFS), donor agencies such as, for Japan, Japan International Cooperation Agency WCA), Japan Bank for International Cooperation (JBIC), and international organizations such as UNESCO, the United Nations University, the World Bank.

4. An international association of national centers for capacity building should be established timely. This association is the assembly of national centers who are responsible for the implementation of ICT policy, research and development for ICT use and the integration of ICT in teaching and learning, and should be supported financially by national governments and international organizations.

Attaining sustainable development is the common goal of all the countries. The most basic and effective way to meet this difficult challenge is to empower human potential through capacity building, especially in science. All the recommendations mentioned above can be materialized by developing a coordinating network of national, regional and global endeavours. Science Council of Japan, together with organizations of the world sharing the same objectives, is committed to contribute towards establishing such a network.

Knowledge is the common treasure of humankind. The advance in information and communication technology is the most precious gift for us, because it can accelerate the sharing of our common treasure among all the people who happened to live on the same planet at the same moment in the eternal flow of time.

Presentation of partner organisations



International Foundation for Science
Karlavägen 108, 5th floor,
SE-115 26 Stockholm,
Sweden

<http://www.ifs.se>

Contact person:
Brian Porter
email: brian.porter@ifs.se
tel: +46 8 545 818 18

IFS is an international NGO, based in Stockholm, Sweden since 1972 with the mission to

contribute towards strengthening the capacity of developing countries to conduct relevant and high quality research on the sustainable management of biological resources. This will involve the study of physical, chemical and biological processes, as well as relevant social and economical aspects, important in the conservation, production and renewable utilisation of the natural resources base.

To achieve this, IFS gives research grants to individual scientists in developing countries after a careful selection process. Some 3,500 scientists from 100 countries have been supported since 1972.



INASP,
P.O. Box 516
Oxford, OX1 1WG
UK

<http://www.inasp.info/>

INASP is a cooperative network of partners. Its mission is to enhance the flow of information within and between countries, especially those with less developed systems of publication and dissemination. INASP was established in 1992 by the International Council for Science (ICSU), as a programme of the Committee for the Dissemination of Scientific Information (CDSI).

Objectives:

- to map, support and strengthen existing activities promoting access to and dissemination of scientific and scholarly information and knowledge;
- to identify, encourage and support new initiatives that will increase local publication and general access to quality scientific and scholarly literature;
- to promote in-country capacity building in information production, organization, access and dissemination.

INASP is advised by an international Council. The Network is open to all interested organizations and individuals.



ICTP,
Trieste,
Italy

www.ictp.trieste.it/

For more than 30 years, ICTP in Trieste, Italy, has been a driving force behind global efforts to advance scientific expertise in the developing world. Founded in 1964 by the late Nobel Laureate Abdus Salam, the ICTP seeks to accomplish its mandate by:

- Providing world-class research facilities for scientists from the developing world.
- Fostering advanced scientific research, especially in theoretical physics and mathematics.
- Creating an international forum for the exchange of scientific information through comprehensive courses, workshops and seminars.



IFDC Africa Division
Lomé, Togo

IFDC - An International Center for Soil Fertility and Agricultural Development - is a non-profit public international organization dedicated to increasing agricultural productivity and food production in the tropics and subtropics through the appropriate use of plant nutrients in sustainable crop production systems. Headquartered in Muscle Shoals, Alabama, U.S.A., IFDC conducts its research, training, and technical assistance programs in collaboration with private, national, and international organizations throughout the world. IFDC's Africa Division, based in Lomé, Togo, has specialized focus on market and policy, agricultural intensification, and input accessibility.

Since 1974 IFDC has held over 590 workshops, study tours, and training programs for over 8,000 participants from approximately 150 countries. Apart from the IFDC Headquarters in Muscle Shoals, Alabama, these programs have been held in 48 other countries. The programs have covered a wide range of subjects including fertilizer marketing, production, distribution and handling, and numerous specialized subjects. In recent years, related courses on sustainability, computer modelling and simulation, fertilizer recommendations, and environmental aspects of fertilizer production and use have attracted participants from around the world.