The Role of Science in the Information Society Conference

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world summit on the information society
Geneva 2003 - Tunis 2005

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CERN, UNESCO and ICSU (in cooperation with TWAS and ICTP): comments and inputs from the Scientific Community on the Draft Declaration and Action Plan

The international scientific community, represented here by the Third World Academy of Sciences (TWAS), the International Council for Science (ICSU), the International Center for Theoretical Physics (ICTP), the European Organization for Nuclear Research (CERN) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), is very pleased to provide to the WSIS process the following comments and specific proposals on the Draft Declaration of Principles and Draft Action Plan.

This contribution builds on previous submissions form TWAS, ICSU and UNESCO for the first two preparatory meetings for WSIS. UNESCO is again making a separate submission at this stage, but has been fully involved in the formulation of the current input, which is reflected in its own submission.

General Background

Science is a key public good that underpins the information society. The fundamental scientific and technological components of the Information Society have been driven by the search for fundamental knowledge and solutions to specific problems. The Information Society tools, from electricity and radio waves to the World Wide Web and browsers, were all discovered or invented in scientific and academic laboratories.

Scientific research and technology drive today s economies and serve as twin pillars of progress for advances in knowledge for all humankind. Scientific knowledge often has international applicability. Information and communication technologies have the capacity to increase accessibility to scientific knowledge worldwide.

The essential role of science and scientists in building the Information Society has been understated in the Draft Declaration *of* Principles and Draft Plan Action. The scientific community urges governments to clearly acknowledged it in the Declaration of Principles and reflected in the Plan of Action of WSIS.

Information and communication technologies (ICTs) are also central to scientific research itself. ICTs enable scientists to perform basic and applied research, build partnerships and scientific international consortia, conduct experiments, collate data, coordinate laboratory activities, and communicate their findings to their peers and the public. The digital world in which we live is not only a product of science but also a fundamental force for shaping the scientific research agenda and determining how the future of scientific knowledge will unfold and be utilized.

The digital world offers novel opportunities for involving scientists in developing countries in scientific endeavors of their choice around the globe, provided some very basic ICT tools are at their disposal. Many of these can now be made more affordable.

Despite this potential, the knowledge divide appears to be widening. Increasing inequalities in access to ICTs reduce opportunities for individuals and institutions to develop and use scientific knowledge that could help foster innovation, facilitate efficient decision making, and support education and training. The digital divide addressed by WSIS shares many of the same characteristics of the scientific divide, defined by the enormous gap in scientific research, innovation and diffusion of technology.

In addition, present systems for the publication and dissemination of scientific information do not provide sufficient access to knowledge originating in many developing countries. While scientific data and information from one country may or may not be specifically relevant to another country s needs, all countries must be able to develop and communicate their own knowledge.

In order to reduce these inequalities and to achieve Sustainable Development and the Millennium Goals, science, technology and innovation will have to play a fundamental role, maximizing the possibilities and benefits of ICTs in the areas of basic and applied research, education, health, agriculture, technology, economic development and government.

Therefore, ensuring equitable access to scientific knowledge and to software tools for analyzing and disseminating this information is essential, as well as making available affordable networking infrastructure, information-processing equipment, software and training to universities and research institutions world wide.

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The Agenda for Action Science in the Information Society , attached to this document, is the product of a workshop organized by ICSU and the ICSU Committee on Data for Science and Technology (CODATA), in partnership with UNESCO. The workshop took place in Paris on 12th. March 2003 and involved over 60 scientists, science managers and representatives of international agencies from all over the world. This Science Agenda for Action conveys the main messages of the Science Community for WSIS. Further information on the workshop can be found at www. icsu.org.

UNESCO, ICSU, TWAS and CERN are organizing a side event to be held at CERN on December 8th and 9th, 2003, whose preliminary programme is attached. Further information on this event can be found at rsis.web.cern.ch/rsis.

Long-term goals for the Information Society include universal access, open standards, open source, interoperability and decentralization, as already stated in the draft declaration of principles. Documentation on this can be found at www.w3c.org/consortium.

Specific proposals

Draft Declaration of Principles (Doc. WSIS/PCIP/DT/1-E)

- Include the new following paragraph in Section I.B.10:

Science has a central role in the information society. There should be universal and equitable access to scientific knowledge and equal opportunities for all to create, disseminate and use information .

- Reformulate Section I. A. 5. as follows:

We are fully aware that our individual and collective ability to create and share knowledge has become a driving force in shaping our future, and that concrete action and global commitment are now required, in order to ensure that science, knowledge and new technologies accelerate the attainment of the Millennium Development Goals that we set for ourselves at the Millennium Summit **.**

- Include the following new paragraph in Section I. B. 10:

The recognition of scientific knowledge as a public good. Scientific data and information should be as widely available and affordable as possible .

- Reformulate Section I. C. 22 as follows:

Access to knowledge and information, from science and other areas: all individuals and organizations should benefit from access to information, knowledge and ideas. The sharing and strengthening of global knowledge for development can be enhanced by ensuring equitable access to information for educational, scientific, economic, social, political and cultural activities .

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- Reformulate Section I. C. 2. 23 as follows:

Access to public domain information: A vibrant and rich public domain is an essential element for the growth of the Information Society. Information, including scientific data, in the public domain must be easily accessible.

- Reformulate Section I. C.3.27, as follows:

All partners —public, private sector and civil society organizations have a stake in the development of information and communications and should be fully involved in decision making at the local, national, regional and international levels. Scientific and academic institutions have an important role to play in this context. Governments should work in close coordination with private enterprise and civil society .

- Reformulate Section I.C.6.38 as follows:

The existence of a supportive and predictable policy, legal and regulatory framework is an important prerequisite for enhancing trust in the development of the Information Society. In particular, knowledge generated by publicly-funded programmes should be recognized as a public good .

- On Par.43: delete the word radio .

- Include the following new principle, under section I.C.4:

Universities and Research institutions have a critical role in knowledge production, analysis, sharing and dissemination. The availability of world wide affordable networking infrastructure, high speed internet connections, information-processing equipment and training are an essential part of capacity building and education initiatives .

And in the Draft Action Plan keep the original wording of *[B. Objectives/45/a) benchmarks: all universities to be connected by 2005]*. This paragraph shall remain as such.

Draft Action Plan Doc.WSIS/PCIP/DT/2-E

- Include the following new paragraph in Section I.A.New 13.bis.

Ensure that any legal regime on database protection guarantees full and open access to data created with public funding. Restrictions on proprietary data should also be designed so as to maximize availability for academic research and teaching purposes .

- Include the following new paragraph in Section I.A. New 13.ter.:

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provide long-term support for the systematic and efficient collection, preservation and provision of essential digital data, e.g. population and meteorological data, in all countries . *(par.4 of Science in the Information Society)*

- Reformulate Section I.A.2.14 as follows:

14. Open standards and open-source software: Development and deployment of open-source software and standards for efficient ICT networking and cooperation to optimize the availability of data and information should be encouraged: .etc. .

- Include the following new paragraph as a new Section I.A.2.16:

Promote electronic publishing, affordable pricing schemes and appropriate open source initiatives to make scientific information affordable and accessible on an equitable basis in all countries

- Include the following new paragraph as a new application in Section 7:

E-Science:
- ICTs have a central role in the practice, dissemination and advancement of basic and applied scientific research. Scientists build partnerships and international consortia, conduct experiments, collate data, coordinate laboratory activities, and communicate their findings to their peers and the public.
- ICTs are not only a product of science but also a fundamental force for shaping the scientific research agenda and determining how the future of scientific knowledge will unfold and be utilized.
- ICTs provide an historic opportunity to reduce the scientific divide: they improve and increase the transfer of scientific knowledge between developed and developing countries; they strengthen universities and research centers worldwide and they facilitate the involvement of scientists in developing countries in scientific endeavors of their choice around the globe.
- There is an urgent need to support scientific research on:

- the use of existing and innovative information technologies in key areas, such as health, education, and sustainable development.

- the socio-economic value of public-domain information and open access regimes, as exemplified by the World-Wide Web .

- Include the following new paragraph in Section I.A.8.44:

Encourage initiatives to increase scientific literacy and consumer awareness of how to select and interpret scientific information published on the world wide web, recognizing the key role of the media in communicating science as well as recognizing the key role of science in communications .

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- Include the following new paragraph in Section I.A. 6.33 Internet Governance , after the existing paragraph:

Recognize that there is an important role for science in developing and implementing the new governance mechanisms that are necessary in the information society

- Keep the original wording of *[B. Objectives/45/a) benchmarks: all universities to be connected by 2005]* . This paragraph shall remain as such.

Science in the Information Society[1]

Scientific research is one of the key factors underpinning the development of the Information Society. The fundamental technological components of the Information Society: electricity, radio waves, the World Wide Web (www) and the web browser were all first developed in academic laboratories. Ensuring equitable access to scientific knowledge is essential in order to achieve the Millennium goals and the use of Information and Communication technologies (ICTs) now offers incredible opportunities in this regard. Scientific research leads to the development of new technologies themselves and to the production of data and information that, when combined with these technologies, can be of huge benefit to society as a whole. **The essential role of science and scientists in building the Information Society should be clearly acknowledged in the declaration of principles and reflected in the plan of action from WSIS.**

Principles

Scientific knowledge and data are of enormous importance in a global Information Society:

- To foster innovation and promote economic development
- For efficient and transparent decision-making, particularly at the governmental level
- For education and training

[1] This statement is the product of a workshop "Science in the Information Society", that was organised by ICSU and the ICSU Committee on Data for Science and Technology (Codata) in partnership with UNESCO. The workshop took place in Paris on 12th March 2003 and involved over 60 scientists, science managers and representatives of international agencies from all over the world. Further information can be found at www.icsu.org.

ICSU, the International Council for Science is a non-governmental organisation that was founded in 1932 and whose mission is to "strengthen international science for the benefit of society". The ICSU membership is made up of 101 national science academies/research councils and 27 international science unions. Whilst every attempt has been made to make the current document as authoritative as possible, the content does not represent the formal views of individual ICSU members.

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Scientific data and information should be as widely available and affordable as possible: the more people that are able to share them, the greater the positive effects and returns to society. Scientific knowledge is a "public good".

The development of new IC Ts opens up **unprecedented opportunities** to ensure universal and equitable access to scientific data and information and to enhance the global knowledge pool. However, **excessive privatization and commercialization of scientific data and information** is a serious threat to the realization of these opportunities for the benefit of society as a whole.

Agenda for Action:

1. Ensure that all universities and research institutions have affordable and reliable high-speed Internet connections to support their critical role in information and knowledge production, education and training.
2. Promote sustainable capacity building and education initiatives to ensure that all countries can benefit from the new opportunities offered by information and communication technologies (ICTs) for the production and sharing of scientific information and data.

3. Ensure that any legislation on database protection guarantees full and open access to data created with public funding**.** In addition, restrictions on proprietary data should be designed to maximize availability for academic research and teaching purposes**.**

4. Promote interoperability principles and metadata standards to facilitate cooperation and effective use of collected information and data.

5. Provide long-term support for the systematic collection, preservation, and provision of essential digital data in all countries.

6. Promote electronic publishing, differential pricing schemes, and appropriate open source initiatives to make scientific information accessible on an equitable basis.

7. Encourage initiatives to increase scientific literacy and awareness of how to interpret web-based scientific information.

8. Support urgently needed research on the use of information technologies in key areas, such as geographical information systems and telemedicine, and on the socio-economic value of public domain information and open access systems.

9. Recognize the important role for science in developing and implementing the new governance mechanisms that are necessary in the information society.

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the **role** of **science**
in the **information society**
CERN, Geneva, 8-9 December 2003

... where the Web was born

MESSAGE FROM THE SCIENTIFIC COMMUNITY
Luciano Maiani, CERN Director-General
http://www.cern.ch/rsis

I am speaking on behalf of the scientific community and the participants in the Summit Event on the Role of Science in the Information Society held at CERN, Geneva, on 8-9 December, organised together with our scientific colleagues at UNESCO, at the International Council for Sciences and the Third World Academy of Science.

We feel that **the voice of the scientific community should be heard at this Summit**, for at least **four** reasons.
- It was basic science that made possible the technologies underlying the Information Society.
- The needs of the scientific community have often driven new developments in Information Technologies, such as the Internet and the World-Wide Web.
- Scientific research will continue to underpin future developments of the Information Society such as the Computing Grids.
- The scientific community has a long tradition of global collaboration; future development of ICTs will empower scientists not previously prominent in scientific research, who nevertheless have valuable human resources and original perspectives on many of the fundamental problems that are common to humanity.

In March 2003 Kofi Annan challenged the scientific community to act. At the conference, Adama Samassékou reminded us of the need for solidarity in addressing this task. The scientists, teachers, policy-makers and stakeholders from around the world who attended the conference recognised this challenge and the need for solidarity.

Essential points that emerged were:

1. Education is the key to development; ICTs are vital in the learning process at all stages of life and South-South cooperation is as important in this process as North-South cooperation;
2. ICTs promote dissemination of health information, enhance capacity-building and permit telemedicine;
3. Planners, decision-makers and citizens need accurate, local and timely information on environmental issues; global collaboration is essential to ensure access to appropriate environmental data;
4. Education and dissemination of scientific knowledge and technological know-how through ICTs are a critical component of local and national economic development;
5. It is important for scientists to engage in the policy arena and develop new and affordable technologies to overcome the digital divide.

The RSIS formulated a vision of how information and communication technologies can be applied for the greater benefit of all.

Several general themes emerged as guidelines and received clear support:
- fundamental scientific information must be made freely available;
- software tools for disseminating this information must also be made freely available;
- networking infrastructure for distributing this information must be established world-wide;
- training of people and equipment to use this information must be provided in the host nations;
- general education is an indispensable basis for the Information Society.

Several of the objectives defined by the RSIS are already recognised in the WSIS Declaration of Principles and the WSIS draft Action Plan

The RSIS has mandated me to urge WSIS to fully endorse and adopt the guidelines and goals that have emerged. We scientists are committed to implementing the Action Plan and to achieving concrete progress by the time of the next WSIS meeting in Tunis in 2005.

I thank you for the opportunity to present to you the conclusions of RSIS, and request your help and support in turning the digital divide into a digital opportunity of knowledge, culture and sustainable development for all.

world summit on the information society
Geneva 2003 - Tunis 2005

ICSU International Council for Science

twas

UNESCO

VIEWPOINT

Science in the information society

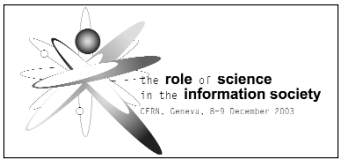
In hosting the recent RSIS conference, CERN took a bold step into the global policy arena. **Manjit Dosanjh**, **John Ellis** and **Hans Hoffmann** explain why.

On 8 and 9 December 2003, CERN hosted a conference on The Role of Science in the Information Society (RSIS, see p14), immediately prior to the World Summit on the Information Society (WSIS). Our efforts to organize this conference were stimulated by a challenge that the UN secretary-general Kofi Annan made to the world scientific community. Last March in the magazine *Science*, he wrote that "recent advances in information technology, genetics and biotechnology hold extraordinary prospects for individual well-being and humankind as a whole," but noted that "the way in which scientific endeavours are pursued around the world is marked by clear inequalities." Annan called on the world's scientists to work with the UN to extend the benefits of modern science to developing countries.

The open exchange of information, made possible by the World Wide Web and other information technologies, has revolutionized everything from global commerce to how we communicate with friends and family. We live in the age of the "information society", but without science there would be no such thing; it was basic science that made the underlying technologies possible. Moreover, continuing scientific research is necessary to underpin the future development of the information society – through the sharing of distributed computing resources via the Grid, for example.

The information society has the potential to empower scientists from regions of the world that have not been prominent in recent scientific research, but have valuable human resources and original perspectives on many of the problems we all face. This could create, in the words of Adolf Ogi, special advisor to the Swiss Federal Council on WSIS, "science sans frontières", making use of what Adama Samassékou, president of WSIS PrepCom, described as "indigenous knowledge".

Prior to the conference CERN conducted an online forum where scientists, policy makers and stakeholders from around the world



reviewed the prospects that developments in science and technology offer for the future of the information society, especially in education, health, environment, economic development and enabling technologies. These issues formed the basis for discussions in five parallel sessions at RSIS, which complemented the plenary sessions. The result is a vision for how information and communication technologies can be applied for the greater benefit of all.

Education is a key element for development. Information and communication technologies (ICTs) are vital for learning at all stages of life. Here, south–south co-operation is as important as north–south co-operation. In the area of health, ICTs can help in priority public-health areas by promoting the dissemination of health information, enhancing capacity-building and permitting telemedicine. In the case of environmental issues, planners and decision-makers need accurate, local and timely information – global collaboration is vital to ensure access to appropriate environmental data. To accelerate economic development, education and the dissemination of scientific knowledge and technological know-how through ICTs is a critical component of local and national development. It is important for scientists in all countries to unite to define their local needs in terms of ICT infrastructure and content.

Through these examples in particular, RSIS was able to formulate a vision of how ICTs can be applied to benefit all. The following themes emerged as guidelines and received clear support at RSIS: that fundamental scientific information be made freely available; that the software tools for disseminating this information be also made freely available; that networking infrastructure for distributing this information be established worldwide; that the training of people and equipment to use this information be provided in the host nations; that general education underpins all these goals and is an indispensable basis for the information society.

Several of the objectives defined at RSIS are already making headway. In particular, the WSIS draft Declaration of Principles recognizes that "science has a central role in the development of the information society." Moreover, the WSIS draft Action Plan aims to promote high-speed Internet connections for all universities and research institutions; the dissemination of knowledge through electronic publishing and peer-to-peer technology; and the efficient collection and preservation of essential scientific data.

In hosting the RSIS conference, CERN took a bold step forward into the policy arena. Since scientific research underpins the past and future development of ICTs and thereby the information society, we scientists have a particular moral responsibility to prevent the "digital divide" from further increasing the gap between rich and poor. Moreover, the information society offers scientists from all parts of the world the opportunity to contribute to the global scientific adventure of which CERN's Large Hadron Collider is just one example.

It is vital that the global scientific community engages fully in the policy arena, through the development of new and affordable technologies to overcome the digital divide. The scientific community should commit its best efforts to implementing the WSIS Action Plan and to demonstrating real progress by the time of the next WSIS meeting in Tunis in 2005.

Manjit Dosanjh, John Ellis and Hans Hoffmann were members of CERN's RSIS organizing committee.

http://cerncourier.com/main/article/44/1/29/1

Annex II — Online-Forum Papers

Submitted by the Invited Online-Forum Participants for Inclusion in the Proceedings

Environmental Information Management in Developing Countries: Reflections on the RSIS Parallel Session on the Environment

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Introduction

The Role of Science in the Information Society (RSIS) is slowly gaining attention and forming part of discussions among scientists, policy-makers and others interested in exploring ways to tap the rich benefits derivable through the application of information and communication technologies (ICTs) in different aspects of national life. Information from Environmental Information Systems management (EIM products) can find application in health, transportation, tourism/ leisure and finance (e.g. risk-rating). Discussions in the North and South, however, underscore what has come to be known as the digital divide, the wide gap between the rich countries in the North and the poor ones, mostly in the South, with regard to the accessibility and affordability of ICTs.

As part of the Conference on the Role of Science in the Information Society, we participated in the Parallel Session on the Environment. In this paper, we present our reflections on the information presented and the discussions generated as they affect our perceptions on the potential influence of modern technologies on environmental information management (EIM) in developing countries.

Status of ICT Use in EIM in Developing Countries

As an interjection during the session, we made a submission on the present scenario in developing countries with regard to the extent of ICT use in EIM in our countries, using the Nigerian and Nicaraguan situations as examples. We observed that:

- Many countries are not taking advantage of available technology.
- There is a need to develop the critical mass for use of ICTs in EIM, for example, not many scientists can confidently exhibit skills in image processing or other environmentally relevant skills for proper EIM in these countries.
- There is a need for public (user) participation in the definition of ICTs for use in order to ensure proper realization of the goals for investment in ICTs in EIM.
- There should be joint efforts in developing countries along regional lines towards devising strategies for addressing the issues and developing functional EIM systems.
- Collaboration with existing global and regional bodies in the North with mandates and expertise in EIM should be explored.

Initiatives with Possible Impact on EIM in Developing Countries

Several initiatives presented by different speakers during the parallel session have potential direct or indirect impact on the monitoring and maintenance of safe and sustainable environments in developing countries. Unfortunately, most of these initiatives originate and focus on the environments in the North. However, the world must realize that environmental and biodiversity issues have the characteristics of global public good. Maintaining the health of ecosystems everywhere is fundamental to international development.

Integrated Global Observing System (IGOS)

The Earth Observation Summit in 2003 was aimed at devising ways to share observed information with an end to building bridges across the known knowledge divides. IGOS brings together international development agencies of the UN, international research organizations, observation agencies, etc. to build an all-inclusive group of experts to achieve the desired objectives. According to the plan:

- User communities are to define their specific needs. This is fundamental for the acceptance of recommended technologies and cooperation during implementation at all levels.
- It is evident that the world is full of data but short of information, hence efforts should be directed at managing the huge data derived from different sources to generate useful environmental information to aid good policy decisions.
- In the area of climate and environment, the concept of concerted efforts is recognized since many countries are under the influences of similar environmental conditions. Moreover, environmental disasters often do not recognize national or political boundaries.
- Political and pragmatic steps need to be taken by the communities themselves if there is to be speedy movement from the low EIM capacities obtainable now to better conditions ahead.

The **Intergovernmental Oceanographic Commission (IOC)** has come up with the **United Nations Global Observation of Ocean Systems (UNGOOS)**. This is the global setup for monitoring the world's oceans with the Commission providing a regulatory function. This initiative recognizes the benefits in joint efforts and hence focuses on shared observation networks, shared sustainable missions, joint products, shared governance involving FAO, UNEP, IOC, etc. and provides a global public-oriented service. Information generated from UNGOOS can be very useful for planning and evaluation of ocean activities including fishing, drilling, etc., which have a direct impact on the economies and livelihoods of many developing countries.

Global Monitoring for Environmental Security (GMES): The priority areas of GMES are:

- European regional monitoring
- Global monitoring
- Security-related activities (not necessarily military security)
- Horizontal support.

This initiative recognizes that lack of access to water, food and energy threatens sustainable development and therefore peace. The TIGER Initiative has the monitoring and availability of safe water to the populace as its main objective, one that is very crucial in most developing countries.

The potential for modern space technology in ensuring stability and peace is being explored. There is need for open access to information especially from space. This should support sustainable development as well as reconstruction in conflict areas. However, it is important to note that user communities should be driving the policies. There is strong evidence that communication gaps exist between the data providers, scientists, and users.

Global Monitoring for Food Security (GMFS): With success on GMES, efforts are being directed towards possible success with GMFS. Food security and poverty reduction have been receiving attention at international policy decision levels with projections, monitoring and evaluation carried out at different institutions in different parts of the world. However, there is need for proper assessment of the impact of environmental changes on sustainable food production which is very important in ensuring food security in the developing world. The issue of biodiversity needs to be highlighted a lot more in environmental discussions and not just the abiotic aspects which have always been focused on. Perhaps, the work of the World Conservation Union's Species Information Service (SIS) would be useful in the GMFS.

World Conservation Union's (IUCN's) Species Information Service (SIS): The need for SIS was underscored by the fact that no 'authoritative', accessible, credible, up-to-date, comprehensive environment or biodiversity information/knowledge system exists. Yet we need to realize that when ecosystems collapse, they do so precipitously. Efforts need to be geared towards preventing this. It is understandable that it is difficult to implement environmental protection laws in any country, much less a developing country. Hence, environmental stress arises and translates quickly to social stress and this does no one any good.

A key to SIS is that it is based on an existing well-functioning knowledge network that is then enhanced, transformed and leveraged by modern ICT systems. It is a vertical integration of the information system with an existing well-functioning scientific and conservation network. An important feature with relevance to developing country conditions is that radar pictures could be used to monitor migrant or transhumant livestock in the tropics which has implications on the ecosystem.

Conclusion

The overall key message in this session was to present some applications of space technology and related initiatives for the management and monitoring of natural resources. We think it was very useful to get this overview, but it would have been value added if the speakers had presented some successful applications at local level. It is also essential for us to know about the level of participation of the different stakeholders in implementing these technologies. For example, what is the level of financial involvement of the user communities, national governments and other agencies in the implementation of these high technologies in EIM? Can they be affordable at present income levels in these countries?

We are in agreement that there should be involvement of the politicians to support the application of modern technologies for EIM in their regions. Evidence suggests that what is happening in most developing countries is misplacement of priorities and lack of political will to engage in technologies with potentials for enhanced development in their entities. This should not be so.

The role of the donor community in helping develop successful strategies for using space technologies in development should be emphasized. It has been suggested elsewhere that the rich nations should do more to avert environmental dangers elsewhere in the world. Trouble anywhere in the world blows ill-wind around. What goes around, they say, comes around.

Future discussions during upcoming meetings and at every opportunity should look into these issues.

Web Application Technologies as Information Tool in Health Care Delivery

Dr Folaju O. Oyebola

Since the advent of the Internet in 1969 as a military project, information exchange has been revolutionized even to the amazement of the pioneers themselves. The drawback has always been the digital divide between the two worlds in terms of skill acquisition and transfer of this technology to the developing world, as it is estimated that only five million individuals in this part of the world have access to the Internet.

The multimedia aspect of the Internet is playing a significant role in the application of computers to medical practice (Graham, 1997) otherwise known as medical informatics. Nowadays, there are online opportunities for patients and public to search and contact doctors on the Internet without visiting the hospital, which is a far cry from what obtained some decades ago.

Medical information exchange could be among the health professionals themselves and with the patients or public depending on the target groups (Hersh, 2002). "Information is knowledge and knowledge is power." The benefit/risk ratio of producing a well informed society including health practitioners cannot be quantified. As for the patients, it is their fundamental right to be well informed about their health, giving consent and making a final decision about their health.

The Internet is currently playing a major role in the dissemination of health information to people through various websites like Yahoo Health, CNN health etc. http://www.yahoo.com : www.cnn/health.com .

The only fear about this privilege is the possibility of self-medication in developing countries as the public can still buy drugs over the counter without any formal prescription.

Health practitioners in this part of the world are plagued with problems of getting standard training, lack of the latest textbooks, journals, bibliography, medical equipment etc. to meet the future challenges in their practice. The use of the Internet can be of immense benefit to access medical information for various uses ranging from current opinions, self-development programmes such as distance learning, CME, telemedicine etc. (Oyebola, 2003).

The beauty of online courses by various universities in the developed world and others like Supercourse is that they have saved us a lot of hard currency required to sit for those courses abroad and to some extent may stem the brain drain and also afford us standard training comparable with that obtainable abroad. The Supercourse project has reached about 140 countries with more than 10,000 members including those in the developing world. www.pitt.edu/~super1/ .

Problems of Accessing the Internet in Developing Countries

Considering the advantages as mentioned above, it is also imperative to point out that internet connectivity or rather its availability in the developing world is plagued by several factors like affordability and accessibility of both the hardware and software as well as the connectivity. Most countries lack an IT policy as their policy-makers are still skeptical and maintain a conservative attitude to the information superhighway.

Some Internet Solutions

As indicated earlier, some websites are actually specialized in disseminating medical information such as the West African Doctors Network, which is a private initiative of Francis Steve George based in Norway, with the sole goal of improving communication capability among the doctors in the sub-region. This author also franchised a similar setup as a sub-web for the Nigerian Doctors, named Nigerian Doctors Network to reflect and disseminate local contents.

http://www.wadn.org

The concept here is the fact that the Internet is filled with all sorts of information and an individual may be lost in this sea. It is reasonable and more convenient for the end user of any information, not only in health but generally, to sieve through or identify relevant information. This becomes necessary where the facility is not easily available and expensive.

Other available websites that specialize in disseminating medical information include:

- African E-Health and development site: http://www.datelinehealth-africa.net/betav1
- Health Internet work: http://www.healthinternetwork.net . This subsequently gave birth to WHO/HINARI.

- HIV/AIDS Treatment in Practice: www.aidsmap.com
- Population and Reproductive Health on the Development Gateway: http://www.developmentgateway.org/pop
- INASP-HEALTH: http://www.inasp.info/health
- MEDLINE: Online resources for both patients and physicians: http://pubmedlineplus.gov

Telemedicine

This is valuable for a second opinion in remote places where the specialists are not available to improve the quality of practice, and could be used for consultation, case discussion etc.

http://path.sourceforge.net ; http://kizuki2.krot.org

Kurt and his colleague created a room for discussion of pathology cases with a base at the University of Basel, and professionals from the Solomon Islands, Tehran and other developing countries are benefiting from it.

http://telepath.patho.unibas.ch

Electronic Health Records

This has equally revolutionized medical practice for easy access of patients' data both by the consumers and health-care providers enabling the former to participate in decision-making. So many utilities that were never dreamed of have been added such as a decision support system and all these features could be accessed online as well.

Discussion Forum

This is an important worldwide forum for chatting and sharing ideas and is a common tool on the Internet nowadays. There is the WHO Health Information Forum (WHO-HIF) with the main purpose of health information exchange irrespective of any specialization. Nigeria has taken a cue from this by establishing the Nigeria Health Information Forum (NIG-HIF).

E-Books

Also available on the Internet are electronic books, atlases, besides millions of journals turning out the latest research work everyday. http://gfmer.ch

Mobile Web

Introduction of PDA devices that are WAP enabled is definitely an invaluable asset to health workers in remote locations.

Future Directions

The range of medical information resources using Web technology is inexhaustible and as a matter of fact being underutilized by the developing countries as a result of the digital divide. It is believed that access to health and medical information even in remote areas is very feasible using this tool.

The policy-makers and the information society should encourage society in general by bringing down the costs, encourage funding, North–South collaboration, facilitate research and training. The drive would definitely improve patients' outcomes, reduce costs, and produce a well-informed people and professionals.

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A Paper Presentation to RSIS Towards the World Summit of Information Society (WSIS) in Geneva

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The leapfrog jump achievement of science in the last century has been a source of amazement to us all especially in the information world. Gone are the days when a community is informed by the sounds of gongs in the market place, there was also the era of listening to a monologue sound box (radio) and later the combination of audio/video as in the television.

In the last two decades, science has revolutionized and brought us multimedia, which is a combination of audio, video, text, images, graphics etc. And of course the Information superhighway using the technology of the World-Wide Web as developed by Tim Berners-Lee, the Godfather of the Internet.

This has definitely changed a lot of things and has empowered mankind in a new measure, the 9/11 incident came to my notice in Nigeria through www.cnn.com in less than an hour. The Ikeja, Nigeria, bomb explosion re-echoed through out the world in the same manner whereas almost one and half years after, some Nigerians living in the country, especially the rural dwellers, are yet to know of this ugly incident. What a contrast?

"Information is knowledge and knowledge is power," says the adage but the limitation of this new science has brewed the 'digital divide'. The divide unfortunately is not exclusively between the North–South but even exists within the developed world, that is, the privileged and the less privileged.

Since knowledge is power, it is the responsibility of the information society to empower the entire world towards a well-informed egalitarian society by bridging the digital gap.

Science has brought a smile to this generation and humankind has moved serially from the Dark, Stone, Bronze, and Industrial and presently to the Information Age, and the latter has changed all facets of communication.

The use in the remotest part of the world of GSM phones, PDAs for health workers, satellite television, V-sat, world space satellite radio, video phone and real-time conferencing will surely stem the rural–urban migration and is already reversing the trend and hopefully will decongest our cities in the near future.

The world is now a global village and what affects the North can equally affect the South leading to new changes in the world not only in the way we communicate but in some other issues like socio-economics, health etc. The latter became obvious to us during the SARS epidemics in Asia whereby the whole world was duly aware of the ravage and resulted in the cancellation of international conferences, low business and tourism in the entire region. Although it affected the countries badly and the region is yet to fully recover, it has helped the whole of mankind by preventing the worldwide spread of this communicable disease.

Fortunately, science is a dynamic field and work continues. The information society has the Herculean task of further research to sustain and improve the level of development and more importantly work on the aspect of capacity-building and training to bridge the wide gap in the developing countries. It is imperative to formulate the required policy needed to transfer skills and knowledge to the less privileged both in the developed and developing world.

Summary of the On-Line Forum on Education and an Overview of Contributions of Participants to the On-Line Forum on Education

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Following is the overview of contributions to the On-Line Education Forum which is intelligently invigorating and appears to have aligned with the theme of the RSIS and to some extent is a guide to achieving global knowledge transfer with the effective use of ICTs.

Education

We want to meet the challenge of Kofi Annan, for the deployment of the Superinformation highway to be inclusive of all of the world's citizens, and to build bridges that create possibilities for all nations.

If "The Information Superhighway is the new vehicle for social and economic activity and communications technology and the information it carries will affect and improve the lives of individuals of all ages, as well as the educational system, business environment, and the very fabric of community life" then it should be accessible to everyone.

In March of this year, United Nations Secretary-General, Kofi Annan, issued a challenge to the world's scientists. While "recent advances in information technology, genetics and biotechnology hold extraordinary prospects for individual well-being and humankind as a whole," he wrote in *Science* magazine, "the way in which scientific endeavours are pursued around the world is marked by clear inequalities." Annan called on the world's scientists to work with the United Nations to extend the benefits of modern science to developing countries.

The Role of Science in the Information Society (RSIS) conference is in part a response to that challenge. Prior to the conference, participants from around the world collaborated in discussions on-line in the RSIS forums.

Summary of the Forum

The forum brought the world to the learner, the school, the university, or the learning places, and to those who are exploring the world of technology, globally and personally.

Many of us were thinking of ways to use technology all over the world by being active participants and collaborators. We excitedly shared our ideas.

No matter what their socioeconomic or ethnic background or country, no matter where we live, the learning field for all participants at all levels in many places in the world was levelled and extended through this forum.

The only limiting factors were time, the infrastructure and the knowledge of the use of the technology infrastructure to make an educational difference. We were introduced to people, places, and ideas we might otherwise not be exposed to. We learned by collaborating, in a community of participants.

Research has now confirmed what many instinctively knew — that learners who are actively engaged in learning, learn more. Networked projects, in which people work with others and conduct their own research and analysis, can transform participants into committed and exhilarated learners. That happened to us in the forums.

By being involved in a community of diverse global learners and participants we became this 'community', this collaborative group of people. Perhaps the inquiry as to the process of the use of technology in our own disciplines started the conversation. We became a dynamic virtual community where discussion, resources and experiences were shared, examined, explored, expanded, and our approaches evaluated in a collaborative environment.

We know that technology makes it possible for participants to teach or learn at more than one location simultaneously. It vastly expands opportunities for students in small, remote areas to take courses on subjects that, for economic reasons, are generally available only to students in more affluent, populated, urban, and suburban areas. The RSIS can be involved in global projects to change the use of technology worldwide. We have not done it as a project but we can involve e-learning, m-learning, Grid technologies and regular pedagogy.

In addition, those who have developed projects can start a new quest which is to enable educators to take a look at learning in many ways by establishing a database of worldwide initiatives.

World Community

In the forum, we were collaborating, in a community of thought. We became a knowledgenetwork or collaboratories, that spanned the world. Science, education technology, and pedagogy linked in certain ways.

In the study of the sciences, Roger Bybee has declared the five e's.

In this model the process is explained by employing five e's. They are: Engage, Explore, Explain, Elaborate and Evaluate. In using the forum we did more than that, we expanded our knowledgenetwork or collaboratory and we extended our ideas to excite and help others to be involved to expand the thinking about the process of education and how it affects learners worldwide.

Early travellers, merchants, explorers brought ideas, technology, and knowledge in slow ways to change the world but technology can be instant, once deployed and affect us all, in the economies, in the environment, in health and technologies. The process of learning to use emerging technologies for global purposes and to coexist, using worldwide ideas is important. Think SARS, mad cow disease, environmental pollution, literacy and media balance.

It is impossible to deny the tremendous effect rapid technological growth has had on our society. This explosion of new technologies has changed the way we live — from the way we do business to the way we communicate with each other. Technological advancements are also affecting the way we teach and learn in global ways.

Impact of Technology on Education

From time to time, someone invents a product or develops a practice which has an unforeseen and massive impact on society.

The results of the printing press, and all of its old and modern successors, are so much a part of our lives it is difficult to imagine an existence without the ability to read, and the books, journals, and newspapers that support a reading public. It is also difficult to imagine how one could organize instruction without textbooks and various associated readings. For teachers and students alike, learning at all levels of education has been primarily a process of reading what experts have written, discussing what has been read, and listening to teachers explain or expand upon textbooks. In most cases, schooling has become a process for understanding, retaining, and reporting what is found on the printed page. This we explored and discussed.

We Discussed the New Definition of Literacy

We explored and discussed the ideas of new literacy in education and we think we must study the science of learning, of educating with new technologies as the tools for change.

Inventions of the twentieth century have the potential to influence society as much as did the printing press. The computer, video, and telecommunications of various kinds are having an impact on every aspect of our society: work, leisure, entertainment, household tasks. These inventions are also transforming the way we approach knowledge and sources of expertise. Today, people are no longer required to read about an event; they can see media versions of it unfold before their own eyes and make their own interpretation. Consequently, the ability to obtain and interpret information quickly and accurately is even more important than in the past.

There is no longer a question about whether the new technology will be used in education.

We feel that there should be projects of dissemination that are global models that demonstrate the possibilities.

I believe the forums should continue.

We should create models of dissemination.

Examples

- Literacy projects.
- Science instructional projects that are collaborative.
- Perhaps as the infrastructure is important to the educational process, demonstration projects that are not just national are more conducive to having people understand the use of emerging technologies.

In a limited way we could use the Grid and other new technologies to demonstrate the possibilities for creating more visionary involvement.

The forums planted the seeds for more involvement, infrastructure and immediacy about global interaction.

Overview of Contributions by Participants at the On-Line Forum on Education

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The On-line Forum on Education had a clear message to all the participants which said that knowledge transfer is an essential ingredient for faster development of developing countries and underdeveloped countries. The forum also underlined the use of information and communications technologies and their influence on distance learning and free information exchange and also encouraged forum participants to discuss experiences from these developments and also to chalk out definite future activity in these areas and to build bridges between concerned, like-minded people to meet on a single platform to address issues of ICTs and their utility in knowledge transfer and free information exchange and their usefulness to humankind.

The on-line forum was also an opportunity to interact with the finest minds in the area of learning with the clear intention of making a fine fabric of knowledge. Overall, experience at the on-line forum was motivating with many of them writing about open-access initiatives for electronic dissemination of knowledge.

Some of the significant contributions and information at the on-line forum talked about alignment of online journals — open access and research keeping in focus the developing countries, integration of technology to make the power of the Internet more meaningful by consolidating educational information in one place resulting in the formation of a global technological university, an essential utility for developing countries. Satellite technology and the Internet have been harnessed to create the African Virtual University (AVU) and its quality learning on the Internet.

Some contributors spoke of online database and knowledge networks, urged scientists to promote universal access to scientific knowledge; the African virtual university and its usefulness; and one can read about ICT at work; open source development and its positive effect on narrowing the digital divide, on-line depository of journals etc, 'open archiving', or the deposition of scholarly research papers to make it accessible; the Indian experiences of the Virtual Center for Technology Enhanced Learning; open university initiatives; and how inexpensive handheld computers may bring about ubiquitous computing.

Other contributors mentioned an ICT-based, world-wide classroom concept for the use of developing countries in getting a quality education; research database as educational tool, to maximize the use of ICT; the effects of intellectual property policy on the conduct of science, digital libraries, e-publishing, print publishing and its cost; simulation software in technical education and its effect on easier understanding of the core technology; continuing education, standards for educational institutes, science education and rural development, knowledge economy, Web integration and higher education, social construction and education.

Access to online education and developing countries, on-line text books, online databases and knowledge networks, gender issues and women in technology education, Global Technological University Internet-based student-focused, single-point-contact websites were also mentioned. This in a real sense makes free information exchange and knowledge transfer a possibility and at a faster pace considering the integration of all the available information into a single entity.

On-line participants were varied and from different backgrounds with solid experiences and with creative concepts for utilizing ICTs in the area of education and its relevance to developing countries.

An action plan in general was mentioned by most of the on-line forum participants who are of the opinion that collective effort and consolidation of all the scholarly material and active involvement of world organizations like UNESCO and others would make all the difference in bringing about the revolutionary changes and narrowing of the digital divide and its positive effect in accomplishing intelligent and knowledgeable developing nations.

Some Comments and Recommendations for the Development of ICT in Developing Countries

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The world-wide impact of ICT is acknowledged, but still the digital gap between Northern and Southern countries prevails. One of the main challenges for the near future is to make technological development pro-poor, pro-poverty reduction, for that we need more commitment from the donor community to persuade national governments to include ICT fully in national development plans and donor assistance programmes.

New technologies are emerging and rapidly maturing, in some cases even faster than users can absorb and integrate them; they are expensive commodities, developing countries can not keep trying to catch up in technology without a national policy that leads to its implantation.

The different actors (governments, NGOs, private sector, donors) need to join their efforts and develop partnership mechanism to operationalize ICT in the solution of local, regional and global problems as well. Modern technology is available for the present to enhance our present efforts. Today there are many more opportunities and facilities to make computers and computerized information like GIS serve communities to jointly learn more about their environment and encourage joint efforts in its management.

ICT promises to increase the capacity of governments to deal with economic and social challenges. E-government is an especially promising area of ICT application for developing countries. It permits more efficient and transparent administration at lower cost, fosters broader public participation, and helps give the poor improved access to government services and a greater participation in public decisions.

On the other hand, in recognizing the human and financial constraints facing developing countries, this initiative could address the following challenges to be part of an agenda for actions:

To promote strengthening of capacity building through the standardization of regional initiatives for the exchange of knowledge and reliable information, exchanging successful experience within the domain of ICTs, (use of GIS, remote sensing) mainly those carried out at local level.

This joining of efforts can facilitate also the exchange and strengthen indigenous expertise familiar with the regional context, avoiding the hiring of permanent experts from developed countries, most of the time recommended by the fund provider. The key to success in the implementation of information systems of any kind is the existence of a skilled and motivated workforce with competence in the use of information.

To promote strengthening of on-going initiatives of statistical organizations (example: Central American region) in setting up a common agenda for the standardization of statistics production (census, surveys, ICT indicators) and technology infrastructure. This approach in the socio-economic context of Central America, where governments are engaged in poverty reduction programmes, free trade signing, are key priorities in order to meet these challenges. Good information is necessary to make the right decision and negotiate on a fair basis.

Again, I would like to stress the need to ground ICT at the local level, considering that many decisions have to be taken at this level for the improvement of the well being of the people and their communities. The importance of user involvement, not just in the last stage of testing a prototype, but throughout the system development, is a great challenge to shift from a technology-driven to a socially-driven approach.

Therefore, it is the scientists' and ICT experts' responsibility to ensure that policy-makers and the public make their decision based on the best available information and how well they help solve local and global problems.

Rural Women in the Indian Himalayas — The Case for Information Societies

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As this conference is being held in Geneva, Switzerland, I felt that it is appropriate to focus attention on people who live in the mountains, especially women. This is not an academic paper but a few thoughts based on my observations.

Twenty-four per cent of the Earth is defined as mountainous and 1 in 10 of the world's population live in these areas. Almost 80% of the 600 million mountain dwellers live below the poverty line. Of the 18 regions identified in 2002 by the UN as being in desperate need of humanitarian aid, 11 of them are mountainous. In the poorest mountain countries average income is just 7% of the world average, more than one third of all women are illiterate, and almost 1 in 10 children die before the age of five [1].

In 2001, the Human Development Index (HDI) rank of India was 127 out of 175 countries, indicating low life expectancy at birth, low educational attainment and low income. The Gender-Related Index (GDI) rank of India in the same year was 103 out of 175 countries. The Indian population is 48.1% women and 51.9% men. Only 9.2% of households were headed by a female in 1992/93. Female illiteracy is 54% while male illiteracy is 31%. The labour force participation rate of women is 22.7% while that of men is 51.6%. In rural India, agriculture and allied industrial sectors employ 89.5% of the total female labour.

As the Indian Himalayas is mainly rural, we can safely argue that this region is poor on account of being mountainous as well as being rural. In these regions, a pair of bullocks work 1064 hours, a man 1212 hours and a woman 3485 hours in a year on a one-hectare farm [2]. In fact as you travel across the Himalayas, it is very common to see women (young and old) carrying huge bundles of grass, twigs and other material strapped to their backs and making their way up the mountain paths. They can also be seen herding cattle, working in the fields, looking after children, going to school or college and also running small wayside tea stalls.

Information and Rural Mountain Women

Although predominantly illiterate, women have tremendous knowledge in certain areas. This is also passed on from generation to generation. Some examples are given below:

They are responsible for agricultural diversity as seed selectors, in seedling production and storage of seeds. In addition to various tasks in the fields they also are involved in taking care of animals, grazing, fodder collection, cleaning of animal sheds, processing milk and livestock products. They also collect and process dung and fertilize the fields with this. Additionally, they make cooking fuel by mixing dung with twigs and crop residues. Women have a bounty of knowledge of forest products as they are involved in collection of non timber forest products for fodder, fuel, medicine, building materials and for usage as household and farm implements. They are intimately involved with the environment being in charge of collecting water and forest products. In fact, the Chipko movement, a women's movement to protect trees from unnecessary felling by timber merchants, was started in Tehri Garhwal more than twenty-five years ago by Gaura Devi. Illustrating regional variations, it can be seen that in Mizoram in the North East, hill women have the knowledge of animal ecology that male hunters acquire. Women engage in small-scale rural production like basket, broom, rope making and shawl weaving. They also process honey and wax. These goods are often sold through local co-operatives or at the village market. Women contribute to food security in a myriad of ways ranging from production of grains to their post harvest processing and vending. They are also primarily in charge of ensuring nutrition to the next generation.

The World-Wide Web and Indian Himalayan Women

Most rural villages do not have access to safe drinking water or electricity, let alone, telephone lines or PCs. However, the bigger townships do. But, individual computers are owned only by the wealthy and even cyber cafes are used only by those with some access to funds.

More crucially,

- The language of the Web is English
- Information is predominantly 'Northern'
- Where does the knowledge base of these women exist on the Web?
- Will usage of the Web cut into traditional modes of sharing and communication — within the family, through marriage into another village, fairs and festivals etc.?
- Will computer literacy make young village girls and boys scoff at their parents' knowledge and make them misfits unable to continue working in their predominantly agricultural communities?

I am not arguing here that IT cannot be used in these communities. Rather I am encouraging us to envision a new concept of what information is, who generates it, who controls it and benefits from it. Once we are clear about that, IT can be made to work for the needs of these women.

A Few Tentative Directions

I illustrate an example of usage of IT in a rural area (non Himalayan) below with some degree of success. Maybe something similar could be conceived of.

START Project (Science and Technology Applied for Rural Transformation). About 2500 villages of Madhya Pradesh, Chattisgarh and Jharkhand are covered. They have succeeded in a comprehensive mapping of village resources and infrastructures. Local NGOs train villagers to conduct surveys indicating agricultural production of the area, farm size, numbers of household, cattle and wells in the region. This information is fed into a Geographical Information System (GIS) software at IIT Mumbai to prepare village resource maps. They spend about Rs. 500 ($US10) mapping each village. These maps are then used both by local villagers as well as government policy planners.

If similar 'maps' can be made of the knowledge base of the hill women, these could become a useful database and can then be shared widely. An example comes to my mind. On a recent trip to Joshimath, I noticed that the apple trees in the entire region had been infected by a disease. However, almost 100 kms away in Chaubatia in the Kumaon Himalayas there was no such problem. Setting up an e-group of apple growers of that area would be helpful in finding solutions to such problems without necessarily travelling to that area.

The Web needs to be made more user friendly so that even 'illiterate' women can handle it and feed it with their songs, stories and data and play it back. Women can also use it to market their goods to greater numbers of people. This will generate more income especially during the lean winter months. It can also provide much-needed information on

health-related matters and perhaps there can even be e-classrooms to teach the basics during the harsh winters when people don't go out much and may have more time to study.

The technology for this needs to be developed and made accessible to the poorest women. In patriarchal societies, where women have virtually no say in any decision-making, are not part of the local government or co-operatives, one needs to think of ways to make this possible. (Despite the fact that in almost 90% of families it is women who engage in dairy related activities, they only form 14% of dairy cooperative members — all India figures.) Very often introduction of high technology means sidelining women. The challenge before us is not to do that.

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Annex III — List of Participants[1]

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1. This list has been put together with the best information available to us. We apologize for any errors.

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