8. BRIDGING THE DIVIDES

> "We are in the middle of a race between human skill as to means and human folly as to ends. Given sufficient folly as to ends, every increase in the skill required to achieve them is to the bad. The human race has survived hitherto owing to ignorance and incompetence; but given knowledge and competence combined with folly, there can be no certainty of survival. Knowledge is power, but it is power for evil as much as for good. It follows that, unless men increase in wisdom as much as in knowledge, increase of knowledge will be increase of sorrow."
>
> *– Bertrand Russell, Impact of Science on Society*

8.1 The Role of Technologies in Propelling a Knowledge-Based Economy Towards the Creation of a Global Society

Scientific discoveries/discussions by themselves rarely create change. It is the confluence of old and new technologies with old and emerging social needs that brings about change. While new technologies hold the promise to reach and benefit the poor, it takes far more than technology interventions to have a sustained impact on poverty/society. Appropriate technology, drawn from modern scientific advancement and indigenous knowledge systems, inclusive of traditional ecological knowledge held both by men and women, must be recognized and incorporated into micro planning of programmes. Timely local adoption often requires significant indigenous technological capacity. Success in building technology capacity has been greatest when it has been linked to an explicit national science and technology policy and carefully worked out strategies, which have the full involvement of the stakeholders and effective monitoring frameworks in place.

Knowledge-based economies, of course, are not restricted to the realm of high technologies, but Science and Technology (S&T) does tend to be central in the revolution. Above all, ethics plays a major role in shaping equitable development. This was one of the reasons that the Technology Achievement Index, a new measure which aims to capture how well a country is creating and diffusing technology and building a human skill base reflecting the capacity to participate in the technological innovations of the net change, was introduced in the Human Development Report of 2001 (HDR 2001). For the Asia-Pacific region, one finds that Japan and Korea, along with Singapore, fall in with the leaders from the developed world, while many other countries like Thailand, Philippines, China, Indonesia, Sri Lanka and India fall under the "dynamic adopters" category, and a few others like Pakistan and Nepal fall under marginalized. The Pacific islands come under the countries which are yet to make a mark, thereby, making this region very diverse in its demonstrated capacity to absorb the technologies (HDR, 2001).

Transformation of knowledge economies into a global society hinges on the proliferation of communities characterized by their strong knowledge production and reproduction capabilities, access to technologies, learning and exchange of local innovations and the intensive use of information technologies in helping them use the data generated to meet their local needs. Recognizing the immense potential of the modern technologies in addressing the challenges and concerns in the present developmental paradigm, the Millennium Declaration,[1] calls upon States to apply new technologies, especially ICTs, to development. It also draws attention to the need for capacity building in the nations in terms of their human resources and S&T infrastructure. Major events in the recent past leading up to the World Summit for Sustainable Development[2] 2002, which seeks to promote partnerships among others for knowledge and new technology and the assessment of the Millennium Development Goals,[3] have also called for similar actions. The following paragraphs will look at some of the issues related to the adoption of these technologies, analyze their ethical dimensions and illustrate how partnerships are important to get the excluded into the mainstream of development.

8.2 Enhancing food and health security through biotechnology – the ethical issues:

Unlike the digital divide, the genetic divide is likely to have far reaching consequences for the developing countries because of the radical nature of biotechnology and its implications for agriculture, human health and environmental management. Advances in biotechnology have the potential to alter the patterns of food production and distribution in fundamental ways.

It is clearly evident that the advances in the biosciences are having economic and social impacts.[4,5] These impacts are increasingly dependent on new types of relationships, teams and alliances within the research community, as well as between science, business and society and its differential absorbing capacitates. Over generations, the production, transformation and distribution of food and agricultural products were generally accepted as routine aspects of daily life around the world. Therefore, such activities have rarely been addressed within the realm of ethics until the regime of intellectual propriety rights (IPR) brought about a fundamental change in this attitude. Key ethical issues being raised in relation to Genetically Modified Organisms (GMO) are 1) food safety in terms of allergens and antibiotic resistance, 2) environmental impact in terms of controlled distribution of GMOs (especially in developing countries where farm holdings are very marginal and monitoring both within the country and trans-boundary when they do not have the required technical skills, nor the budget, is very difficult, at best), 3) other issues in terms of labeling and cost benefit analyses (who decides whether the country needs this or not), 4) access to the benefits by the underprivileged (will they really benefit?) and, 5) religious questions[6] and considerations related to GMOs.

Grey areas continue to persist and this is relevant especially for the countries of this region, which is rich in natural resources and traditional systems. Further, the development is highly skewed in terms of access to technologies and differential capacities of human resources. While there have been measures developed to consider issues relating to access to technologies, equity, conservation of biodiversity and preservation of cultural diversity, especially in terms of recognition and reward (Articles 8j, 15, 16 and 19 of CBD,[7] TRIPS[8] and various legislations like the Farmers Rights, FAO[9] and novel means of documenting traditional knowledge/innovations, like peoples/community biodiversity registers, and the National Innovation Foundation[10] for recognition and reward), there are still a number of key issues that continue to be debated and need to be further addressed from the perspective of ethical dimensions. For instance, questions to be considered include: Who decides if genetic resources are to be priced? If they are, what is the appropriate price for genetic resources (raw materials or materials processed at different stages)? Is traditional knowledge a mere "raw material" in the grist of the modern scientific mill, or should it be accorded the same respect as the scientific knowledge of another corporate entity? How important is local traditional knowledge, and in what sort and stage of research and development can it be accepted? What systems need to be in place to validate them, so that they are accepted by international standards? Who sets these? Can independent research on this question be made to all the stakeholders involved? Who bears the cost of the tremendous capacity building exercises of these nations in terms of keeping up with the commitments and timeframes of the various conventions and treaties signed by them?

Research for poverty alleviation and productive management of natural resources requires a different set of public goods than the high-yielding varieties and breeds of grain that were produced in the past. Needed are innovative research methods and approaches that empower small scale farmers to deal with a changing environment, and innovative policies and strategies for strengthening and scaling up promising local initiatives through access to timely and appropriate information which is locale specific. In the food and agriculture sector, modern information and communication technologies (ICT) have enormous potential for wide and rapid knowledge sharing at all stages of the food chain. For example, ICT allows precision farming; farming guided by detailed environmental information so as to minimize the use of water, agrochemicals and labour. While access is highly skewed in much of the developing world, many ways of overcoming the divide are being attempted through novel approaches and partnerships between the publicly funded systems like the Consultative Group on International Agricultural Research (CGIAR), which has a significant presence in this region through the International Rice Research Institute (IRRI), International Crops Research Institute for the Semi-arid Tropics (ICRISAT), the Centre for International Forestry Research (CIFOR), WorldFish Center and the International Water Management Institute (IWMI), and initiatives at the national level. For instance, Malaysia is setting up

a biotech hub outside Kuala Lumpur that it calls Bio-valley.[11] Indonesia is setting up its own industrial park called Bio Island.[12] Even Japan and Korea have investors in this area. China, India and Indonesia are already planting acres of genetically modified cotton, and countries like Thailand and the Philippines are not far behind. Some of them like China, India and the Philippines, have regulatory systems in place, while others need to develop them.[13]

Public research must be strengthened, because its fruits can be passed on to small farmers at a cost, or via government channels free of charge. This cannot be done with the results of research sponsored by private enterprises. For these reasons, institutions like CGIAR, with its focus on the needs of developing countries, have to continue to play conspicuous roles in such efforts with the National Agricultural Research Systems. Regulatory processes are becoming clearer in countries, and both the public and private sectors need to show more commitment to training and support for local regulatory systems.

Biotechnology has an even greater role in the medical sector. For example, in 1989, biotech research on hepatitis B resulted in a breakthrough vaccine which also brought down the price of the vaccine, making it more affordable. Today, the more than 300 biopharmaceuticals products that are in the market, or pending regulatory approval, may hold equal promise. Since many of the raw materials for the pharmaceutical sector come from this region, along with the associate traditional knowledge, it has become imperative that the benefits reach them too. This is still a nascent and gray area and many of the legislations in place, or being developed, need to be tested. Much more needs to be done to develop vaccines and treatments for HIV/AIDS, TB, malaria, etc. Medical biotechnology raises many ethical issues, such as in areas of human cloning. A rigorous analysis of risks and benefits and a voluntary code of conduct and enforcement will be necessary to form a strong basis for drawing up areas of intervention using this technology.

One means by which the rights of future generations could be safeguarded is through the use of the precautionary principle as set forth in numerous documents, including the Rio Declaration on Environment and Development (1992), the Earth Charter (2000),[14] the Convention on Biological Diversity (1992) and the Cartagena Protocol on Biosafety (2000).[15] The precautionary principle, simply put, asserts that in areas where scientific knowledge is lacking and/or where levels of uncertainty with respect to deleterious effects are high, one should proceed with extreme caution. This applies particularly to those instances where decisions are irreversible. Other issues, like food safety, are already covered by the World Health Organization – WHO Constitution, 1946[16] and the Codex Alimentarius Commission 1963.[17]

It needs to be recognized that biotechnology may add new dimensions to existing integrated approaches, but will not replace them. Choosing the best options to address specific production problems in developing countries should be based on

economic, technical, social, ethical trade, and safety considerations. Experts, inclusive of the scientists and technologists and the media, have the ethical obligation to be proactive and to communicate in terms that can be understood by the layperson. There is also a need for donors and various government agencies to address the wider causes of food insecurity, like distribution of land and dwindling water resources, credit and adequate agricultural training, and proper infrastructure, especially unique to this region. Much more research needs to be carried out on socio-economic, environmental and biodiversity impacts of GM crops, especially in this region, which is endowed with abundant natural resources and traditional wisdom. Genetic resources for food, agriculture, and raw materials for traditional systems of medicines should be exempted from the intellectual property rights regime. Many of the countries in this region have finalized *sui generis* systems, which need to be tested for a period of time since these are bound to touch on the ethical issues being debated. Funding for public sector agricultural research should be increased and should be in support of the local needs of the region.

8.3 Bridging the digital divide – the role of ICT

While there has been tremendous leapfrogging in ICT, it is clearly evident that the impact has not been distributed evenly (HDR 2001). As many as 133 developing countries have asked the UN to maintain radio stations and other traditional media as a means of disseminating information, because the use of the internet alone would exclude many people from access to information flows. It is also evident that technology transfers and diffusion are not easy. While IT strategies in the Asia-Pacific region are very strong with policy frameworks in place, like the Infocomm 21 Master plan for Singapore,[18] a very clear ICT policy framework and action plan worked out for Indonesia, the national IT agenda for Malaysia which hosted the GKP 2 in this region, Cyber Korea 21,[19] Digital 21 strategy for Hong Kong, etc., the number of users of the internet is still at a dismal 2.3% of the total population in East Asia and the Pacific, while for South Asia it is only 0.4% (HDR 2002).

While reaching the poor and realizing the potential of ICT for poverty reduction in the areas of opportunity, empowerment and security is a difficult endeavour. ICT projects implemented by grassroots organizations and individuals who have the appropriate incentives to work with marginalized groups can achieve encouraging results. Local ownership and participants from the community characterize successful ICT projects. This region has very many diverse examples of successful applications of ICT.

ICT can improve health care delivery to the poor, as in the Sanpatong Family[20] care project for people living with HIV/AIDS in Thailand. This successful project built capacity for self care and self reliance of people living with HIV/AIDS and their families. Not only were their attitudes changed, community care was

mobilized in the whole village to provide support and care. Telemedicines can diminish the cost and hardship of long distance travel for medical attention and diagnosis, and email can deliver, at minimal cost, recent medical findings to health workers lacking research and technological facilities. Furthermore, ICT can simplify medical data collection, record management, and paper filing. Handheld computers, or Personal Digital Assistants (PDAs), are allowing auxiliary nurse midwives, participating in the InfoDev-sponsored India Health care Delivery project,[21] to reduce redundant paperwork and data entry, freeing up time for healthcare delivery to the poor. Other examples include the Grameen Telecom Village[22] payphones as income generators. ICT can also help small farmers and artisans by connecting them to markets. The Agro-clinic Planning and Information Bank (APIB) India is a data bank which provides farmers with day-to-day information on land and water resources, the weather, seeds, fertilizers, pesticides, and usage, credit, insurance facilities, remote sensing patterns of land use, pattern changes, etc. In the Philippines, wireless technology, driven mainly by the popularity of text messaging or short message services riding on mobile phone technology, is expected to progress from being a communication tool that appeals mainly to individuals, to being a powerful business application for enterprises.[23] Access to such generic information helps in the overall development of the community by timely information aids. Another such example is the Knowledge Centre initiative by M.S. Swaminathan Research Foundation. (See Box 1)

While many factors contribute to the success of ICT projects in rural areas of developing countries, low-cost access to information infrastructure is the basic necessity. Still, insufficient conditions to reach the poor, inadequate or no connectivity, and unstable power supplies clearly reduce the economic viability of ICT projects. Given that it is not realistic to provide telephone lines or computers to all households in developing countries, government and regulators should be concerned with policy instruments for achieving 'universal access' and continue to look at other means of communication and transfer of information for development until then. Although the availability of content in local languages and the use of graphic and voice interfaces can make ICT applications more accessible to poor people, illiteracy, low levels of education, gender, class and caste inequalities, and development, in general, continue to be obstacles to the use of computers and other ICT tools.

8.4 Targeting the Youth

The youth segment of the population in this region is estimated to constitute approximately 18% of the total population, over 650 million persons, or over 60% of the world youth population. By 2030, the youth segment for the region is estimated to grow to exceed over 700 million, constituting almost 15% of the total population. The sheer size of the youth population in the region underscores the magnitude of the challenge that countries face in integrating youth and developing their full potential, most critically, perhaps, in the area of employment.

Box 1. Bridging the digital divide – Information Village at Pondicherry, India[24]

The level of poverty is high in these villages. The population of one such information village is 13,097, of which 6,353 are women. The number of literates is around 4,700. Work is basically agricultural, while some people work in a fishery. Hardware and software were provided for the basic operation of PCs running Microsoft Windows 95m, equipped with dispatch receipt of Microsoft Exchange, composing documents in HTML. Voice recording on WAV format, and solar energy since the power supply was erratic. To be of use to the farm families, generic information found via the internet networks had to be rendered into locality specific knowledge that rural women and men could use. PRA surveys and other forms of data collection for needs analysis were conducted to find out what this local action specific knowledge was. Educated persons, school dropouts, and women were trained in how to design and create content both in response to a needs analysis and in the operation of information shops. Moreover, youth were trained in the maintenance of the systems and to update content. The information that they developed included: entitlement databases, information on grain prices, seed and fertilizer quality, and a directory of hospitals and health help lines. Various NGOs, government agencies, hospitals, private sector organizations and the local village communities cooperated in the project. The impact of the project was monitored to keep the government, NGOs and CSOs and the private sector informed of the practical potential of ITs. The benefits included overcoming the barriers of language, provision of an alternative to the existing poor telephone connection, improved supply of electricity, improved market prices and lower production costs due to timely dissemination of information, human resources development, gender equity in accessing the technology, women-managed knowledge centres, local enterprises created through the development of new marketing approaches and the possibility of employment creation in areas such as software development and distance education training for ITs in community development.

Such knowledge centres have now been established in more than 19 such villages, which cater to the local specific needs, and also have been spread to the other states of India.

Education of the young is one of the most important investments, and an indicator to assess developmental impact. It helps to empower youth and, thereby, the strengthen the future of the nation by being able to absorb the changes being brought about by the technological revolution. An analysis of this region indicates that, in the second half of the 1990s, the proportion of public spending on education was as high as 15-16 percent in Malaysia and the Philippines, 18% in Republic of Korea, 20% in Thailand, and 23% in Singapore. By contrast, the figures for other low-income Asian economies are lower. Pakistan spent only 7%, Sri Lanka 9%, India 12% and both Bangladesh and Nepal spent 14%.[25] There is a need to invest more in education, not only at the primary and secondary stage of education, but also at the tertiary level. This, combined with higher standards of health, will help

youth, both boys and girls, contribute in the development of the nation in a better manner.

There is a large number and wide range of good practice in generating youth employment in the region, ranging form labour market interventions, implemented by governments, to public-private sector partnerships and self help and self employment initiatives. New employment and entrepreneurial opportunities for young people in the region can be found in the new economy. In some countries in the region, telecentres are being set up through public and private initiatives in telephone shops, schools, libraries, community centres, police stations and clinics. Sharing the expense of equipment, skills and access amongst an ever-increasing number of users also helps to cut costs and make these services viable in remote areas. Countries in the Asia-Pacific region have been innovators in the design of antipoverty programmes like public employment schemes; and, many countries like Bangladesh, China, Nepal, Philippines, Thailand, and India have cash or food for work programmes. Micro-credit and micro-enterprise creation through technology support have been initiated among women and youth. Examples include: the Grameen Bank in Bangladesh, a NGO network that supports business activities of women in the Philippines, a bank for Agricultural cooperatives in Thailand and Badan Kredit Kecamatan (BKK) in Indonesia. Also, Science Parks and Rural Technology Parks are being set up to increase the support to help with technology transfers, training and the promotion of entrepreneurial activities.

An ecological revolution based on the adoption of eco-technologies would help a lot in creating locale specific jobs linked to natural resources. It is important that an economic development, which leads to a job-led growth, takes place. If not, conflicts will surely increase due to deprivation. Scientists of the International Peace Research Institute, Oslo, have studied the cause of armed conflicts during the last 10 years. They found that, in most cases, violent conflicts could be traced to economic, rather those ideological, differences.[26] Unfortunately, even now, far too high a proportion of national GDP is being spent on arms and military equipment as compared to programmes designed for poverty eradication and meeting the basic needs of the underprivileged. The so-called peace dividend still remains only in the realm of possibility.[27]

It might be appropriate to recall what Dwight D. Eisenhower, a great war leader who subsequently became the President of the United States, stated on the 16th August 1953 – "Every gun that is made, every warship launched, every rocket signifies in the final sense a theft from those who are hungry and are not fed, from those who are cold and are not clothed. This world in arms is not spending money alone. It is spending the sweat of its labourers, the genius of its scientists and the hopes of its children."[28] Harnessing science and technology for fulfilling the basic minimum needs of every child, woman and man living on our planet will be possible only if this message becomes central to the ethos of human culture.

8.5 Engendering Development

The five-year review of progress in implementing the PFA (UN, 2001), held in June 2000, showed that the path of progress has been slow. The Millennium Declaration and the MDGs also identify gender-equality and women's empowerment as central cross-cutting goals. New approaches are needed to address these opportunities and challenges within the Platform's vision of gender equality and women's empowerment.

Literacy levels, education and employment rarely bring about dramatic changes without widespread changes to economic and cultural structures. At the current rate of literacy, UNESCO projects that in 2015 there will be an estimated 107 million illiterate young people and again more than half, about 67 million, will be young women. While some of the countries in this region seem to be progressing well, other countries, especially from the South Asian region, still have a far way to go. There, the socio-cultural construct continues to prevent women from coming into fore front and to freedom of choices.

The ethics of autonomy/freedom/empowerment of women requires that women have more say in all the decisions (freedom of speech and action) that affect their lives, including in the household, the community, the market place, the workplace, and in all levels of public assemblies and offices, from the local to the national to the international. For this to happen, women will have to have to be empowered through skills (transformation from unskilled to skilled), information (access to information and freedom of choice) and economy (access to credit and technologies). Surveys continue to show dismally little presence of women in S&T, and of the benefits of ICT reaching them. There is an urgent need to see that they benefit from the impact of globalization, and that they are recognized for the roles they perform and the knowledge they hold. While some countries do try and have quota systems to increase the presence of women it should be realized that mere number games will not help in the promotion of equity. It is important that women are able to participate meaningfully and be heard. This can happen only when there is a systematic approach of empowering them through education and improved health.

Gender equity in S&T means ensuring that scientific and technological enterprises are as open to women as they are to men, and that women can actively participate as creators and innovators at all levels – from formal high school science classes to research institutes, from technical training for school leavers to the management and shaping of technologies as end users, be at the urban or rural level. Gender equity in and through S&T is like two sides of the same coin; one cannot be done without the other. Constitutions, national laws, ministerial declarations, national bureaucratic structures and good gender development plans based on innovative partnerships can make this happen. A study conducted by the APGEST network, sponsored by UNESCO, offered very good examples of how appropriate

technologies, with support from the above mentioned components, could make a difference, especially in the areas of ICT and Green Health (traditional systems of medicines). These examples came from very diverse regions, such as Korea and the Pacific islands. There is increasing recognition of the knowledge held by women, especially in traditional medicine systems. In one of the examples documented in Fiji, it was very evident how women groups got together and helped in the revitalization of natural medicine.

Boxes 2 and 3 below describe how many governments are taking active steps to promote equality. In Vietnam, the national strategy for the advancement of women 2001-2010 sets targets to achieve greater equality and to encourage women in the areas of employment, education and health care, from its present rate of 25% to 50%. Gender responsive budgets are being introduced to ensure the objectives of gender equality, as in the Philippines and Sri Lanka.

In the growing intellectual property rights regime, it is important that women get their share of recognition and reward for better and more effective protection of women's intellectual rights. The following themes need to be explored and incorporated in any national or international legislation designed to achieve an optimum result: 1) the technological worlds of women and men differ according to social, economic, cultural and gender relationships existing between them, 2) the space in which women live affects their patterns of production and use of

Box 2. Spearheading Gender Equity in Science and Technology (S&T) through a Ministry of Gender Equality – Republic of Korea[29]

The Republic of Korea has established a Ministry of Gender Equality as the central agency that promotes the rights and interests of women and develops their capacities through mainstreaming gender policies. Significantly, it emphasizes the empowerment of women in S&T and provides training for women in information and technology. Furthermore, it promotes the advancement of female students into the fields of S&T through various measures, such as a "Girl-friendly Science Programme." Anther example is the Kyonggi Women's Development Centre for Women's IT training. The centre organizes 10-month IT training courses targeted at unemployed women, female-headed households, and handicapped women who are seeking jobs. Areas of industry shortage were identified and courses were offered. Timings were such that it suited the women and they were also supported with a commuter bus service, day care, and face to face counseling to improve the confidence level of women, which was often low either due to lack of education, age, lack of job experience, etc. The Centre helped in placements and financial tie-ups if they wanted to start a business venture after the training. The entry of women into high skilled occupations helped soften the rigid division of gender roles and job segregation in Korean society and improve women's position in the labour market. Thus, a move to promote a million housewives into ICT enabled empowerment is today becoming a reality through a supportive policy and an implementation which suited the needs of the women.

technology, as do circumstances, such as national disasters, conflicts, environmental changes and market demands, 3) the innovations that women make are based on their perceptions of the priorities in all aspects of their lives, and particularly on their understanding of the risks involved, 4) women's knowledge and skills in food production, processing and marketing play a crucial role in household livelihoods and food security, 5) technical information and skills are communicated to women, and between women, using different channels, and 6) the national policy environment affects the ways in which women use, adapt and adopt technology. There is a need to engender programmes working with Indigenous Knowledge/ Traditional Ecological Knowledge, to create a network of supporting institutions in which women will have a voice (Box 3).

Box 3. Establishment of WANIMATE, the Women's Association for Natural Medicinal Therapy, Fiji [29]

WANIMATE, ECOWOMEN and the Ministry of Health, the Department of Women, the Ministry of Education and the University of the South Pacific are working together to revive traditional medicine. The majority of healers are women. They live mostly in rural areas and often have little formal education. Many Fiji families have little money and rely primarily on subsistence farming and aquaculture. Although hospital outpatient's visits are free, medicines must still be purchased and bus fares needed to reach the nearest centre. Because of this situation, traditional medicines are still preferred. The WANIMATE was formed to help women comprehend the science behind the treatment and stress the importance of nutrition for good health. When the scientists, environmental activities and NGOs realized the need to protect biodiversity by documenting traditional practices, they had a regional Women's Traditional medicine Workshop in Fiji. A typical workshop includes traditional healers, village health workers and other women interested in traditional medicine. The conservation and protection of safe and effective traditional knowledge and medicinal plant resources for women and their families is promoted through training, awareness, demonstration, consultation, networking, and research that explain the issues on intellectual property rights. A traditional medicine handbook in Fijian has been published and is distributed in all workshops. Traditional gardens have been established at health centres, and women's health groups have been formed. Women healers, scientifically trained nurses, and botanical and ecological scientists have all increased their levels of awareness on traditional health and healing systems and have worked together on documentation, conservation and preservation. They all contribute to the Fiji Biodiversity Strategy Action Plan. There are management mechanisms that ensure a two-way dialogue and strong links between all stakeholders.

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