REGIONAL HUMAN DEVELOPMENT REPORT

Promoting ICT for Human Development in Asia

Realizing the Millennium Development Goals

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Foreword

Communications for Goodness' Sake

Sir Arthur C. Clarke

Mine was the first household in Sri Lanka to have a working television set — two years before my adopted country commenced terrestrial transmissions in 1979. The Indian Space Research Organisation (ISRO) donated a 5-metre dish antenna that enabled me to receive signals from communications satellites placed over the Indian Ocean. It was a crowd-puller for several weeks: everyone from cabinet ministers and civil servants to school children wanted to see pictures coming in from the skies.

Today, television rules how Sri Lankans work, dine and socialise. And when an important cricket match is being broadcast live, I have to look hard to find any signs of life on the streets of Colombo.

Even if the novelty of images from the skies has completely worn off, debates on their social and cultural impact continue. In the early days, I was often approached by people who were concerned about what satellite television might do to local cultures, traditions and values. Some of us who suffer from information overload find it difficult to imagine its even deadlier opposite: information starvation. I get annoyed when I hear arguments – usually from people who have been educated beyond their intelligence – about the virtues of keeping happy, backward people in perpetual ignorance. Such an attitude seems like that of a fat man preaching the virtues of fasting to a starving beggar.

Every TV programme has some education content: the cathode ray tube (and now the plasma screen!) is a window on the world; indeed, on many worlds. Often it's a very murky window, but I've come to the conclusion that, on balance, even bad TV is preferable to no TV at all.

In the mid 1970s, I was associated with the world's first systematic attempt to transmit educational television programming directly to villages. The Satellite Instructional Television Experiment (SITE) involved 2,400 villages in six Indian states, and used a leased American communications satellite to beam television programmes carrying information on family planning, crop production, healthy living and other practical matters that can raise the quality of life – and often save lives.

Working with the indefatigable Dr Yash Pal and his dynamic team gave me valuable insights on how developments in communications can produce tangible benefits for large numbers of ordinary people. Soon after SITE ended, I wrote, "One of the most magical moments in Satyajit Ray's exquisite *Pather Panchali* is when the little boy Apu hears for the first time the aeolian music of the telegraph wires on the windy plain. Soon, those wires will have gone forever; but a new generation of Apus will be watching, wide-eyed, when the science of a later age draws down pictures from the sky – and opens up for all the children of India a window on the world."

Those experiments with the 'schoolmaster satellite' now seem to belong to a completely different age. Much has happened since, particularly in the 1990s when commercial satellite television proliferated, opening up fierce competition in the skies over India. Many millions of dishes have bloomed across the subcontinent, and tens of millions of modern-day Apus are now growing up taking satellite television, mobile phones and Internet for granted.

But we have to acknowledge that the communications revolution has bypassed tens of millions of others in many parts of the world. We are reaching the point in our technological evolution when we can – and must – commit more time and resources to solving the problems of poverty, deprivation and inequality.

I discussed some of these concerns while addressing the UN General Assembly 20 years ago, during the World Telecommunications Year 1983. I suggested that the 'A telephone in every village' would be one of the most effective social stimulants in history, because of its implications for health, weather forecasting, market information, social integration and human welfare. I added, "Each new telephone installation would probably pay for itself, in hard cash, within a few months. I would like to see a cost-effectiveness study of rural telephone systems for the developing countries of Asia, Africa and Latin America. But the financial benefits, important though they are, might be insignificant compared with the social ones."

When I spoke my mind from that famous podium in New York, I did not imagine how quickly my words would be illustrated by actual developments. Just as satellite television swept across the globe during the 1980s, the Internet spread rapidly in the 1990s. Virtually everything we wish to do in the field of communications is now technologically possible. The key limitations are financial, legal, social and political. In time, I am sure, most of these will also disappear, leaving us with only limitations imposed by our own morality.

And making the right choices and investments is indeed a hard task. There is a danger that technological tools can distort priorities and mesmerise decision-makers into believing that gadgets can fix all problems. A computer in every classroom is a noble goal – provided there *is* a physical classroom in the first place. A multimedia computer with Internet connectivity is of little use in a school with leaking roofs – *or no roof at all*. The top priorities in such cases are to have the basic infrastructure and adequate number of teachers – that highly under-rated, and all too often underpaid, multimedia resource.

We must therefore take a few steps back from the digital hype and first try to bridge the 'Analogue Divide' (to coin a phrase) that has for so long affected the less endowed communities in developing countries (and even in some developed ones). Information and Communications Technologies (ICTs) should be part of the solution, not the *only* solution.

We need to ensure that ICTs are not only accessible but are also *affordable*. I have seen how some Sri Lankan schools have all the hardware and software and yet can't use the Internet — because they can't afford the phone bill. I was appalled to hear some years ago that about a third of transistor radios in the developing world are not used – because their owners can't buy new batteries. (This inspired British inventor Trevor Bailey to develop the wind-up radio).

Our big challenge, therefore, is to get ICTs to solve real life problems without creating any new ones. In the early part of the last century, Mahatma Gandhi proposed a simple test for the effectiveness of any development activity: find out how the last man would be affected by it. We should adapt this as a test for ICTs in development: how will the last man, woman and child be reached, touched and transformed by these marvellous communication tools?

This Regional Human Development Report is a pioneering attempt to examine how ICTs can be used effectively to bring about such development and social change. It is no coincidence that it covers the Asia-Pacific region – home to the world's largest television audience, and where mobile phones and personal computers are among the fastest selling consumer electronic products. Using the United Nations' eight Millennium Development Goals as a benchmark, the Report presents the experience of nine Asian countries.

There is no single formula for success; each country has to define what works best within the range of options and technologies available. Such decisions and choices have to be made quickly and resolutely as the development needs are vast and urgent.

The information age has been driven and dominated by technopreneurs – a small army of 'geeks' who have reshaped our world faster than any political leader has ever done. *And that was the easy part*. As this Report shows, we now have to apply these technologies for saving lives, improving livelihoods and lifting millions of people out of squalor, misery and suffering.

In short, the time has come to move our focus from the geeks to the meek.

Sir Arthur C. Clarke
Colombo, Sri Lanka

[A well known writer of science fiction, Sir Arthur C. Clarke has long advocated the appropriate use of information and communications technologies for development. He was the first to propose the concept of the geostationary communications satellite in 1945, and one of his short stories inspired the World Wide Web. He has lived in Sri Lanka since 1956 and was, until recently, Chancellor of the University of Moratuwa, Sri Lanka.]

Preface

The Regional Human Development Report on *Promoting ICT for Human Development: Realizing the Millennium Development Goals*, is a first-time attempt to systematically assess the role and impact of Information and Communication Technologies (ICTs) on human development in Asia. Initiated jointly by UNDP's Asia-Pacific Development Information Programme (APDIP) and Asia-Pacific Regional Human Development Reports Initiative (APRI), the Report makes a significant contribution to our understanding of the potential and challenges of using ICTs to achieve human development goals. The Report covers nine countries in Asia: China, India, Indonesia, Malaysia, Mongolia, Pakistan, Sri Lanka, Thailand and Vietnam.

This timely effort comes in the wake of an increasing global acceptance of ICT as a tool to fight poverty, especially in the developing world. Ambitious ICTs infrastructure initiatives and development strategies and programmes on ICT are being widely launched across Asia. While the advantages of ICT for development are enormous and rightly acknowledged, it has become equally imperative to recognise that benefits of ICTs are not evenly distributed. Many sections of societies in developing countries of Asia have been barely touched by the opportunities of the information age. It is this digital divide that needs to be urgently bridged today. The gap in opportunities occurring across and within countries due to differences in starting points, inaccessibility to technology and knowledge exchange, lack of infrastructure and inhibiting social and cultural factors, needs to be overcome. There is also the gap in relevant content that addresses the concerns of the worst off.

This Regional HDR is a major step towards bringing this to the centre of the development debate. The Report's unique approach lies in its use of the Millennium Development Goals (MDGs) to measure and monitor the impact of ICTs on human development. Its comparative study across the nine countries in Asia highlights both qualitative and quantitative linkages between ICTs and human development and the channels through which the linkage effects occur.

The Report provides a clear documentation of the different levels of achievement of human development from the perspective of the MDGs and effective ICT use towards achieving them in the nine countries of Asia. Country-specific experiences, and cross-country comparisons capture the rich variety of ICT initiatives in the region, as well as their successes and failures. Conscious efforts are needed to level playing fields for harnessing the use of ICT for human development in the region.

The possibilities of using ICT towards realizing MDGs are numerous. A future in the information and communications age that not only includes the poor, but also provides them with increasing opportunities and choices for a better life, however, will not occur automatically. The role of governments will continue to be central in deployment and facilitation of ICT initiatives. Civil society groups are emerging as important stakeholders, particularly to complement the efforts of governments. The trend of deregulation of ICT industries is also increasing the role of industry in ICT. The challenge is to channel this for human development initiatives. Effective partnerships among stakeholders, as the Report emphasizes, is also key to any successful ICT initiative towards human development. ICT is only a tool. The success of harnessing this tool effectively is dependent on the commitment of the stakeholders to the realization of the MDGs.

The battle for poverty and MDGs will be won or lost in parts of Asia and sub-Saharan Africa. This Report, therefore, is a timely analysis on the potentials of ICT as a tool and the role it can play in achieving these goals and enhancing human development.

Hafiz A. Pasha
UN Assistant Secretary General
UNDP Assistant Administrator and
Regional Director for Asia and the Pacific

Abbreviations

ABU	Asia-Pacific Broadcasting Union
AIDS	Acquired Immuno-deficiency Syndrome
AIOU	Allama Iqbal Open University (Pakistan)
AKDN	Aga Khan Development Network
ANMs	Auxiliary Nurse Midwives
APSWAN	Andhra Pradesh State-Wide Area Network
ARBEC	ASEAN Review of Biodiversity and Environmental Conservation
ARI	Acute Respiratory-tract Infection
ARPANET	Advance Research Projects Agency Network
ASEAN	Association of South East Asian Nations
BAPPENAS	National Development Planning Agency (Indonesia)
BMI	Body Mass Index
BPO	Business Process Outsourcing
CAPART	Council for Advancement of People's Action and Rural Technology (India)
CASH	Community Access to Sustainable Health
CAT	Communications Authority of Thailand
CCTV	China's Central Television Network
CDMA	Code Division Multiple Access
CENWOR	Centre for Women's Research (Sri Lanka)
CGIAR	Consultative Group for International Agricultural Research
CME	Continuing Medical Education
CPP	Caller Party Pays
DAGS	Demonstrator Applications Grants Scheme (Malaysia)
DANIDA	Danish International Development Agency
DEPDC	Development and Education Programme for Daughters and Communities Centre (Thailand)
DFID	Department for International Development (UK)
DHQ	District Headquarters
DISK	Dairy Information System Kiosk
DLF	Distance Learning Foundation (Thailand)
DM Method	Division by Mean Method
DSP	Digital Signal Processing
ECG	Electrocardiogram
EDI	Electronic Data Interchange
EFL	Environmental Foundation Ltd. (Sri Lanka)
EMR	Electronic Medical Record
EPPO	Energy Policy and Planning Office (Thailand)
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agricultural Organization
FdP	Foundation du Present

FIVIMS	Food Insecurity and Vulnerability Information and Mapping Systems
FOOD	Foundation of Occupational Development
FTP	File Transfer Protocol
GCR	Global Competitiveness Report
GDLN	Global Distance Learning Network (Indonesia)
GDP	Gross Domestic Product
GEM	Gender Empowerment Measure
GIS	Geographical Information System
GISTDA	Geo-Informatics and Space Technology Development Agency (Thailand)
GoI	Government of India
GPPNs	Global Public Policy Networks
GREAT	Gender Research and Training
GSD-List	Gender and Sustainable Development List
GSM	Global System for Mobile communications
HDI	Human Development Index
HDR	Human Development Report
HIV	Human Immunodeficiency Virus
HPI-1	Human Poverty Index
HTML	Hyper Text Mark-up Language
HTTP	Hyper Text Transfer Protocol
ICT	Information and Communication Technology
ICT4D	ICT for Development
IDRC	International Development Research Centre (Canada)
IDU	Intravenous Drug User
IIM	Indian Institute of Management
IIT	Indian Institute of Technology
IMR	Infant Mortality Rate
INSAT	Indian National Satellite
ISP	Internet Service Provider
ISRO	Indian Space Research Organization
IT	Information Technology
ITeS	IT-enabled Services
ITU	International Telecommunicaters Union
IUCN	World Conservation Union for International Union for the Conservation of Nature and Natural Resources
JICA	Japan International Cooperation Agency
KADO	Karakoram Area Development Organization (Pakistan)
KMVS	Kutch Mahila Vikas Sangathan
KNP	Kirthar National Park (Pakistan)
LAN	Local Area Network
LHP	Lifetime Health Plan
LSPs	Local Service Partners
MACTCS	Mutually Aided Cooperative Thrift and Credit Societies

MANAGE	National Institute of Agricultural Extension Management (India)
MDGs	Millennium Development Goals
MEERP	Maharashtra Emergency Earthquake Rehabilitation Project
MICT	Ministry of Information and Communications Technology (Thailand)
MoH	Ministry of Health
MMR	Maternal Mortality Rate
MCPHIE	Mass Customized/Personalized Health Information and Education
MOSTEC	Minister of Science, Technology, Education and Culture
MPH	Ministry of Public Health
MPS	Making Pregnancy Safer
MRO	Mandal Revenue Office
MSSRF	MS Swaminathan Research Foundation (India)
NAC	National AIDS Commission (Indonesia)
NACO	National AIDS Control Organization (India)
NHDR	National Human Development Report
NASSCOM	National Association of Software and Service Companies (India)
NECTEC	National Electronics and Computer Technology Centre (Thailand)
NER	Net Enrolment Rate
NFHS	National Family Health Survey
NGO	Non-Governmental Organization
NITA	National IT Agenda (Malaysia)
NITC	National IT Council (Malaysia)
NITF	National IT Framework (Malaysia)
NOCs	Network Operation Centres (Thailand)
NRS	Nari Raksha Samiti
NSSO	National Sample Survey Organization (India)
ODA	Official Development Assistance
OSS	Open Source Software
OECD	Organization for Economic Co-operation and Development
PCDOM	Primary Care Doctors' Organization of Malaysia
PCO	Public Call Office
PDA	Personal Digital Assistant
PDS	Public Distribution System
PEN	Pakistan Educational Network
PLI	Poverty Level Index
PNS	Primary Health Care Network Services
POP	Post Office Protocol
PPP	Purchasing Power Parity
PROPER	Programme for Pollution Control, Evaluation and Rating (Indonesia)
PTCL	Pakistan Telecommunication Company Limited
PTV	Pakistan Television
RE Method	Range Equalization Method
RDA	Recommended Dietary Allowance

RHDR	Regional Human Development Report
RMB	Renminbi
Saathii	Solidarity and Action Against the HIV Infection in India
SDC	Swiss Agency for Development Corporation
SDNP	Sustainable Development Networking Programme (Pakistan)
SEAMEO	Southeast Asian Ministers of Education Organization
SIBIS	Statistical Indicators Benchmarking the Information Society
SKS	Swayam Krishi Sangam
SMART	Self-Monitoring and Reporting Tool (Pakistan)
SME	Small and Medium Scale Enterprise
SRS	Sample Registration Survey
STI	Sexually Transmitted Infection
TAI	Technology Achievement Index
TAO	Tambon Administration Organization (Thailand)
TB	Tuberculosis
TEENET	Thailand Energy and Environment Network
THIS	Total Hospital Information System
TKTI	Tim Koordinasi Telematika Indonesia (Coordinating Team for ICT Development in Indonesia)
TOT	Telephone Organization of Thailand
TPCPC	Telecommunications and Post Cultural Point for Communes
TRAI	Telecom Regulatory Authority (India)
UGC	University Grants Commission (India)
UIN	Universal Internet Number
UMNO	United Malays National Organization
UN	United Nations
UNESCO	UN Educational, Scientific and Cultural Organization
UNICEF	UN Children's Fund
UNFPA	UN Population Fund
UNCSTD	United Nations Commission on Science and Technology for Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VARP	Virtual Academy for Food Security and Rural Prosperity
VJR	Virgin Jungle Reserves
VSAT	Very Small Aperture Technology
YASHADA	Yashwantrao Chavan Academy of Development Administration (India)
WANs	Wide Area Networks
WLL	Wireless in Local Loop
WIRC	Women's Information and Research Centre (Mongolia)
WHO	World Health Organization
WWF	World Wildlife Fund for Nature
WWW	World Wide Web

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Overview

Developing countries the world over have made the widespread use of Information and Communication Technologies (ICTs) a central feature of their development agenda. To that end, they have devised policies aimed at promoting the use of information technology for development; radically altered their communications polices; invested massively in strengthening and extending their ICT infrastructure; and launched numerous e-governance initiatives. Conviction that ICT use can accelerate the pace and improve the quality of development is strong.

The United Nations (UN) too sets great store by these technologies. The UN ICT Task Force (2003) had concluded that ICTs can act as a human development *enabler*, and have the potential to enhance the contribution of other polices aimed at achieving the Millennium Development Goals (MDGs) set by the September 2000 Millennium Summit. ICTs, wisely deployed, can potentially impact almost every sector, making development budgets, private sector investments and commitments from development partners go that much further in terms of cost effectiveness, impact and reach. This is bound to increase the effectiveness of new and more responsive solutions in the fields of health, education and related MDG focus areas. Even though in some areas the first-order causal relations between ICT use and the realization of the MDGs is limited, the growth-inducing effects of ICT use can indeed be substantial. And inasmuch as increases in per capita income contribute to human development, the realization of the MDGs is furthered.

However, it must be recognized that the potential of ICTs and the promise they hold for developing countries can, at times, be exaggerated. The use of ICTs for development between 1995 and 1997 was examined by the Working Group on IT and Development of the United Nations Commission on Science and Technology for Development.[1] It noted that despite the positive impacts experienced in industrialized countries and certain sectors of many developing nations, evidence showed that there were many people, especially in the least developed countries, whose lives had been barely touched by ICTs. There were also many whose lives were being negatively affected by their exclusion from the global information society or by the social or economic dislocations that can accompany the introduction and diffusion of these technologies.

This Regional Human Development Report (RHDR) on *Promoting ICT for Human Development in Asia: Realizing the Millennium Development Goals* is an attempt to holistically assess the role that ICTs can play in advancing human development in Asia. The objectives of the Report are to:

- explore the relationship between ICTs and human development using the MDGs as the framework for assessment
- assess the status of ICT use and diffusion in Asia
- identify relevant ICT indicators that can be used to quantify ICT-MDG correlates to construct composite indices that could help in ranking countries
- map experiences of harnessing these technologies for human development in the Asian region
- recognize and identify the limitations to applying ICTs to further human development

Even though in some areas the first-order causal relations between ICT use and the realization of the MDGs is limited, the growth-inducing effects of ICT use can indeed be substantial

and the possibility of widening the digital divide, and
- draw lessons from multi-country experiences for identifying policy directions.

According to one definition[2] "ICTs are basically information-handling tools – a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. They include the 'old' ICTs of radio, television and telephone, and the 'new' ICTs of computers, satellite and wireless technology and the Internet." More specifically, the division between old and new technologies in the broad area of ICT can be seen as that between those based on analogue devices and on digital devices (Box 1). Seen in this way, it should be clear that there is a new digital component even to technologies such as the radio, television and telephone.

Technology being digital has important implications. In particular, it permits a greater degree of *interactivity* and has superior *multimedia* capabilities, thereby substantially enhancing communication possibilities. Moreover, developments in digital technology have significantly reduced costs of data storage, manipulation and

"ICTs are basically information-handling tools – a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. . . ."

Box 1 ***Digital vs. Analogue***

Analogue and digital are alternative means of capturing and representing events and phenomena. The principal difference between them is that while analogue representations are continuous, digital representations consist of discrete and discontinuous data or events. An example conventionally used to illustrate this is the difference between digital and analogue watches. Digital watches go from one value to the next without displaying all intermediate values. In effect, they display only a finite number of times of the day. In contrast, analogue watches, with hands that move continuously around the clock face, not only touch the numbers one through 12, but also the infinite number of points in between. However, there is no limit to how accurate you can make digital technology. For example, if you wanted your clock to display time in 100ths of a minute, you could do that.

Computers are digital machines because, at their most basic level, they can distinguish between just two values, 0 and 1, or off and on. As opposed to this, analogue devices are those in which continuously variable physical quantities such as electrical potential, fluid pressure or mechanical motion are represented in a way analogous to the corresponding quantities in the problem to be solved.[1]

"Bits have always been the underlying particle of digital computing, but over the past 25 years we have greatly expanded our binary vocabulary to include much more than just numbers. We have been able to digitize more and more types of information, like audio and video, rendering them into a similar reduction of 1s and 0s".[2]

A digital photograph, for instance, consists of an array of dots that are either black or white. From afar, the viewer does not see the individual dots (the digital form), but only lines and shading which appear to be continuous. Although digital representations approximate analogue events, they are useful because they are relatively easy to store and can be manipulated electronically.

Digital representation often involves converting analogue to digital, and back again. The music on a compact disc itself exists in an analogue form, as waves in the air. These sounds are then translated into a digital form that is encoded onto the disk. When you play a compact disc, the CD player reads the digital data, translates the data back into a voltage wave that approximates the original analogue waveform, and sends it to the amplifier and eventually the speakers.

There are many advantages associated with digital representation. A bit has no size or weight. It gives us an accurate way to represent data, an easy way to mechanically store and manipulate that data, and it can travel at the speed of light. Two other advantages of digital technology are: the representation does not degrade over time and the digitized information can often be compressed.[3]

transmission, while increasing the potential of the technology. This Report broadly follows UNDP's definition and, while accommodating both the roles of old and new technologies, focuses on the role of digital technologies. This is partly because older technologies make fewer demands on user skills and are considered to be 'skill independent', while newer technologies are far more 'skill dependent'. Users need more education or training in their use, especially to exploit the potential of interactivity. The skill dependence associated with new technologies makes their diffusion among disadvantaged sections more difficult, necessitating a coherent policy environment complemented by effective partnerships between public and private sectors and civil society.

Since our concern here is with the use of ICTs for advancing human development, such diffusion is indeed crucial. Despite a long record of economic growth and improvement in living standards across the globe, the incidence of such development has been extremely uneven. Large parts of the developing world are still characterized by the persistence of poverty, hunger and malnutrition, ill-health and disease, and illiteracy and unequal access to skills and knowledge. Of the 4.9 billion people in developing countries, in 2000 around 1.1 billion lived on less than US$ 1 a day (1993 purchasing power parity (PPP)[†] US$), more than 950 million were illiterate, 1.2 billion lacked access to an improved water source, and 2.7 billion lacked access to basic sanitation. Nearly 104 million boys and girls in the primary school age were out of school, while 11 million children under age five died each year from predictable causes – equivalent to more than 30,000 children a day.[3]

The growing consensus on the need to urgently deal with each of these forms of deprivation stems from the pressure to improve social indicators or the belief that an education, good health and a reasonable livelihood for all are justifiable ends in themselves. It is also a recognition that progress on each front has implications for other areas and that holistic human development is, in the final analysis, a prerequisite for sustainable growth.

In Asia too the record of growth and human development has been mixed. The region is home to the erstwhile miracle countries, which had experienced dramatic growth rates over a long period prior to the Asian financial crisis of 1997. Many have also recovered from the crisis since and are recording creditable rates of growth. Meanwhile, China continues with its more than two-decade long boom and India is showing signs of delivering sustained high rates of growth. The two most populous nations of the region are now leading the Asian economic drive.

Not surprisingly, human development mapping in Asia has reflected overall progress over the last two decades. Yet in many countries in Asia and among sections of the population even in the relatively better-off countries, human development continues to pose a significant challenge, putting a blemish on otherwise commendable achievements. The persistence of income poverty, hunger, low levels of adult literacy, preventable diseases and poor healthcare as well as significant gender inequalities reiterates the need to place human development at the core of national and international development agendas.

However, it has been evident for some time now that collective action on a global scale is crucial when choosing to deal with the alarming levels of poverty, hunger and deprivation. Commitment to such collective action was won at the historic UN Millennium Summit held in September 2000, where Member States of the UN agreed to work together to eradicate poverty, promote human dignity and equality, and achieve peace, democracy and environmental sustainability. The Millennium Declaration issued at this Summit demonstrates the commitment of world leaders to collectively work towards a global partnership for improving the human condition.

A concrete contribution of the Declaration was the global consensus on the eight specifically identified MDGs to the realization of which 191 UN Member States have pledged themselves. The Goals are time-bound, most of which are to be achieved by the year 2015, taking 1990 as the base year (Box 2). Associated with each MDG are

Besides analysing the extent of and the constraints to ICT diffusion, this Report studies the specific ways in which the technology has been deployed in efforts that can contribute to realizing the MDGs in different areas

[†] A method of measuring the relative purchasing power of different countries' currencies over the same type of goods and services.

Box 2 ***The eight Millennium Development Goals***

Goal 1:	Eradicate extreme poverty and hunger
Goal 2:	Achieve universal primary education
Goal 3:	Promote gender equality and empower women
Goal 4:	Reduce child mortality
Goal 5:	Improve maternal health
Goal 6:	Combat HIV/AIDS, malaria and other diseases
Goal 7:	Ensure environmental sustainability
Goal 8:	Develop a global partnership for development

specific targets, totalling 18, to be monitored through 48 specific indicators (Appendix 1). By translating the objective of advancing human development into these time-bound goals, targets and indicators, the Millennium Declaration helped direct the energies of the international community as well as build the constituency for a global movement to advance human development.

Even though Asia's record is better than the average for developing countries as a group, there are substantial divergences between Asian countries and within each of them

Given this focused agenda, this Report uses the MDGs as the framework to analyse the way in which ICTs can be harnessed to promote human development. Besides analysing the extent of and the constraints to ICT diffusion, it studies specific ways in which the technology has been deployed in efforts that can contribute to realizing the MDGs in different areas. Many of these applications are in the nature of pilot projects – experimental in character, small in scale and uncertain in terms of sustainability. Yet they provide the material to assess the role that ICTs can play as well as the models that, if successful, need to be scaled up.

The Asian region is particularly well placed to harness and strategically deploy ICTs for development as it is home to some of the fastest growing ICT markets, and has the fastest growth of ICT industries in the world. However, the digital divide, both between Asian countries and within them, reveals the enormous disparities in ICT access, connectivity and skills. This divide can be a major hurdle in the effective application of ICTs for overcoming the human development challenge.

Teams of experts commissioned exclusively for this project prepared nine detailed country studies on the theme (Table 1). The nine countries – China,[4] India,[5] Indonesia,[6] Malaysia,[7] Mongolia,[8] Pakistan,[9] Sri Lanka,[10] Thailand[11] and Vietnam[12] – are spread over the three distinct sub-regions of South Asia, South East Asia and East Asia, providing a rich and diverse canvas. Each country study provides extensive qualitative documentation on the specific uses of ICTs across the MDGs for promoting human development.[†] Since this Report is based on an examination of such projects in a wide variety of contexts in Asia, it has a rich material base on which to build its arguments and its policy suggestions.

A separate statistical exercise, aimed at identifying key ICT indicators relevant to and available for Asia, was undertaken to complement the country studies. Indicators were selected with the intention of collating such data on ICT use and diffusion as could help in formulating and computing composite aggregate indices that quantitatively capture the role of ICTs in human development in individual countries. The findings of the RHDR are thus informed by an interesting combination of a qualitative analysis from the nine countries and a quantitative exploration.

Chapter 1 maps the performance of the Asia-Pacific region, and especially the nine countries that are the focus of this study, on the human development front so as to identify the distance

Table 1 ***Countries covered by the Regional Human Development Report***

Region	Countries	Number
South Asia	India, Pakistan and Sri Lanka	3
South East Asia	Indonesia, Malaysia, Thailand and Vietnam	4
East Asia	China and Mongolia	2
Asia		**9**

[†] In all instances where specific reference to a source is not provided, the relevant reference is the concerned country study, available with the respective country office of the UNDP.

that must be travelled to ensure a minimally better life for all. Even though Asia's record is better than average for developing countries as a group, there are substantial divergences between Asian countries and within each of them. This has implications for the use of ICT for advancing human development and realizing the MDGs. While, on the one hand, the human development shortfall and the potential for using ICTs to ensure progress encourages the promotion of the technology as a tool for human development, the inequities that a low level of human development entails raises the possibility that ICT use could be accompanied by a widening digital divide, on the other. The need for a nuanced policy stance to deal with these complexities is obvious.

Since the MDGs provide the framework for assessing the current and potential use of ICT for development (ICT4D), Chapter 2 details the major goals and targets set out in the Millennium Declaration and makes an assessment of progress in each area in the Asia Pacific region as a whole, and the nine countries specifically studied for this Report. This helps define the distance that remains to be travelled to realize goals in each of the areas, the areas in which progress is being made, and those regions and areas in which there are signs of stagnation and reversal. On that basis, the significance of different kinds of experiments with the use of ICT4D can be judged.

Chapter 3 offers a detailed discussion on the ways in which the technology can be used to facilitate human development advance. It identifies the different possible uses of the technology in specific areas of human development and assesses its potential as an instrument to break down barriers to knowledge creation, dissemination, participation, and economic opportunity.

Chapter 4 assesses the status of ICT diffusion in Asia in terms of the extent of cross-country and intra-country horizontal and vertical diffusion. It notes that while there is evidence of rapid penetration of ICTs, albeit from a low base, the level of penetration and the regional spread of the technology are still limited in many countries. Thus, there are substantial variations in the rate of increase of ICT expenditure across the nine countries chosen for study, though the variation is lower in terms of the level of ICT expenditure relative to Gross Domestic Product (GDP). The latter figure does suggest a tendency towards some degree of convergence within the Asian region as all countries attempt to exploit the benefits of the technology. Overall, however, from the point of view of the use of the technology for human development purposes, its degree of penetration is uneven and far from satisfactory.

Chapter 5 reports an exercise that aims to identify, collate and consolidate evidence of a kind that permits an assessment of the impact of ICT on human development. Towards that end, it is necessary not only to identify indicators of the status of ICT use, but also to analyse the nature of the interdependencies between indicators of ICT development and those reflecting human development concerns of the kind captured by the MDGs. The chapter attempts to do this by using empirical evidence from the nine Asian countries to construct a composite index on the use of ICT for development. The resulting indices present the relative position of the nine countries in terms of development of ICT for the attainment of the MDGs.

By the late 1990s, all nine Asian countries had put policy frameworks in place, seeking to accelerate the pace of ICT development. Chapter 6 aims to examine the extent to which these frameworks are sensitive to human development concerns and the ways in which they implicitly seek to realize the MDGs by promoting ICT use. The evidence suggests that as Asian nations progressed, so did their understanding of using ICTs for human development. The zeal to devise an appropriate policy framework was, therefore, also accompanied by a tendency to place human development concerns at the heart of each nation's ICT regulatory framework.

The experiences of the countries chosen for special study as the basis of this Report suggest that, at a macro-level, ICT policy is indeed sensitive to human development concerns and seeks to use the technology in partnership with Non Governmental Organizations (NGOs), donors and the private sector. What needs to be examined, therefore, is the degree to which this economy-wide commitment is being translated into specific projects that advance specific MDGs.

Chapters 7 to 12 make an effort to arrive at such an assessment in each MDG area by examining, in some detail, a selected set of experiments to use ICTs for development in the nine countries

The experiences of the countries chosen for special study as the basis of this Report suggest that, at a macro-level, ICT policy is indeed sensitive to human development concerns and seeks to use the technology in partnership with NGOs, donors and the private sector

chosen for special study. While the experiments are most often in the nature of pilot projects and conclusions regarding their financial viability and sustainability cannot yet be drawn, this analysis does strengthen the view that the potential of the technology is immense and that there are efforts underway to exploit that potential. Case studies of diverse experiments also offer some indication of the constraints faced in harnessing the technology for human development, the pitfalls that can be encountered in the process and the appropriate conditions and policies for exploiting the technology.

The lessons derived from these experiences are pulled together to yield an assessment of the direction in which efforts to harness ICTs must go, with the objective of realizing the MDGs. That assessment is presented in Chapter 13, which concludes the Report.

Photo: UN Country Team Mongolia

MDGs

Chapter 1

Human development in Asia: milestones and challenges

Human development is defined as the process of enhancing the capabilities of individuals so as to expand their choices to live the kind of lives they value. While this does not preclude the pursuit of economic growth as a major goal of policy, it does require treating the quality of life of people as the ultimate concern, and production and prosperity as a means to that end.[1] As was made clear in the introductory statement to UNDP's first *Human Development Report* released in 1990: "People are the real wealth of a nation. The basic objective of development is to create an enabling environment for people to enjoy long, healthy and creative lives."

When stated in this form, the concept remains wide in scope and amenable to variable interpretation. However, a broad agreement on some aspects of human development has evolved over time. The discussion has also yielded a range of indicators and indices that capture, in summary form, specific aspects of both the state of people's capabilities and the quality of their lives. However, the concept of human development requires a degree of simultaneous advance in all directions. This is because the notion that improvements in various social indicators are inter-linked is implicit in human development as a concept. Literacy and education are, for example, of intrinsic importance but also of immense instrumental significance in social development. Education, particularly female education, has a fundamental influence on attitudes to health, on health-seeking behaviour and therefore on health status. Similarly, there is evidence of a strong direct correlation between life expectancy and literacy, and an inverse relationship between infant and child mortality and the level of maternal schooling. This is because, at given levels of income, schooling increases the ability to improve nutrition; it contributes to the ability to initiate earlier and more effective diagnoses of illness, and to hygiene and the prevention of illness.

Advancing inter-linked goals of this kind substantially increases people's capabilities, enhances the choices that they have, and permits them to participate in, contribute to and benefit from the process of development. This is, however, not to say that human development is just another term for social development. It is, in fact, "a holistic paradigm embracing both ends and means, both productivity and equity, both economic and social development, both material goods and human welfare".[2]

Human development is defined as the process of enhancing the capabilities of individuals so as to expand their choices to live the kind of lives they value

The principal concern of this Report is to examine how the use of ICTs can influence the effort to improve specific indicators of social development and thereby accelerate the pace of human development advance. The focus on ICTs is imperative because of their tremendous potential to increase productivity, expand communication possibilities, build networks, ensure inclusion and facilitate delivery of services. This makes the technology an exceptional tool to enable human development policies, especially by enabling greater access to education and knowledge, health services and better livelihood opportunities in rural areas where the majority of the population lives.

Human development advance: some evidence

While the decade of the 1990s was marked by significant progress in terms of identified human development indicators across the

world including the Asian region, it was also a decade that appears to be characterized by a setback in human development advance. Given changes in methodology and revisions of data by international source agencies, there are problems associated with comparing changes in the Human Development Index (HDI) values over time. But if such a comparison is made, the global *Human Development Report 2003* noted, it appears that HDI values had fallen in that year in 21 out of a sample of 113 countries with complete data. It also noted that while the 1980s had seen the HDI value decline in four countries, the figure rose to 15 during the 1990s. Factors explaining these declines varied, being attributable to lower incomes and failed economic growth in some countries or to the spread of HIV/AIDS, which lowered life expectancy, in others.

However, the Asian region – both South Asia, and East Asia and the Pacific – was characterized by improvements in HDI values over 1990-2002. This was in keeping with the overall trend in developing countries, but contrary to the situation in Sub-Saharan Africa where reversals were observed in a significant number of countries (Table 1.1). Further, as Table 1.2 indicates, both in terms of the growth of per capita incomes and the pace of reduction of poverty, East Asia and the Pacific, and South Asia performed much better than other regions of the developing world during the 1990s. In fact, the evidence suggests that the incidence of poverty increased in all regions other than Asia.

The principal concern of this Report is to examine how the use of ICTs can influence the effort to improve specific indicators of social development and thereby accelerate the pace of human development advance

The average of the values of the HDI in the nine countries taken up for study in this Report is also higher than elsewhere in the developing world. With the exception of Pakistan, all countries belong to the medium human development category, though Malaysia is close to breaking into the high human development category. This points to the considerable differences between these countries, reflected in a variation in human development values from 0.497 to 0.793, and HDI ranks from 59 to 142 (Table 1.3). However, most countries are better than average performers on the human development front when compared with other developing countries. Comparing the HDI values for the year 2002 for the nine countries with those calculated for all developing countries put together, only India and Pakistan have a value lower than the developing-country average. In fact, China, Malaysia, Thailand and Sri Lanka record figures that are higher than even the average HDI value for the world as a whole. The country-specific human development indices also indicate that, in keeping with the overall situation in Asia, human development indices point to continuous progress over the past two decades or more in all nine countries.

Despite the positive picture the evidence (Table 1.3) paints with regard to Asia, there is ample cause for concern. The first and obvious cause is the fact that close to two-thirds of the world's poor live in the Asia-Pacific region, with more than 693 million people living on less than US$ 1 a day in 2000.

The second problem is that the record of poverty reduction across the region has been uneven. The Economic and Social Commission for Asia and the Pacific (ESCAP) Survey of the Asia Pacific 2002 argued: "The incidence of extreme poverty in East Asia, South-East Asia and the Pacific declined rapidly during the 1990s, from 28 to 15 per cent between 1990 and 1998. On this trend-line basis and given sustained efforts, the goal of halving poverty between 1990 and 2015 would be within reach in East Asia and South East Asia. Progress in poverty reduction in South

Table 1.1 ***Region-wise HDI trend from 1975 to 2002***

Region	HDI trend
East Asia and the Pacific	Increased from 1990 to 2002 in 13 out of 13 countries
South Asia	6 out of 6 countries
Arab States	13 out of 13 countries
Central and Eastern Europe and the CIS	11 out of 16 countries
Latin America and the Caribbean	23 out of 25 countries
Sub-Saharan Africa	21 out of 35 countries

Source: UNDP Human Development Report, 2004, pp. 246-8.
Note: The total number of countries mentioned for each region is the one for which data are available for 1990.

Table 1.2 ***Economic growth and income poverty reduction***

Region	Growth in the 1990s (annual per capita income growth) (%)	Poverty reduction in the 1990s (percentage point reduction)
East Asia and the Pacific	6.4	14.9
South Asia	3.3	8.4
Latin America & the Caribbean	1.6	−0.1
Middle East & North Africa	1.0	−0.1
Sub-Saharan Africa	−0.4	−1.6
Central and Eastern Europe and the CIS	−1.9	−13.5[a]

Source: UNDP Human Development Report, 2003, p.41.

[a] Change measured using the US$ 2 a day poverty line, which is considered a more appropriate extreme poverty line for Central and Eastern Europe and the CIS. For all other regions, the poverty line is US$1.

Close to two-thirds of the world's poor live in the Asia-Pacific region, with more than 693 million people living on less than US$ 1 a day in 2000

Asia has been slow, only 4 percentage points over the same period, and thus the achievement of the above target remains doubtful. Eastern Europe and Central Asia had very low poverty rates in the pre-transition period. Subsequently, those rates showed rapid increases in most of the 1990s, especially in several countries in Central Asia, which face great difficulties and thus have little chance of achieving the goal of halving poverty with 1990 as the base year".[3]

Thirdly, while it is indeed true that increases in per capita income in Asia did contribute to a decline in the incidence of poverty during the 1990s, in large parts of the developing world, the data suggest, growth of per capita incomes actually

Table 1.3 ***Trends in the HDI from 1975 to 2002***

Country/ Region	HDI values							HDI rank (2002) (out of 177 countries)	Trend in HDI (1975 to 2002)
	1975	1980	1985	1990	1995	2000	2002		
China	0.523	0.557	0.593	0.627	0.683	0.721	0.745	94	↑
India	0.411	0.437	0.476	0.514	0.548	0.579	0.595	127	↑
Indonesia	0.467	0.529	0.582	0.623	0.662	0.680	0.692	111	↑
Malaysia	0.614	0.657	0.693	0.720	0.759	0.789	0.793	59	↑
Mongolia	NA	NA	0.650	0.656	0.629	0.658	0.668	117	↑
Pakistan	0.346	0.373	0.405	0.444	0.473	NA	0.497	142	↑
Sri Lanka	0.613	0.648	0.674	0.698	0.719	NA	0.740	96	↑
Thailand	0.613	0.651	0.676	0.707	0.742	NA	0.768	76	↑
Vietnam	NA	NA	NA	0.610	0.649	0.686	0.691	112	↑
East Asia and the Pacific	NA	NA	NA	NA	0.678[a]	0.722	0.740	—	—
South Asia	NA	NA	NA	NA	0.452[a]	0.582	0.584	—	—
All developing countries	NA	NA	NA	NA	0.565[a]	0.655	0.663	—	—
World	NA	NA	NA	NA	0.724[a]	0.722	0.729	—	—

Source: UNDP Human Development Report, 1998, 2001 and 2004.

NA: Data not available.

[a] Indicates the median value achieved in the region or country group.

Note: The last four rows are not strictly comparable across years as the data are taken from different Human Development Reports.

TAI stands for Technological Achievement Index, which is a composite index designed to capture the performance of countries in creating and diffusing technology and in building a human skills base (UNDP, 2001).

declined during the 1990s. But even here it was true that per capita incomes were increasing in absolute terms. If, despite this, poverty was increasing everywhere excepting in East and South East Asia, it must be true that inequality must have been increasing during these years. Even in China and India, critics argue, the data properly interpreted point not just to an overestimation of the poverty decline, but also to an increase in income inequality that is either dampening the pace or reversing the trend of poverty decline more recently.† Given the role of these two populous countries in deciding global poverty trends, urgent action is obviously necessary.

The record of poverty reduction across the region has been uneven

Such controversies reflect the need to examine human development trends at the national level and make cross-country comparisons to yield a regional perspective. This Report, based on nine country studies, seeks to achieve precisely that. The experiences of these countries reflect considerable diversity, and permit the exploration of a variety of factors that constrain or facilitate human development advance. It must be noted, however, that divergences in human development within the Asia-Pacific region as a whole are far greater than that between the nine countries chosen in this Report for special study, to illustrate and analyse the role that ICT can play in advancing human development.

However, even among these nine countries, inter-country disparities are stark if we compare the human development indicators that enter into the computation of the HDI, such as life expectancy at birth, adult literacy rate, combined

Table 1.4 ***HDI and indicators***

Country /Region	Life expectancy at birth (year) (2002)	Adult literacy rate (age 15 & above) (2002)[a]	Combined primary, secondary and tertiary gross enrolment ratio (%) (2001-02)[b]	GDP per capita (PPP US$) (2002)	Life expectancy index	Education index	GDP index	HDI Value	HDI Rank (out of 177 countries)
China	70.9	90.9[c]	68[d]	4,580	0.76	0.83	0.64	0.745	94
India	63.7	61.3[c]	55[d]	2,670[e]	0.64	0.59	0.55	0.595	127
Indonesia	66.6	87.9	65[f]	3,230	0.69	0.80	0.58	0.692	111
Malaysia	73.0	88.7[c]	70[f]	9,120	0.80	0.83	0.75	0.793	59
Mongolia	63.7	97.8[c]	70	1,710	0.64	0.89	0.47	0.668	117
Pakistan	60.8	41.5[c,d]	37[d]	1,940	0.60	0.40	0.49	0.497	142
Sri Lanka	72.5	92.1	65[f]	3,570	0.79	0.83	0.60	0.740	96
Thailand	69.1	92.6[c]	73[d]	7,010	0.74	0.86	0.71	0.768	76
Vietnam	69.0	90.3[c,d]	64	2,300	0.73	0.82	0.52	0.691	112
East Asia and the Pacific	69.8	90.3	65	4,768	0.75	0.83	0.64	0.740	
South Asia	63.2	57.6	54	2,658	0.64	0.57	0.55	0.584	
Developing countries	64.6	76.7	60	4,054	0.66	0.71	0.62	0.663	
World	66.9	—	64	7,804	0.70	0.76	0.73	0.729	

Source: UNDP Human Development Report, 2004.

a. Data refer to estimates produced by UNESCO Institute for Statistics in July 2002, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution.

b. Data refer to the 2001/02 school year, unless otherwise specified. Data for some countries may refer to national or UNESCO Institute for Statistics estimates. Since data are from different sources, comparisons across countries should be made with caution.

c. Census data.

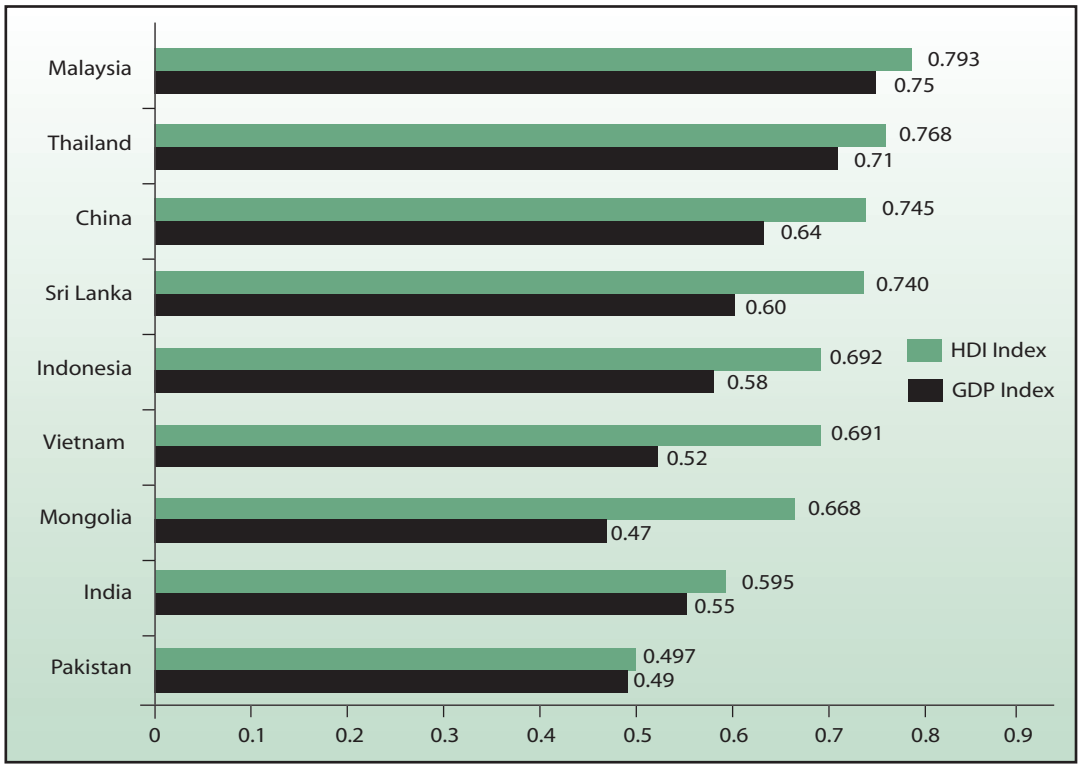
d. Data refer to a year other than that specified.

e. Estimate based on regression.

f. Preliminary UNESCO Institute for Statistics estimate, subject to further revision.

† See, for example, Sen (2002) and Bouche *et. al.* (2004)

Figure 1.1 ***HDI values and GDP indices 2002***



Source: UNDP Human Development Report, 2004

primary, secondary and tertiary gross enrolment ratio, and GDP per capita. While Malaysia, Sri Lanka and China have relatively high values for life expectancy at birth (over 70 years, which was much higher than the world average of 66.9 years), Mongolia, India and Pakistan fall short of these countries by 10 years with a far lower life expectancy of just over 60 years (Table 1.4).

The cross-country comparison also reveals certain features of relevance to the use and role of ICTs in advancing human development. Thus, in keeping with the perspective underlying the human development framework, it is clear that a country's performance in terms of the HDI is not determined solely by its GDP. Some countries, especially Sri Lanka, Vietnam and Mongolia, have recorded a much better performance in human development terms than appears warranted by their GDP levels relative to the other countries (Figure 1.1). Hence, if factors contributing to human development advance are facilitated by the enabling environment that the use of ICTs creates, investing in IT to design such an environment can help advance human development even if GDP growth does not keep pace with the diffusion of ICT. In this context, the fact that countries such as India and Pakistan, which have the lowest HDI value among the countries in the nine-country sample, record high ranks for certain ICT development indices (see Chapter 5) is heartening.

That having been said, we should be careful not to extrapolate this argument too far. Whether this ICT development can be sustained and translated into faster human development depends on factors that constitute components of the HDI. Given the skill-dependence of the technology, an index of significance for ICT application and use is that relating to education and literacy. Comparing adult literacy rates, defined as the percentage of literate people aged 15 years and above, across the nine countries, shows that the differences are quite marked (Table 1.4). In 2002, while five of the nine countries (China, Mongolia, Thailand, Sri Lanka and Vietnam) recorded literacy rates in excess of 90 per cent and two others (Indonesia and Malaysia) above 85 per cent, Pakistan recorded the lowest rate at 41.5 per cent and India figured second last with 61.3 per cent.

In terms of the combined primary, secondary and tertiary gross enrolment ratio, Pakistan's record was even poorer at 37 per cent, while

Some countries, especially Sri Lanka, Vietnam and Mongolia, have recorded a much better performance in human development terms than appears warranted by their GDP levels relative to the other countries

Thailand stands clearly above the rest with 73 per cent, immediately followed by Malaysia and Mongolia (70 per cent). The other countries have enrolment ratios ranging from 55 per cent (India) to over 60 per cent (China, Indonesia, Sri Lanka and Vietnam).

As mentioned earlier, the newer computer and Internet-related technologies are more demanding in terms of skills of users than older communication technologies such as radio, TV and the telephone. This makes the relationship between ICT and educational advance a two-way phenomenon. While ICT can be used as an enabling device to increase the spread and quality of education, ICT use itself can be constrained or facilitated by pre-existing educational levels which influence the skills of users or their ability to develop new skills. This raises the possibility that ICT use may widen an already existing divide. To the extent that the better-endowed sections are more capable of taking advantage of the new technology, inequalities will only increase.

Finally, the countries being considered are also characterized by stark differences in GDP per capita (measured in terms of PPP US$). A higher per capita income makes it easier to mobilize resources and finance investment in not just basic infrastructure such as roads and electricity, but also in specialized ICT-related infrastructure. Malaysia has a high GDP per capita of US$ 9,120, which is even higher than the world GDP per capita figure of US$ 7,804, followed by Thailand's figure of US$ 7,010. China comes next with a much lower US$ 4,580 to be followed by Sri Lanka (US$ 3,570), Indonesia (US$ 3,230) and India (US$ 2,670). Finally, Vietnam, Pakistan and Mongolia constitute the lower end with GDP per capita at or below US$ 2,300.

Inadequate human development also implies a higher degree of discrimination against particular sections, such as women and indigenous populations. Thus, human development advance cannot be registered without addressing such divides

Human deprivation indicators

The differential capabilities that stem from these factors can have significant implications for the effectiveness of ICT as an enabling instrument for advancing human development and realizing the MDGs, because of the strong relationship between human development indicators and specific indicators of deprivation (Table 1.5). Malaysia and Thailand, the top two performers among the nine in terms of the HDI, have the lowest incidence of poverty (less than 2 per cent) measured as the proportion of the population living below the income poverty line of US$ 1 per day. India records the highest incidence (34.7 per cent), followed by Vietnam (17.7 per cent), China (16.6 per cent), Mongolia (13.9 per cent), and Pakistan (13.4 per cent).

If one were to consider the data on the probability at birth of people not surviving to the age of 40, there is some correlation between this data and a country's HDI ranking. Countries with less than 10 per cent of their population in the 2000-05 cohort who will not live to the age of 40 are Malaysia (4.2 per cent), Sri Lanka (5.1 per cent) and China (7.1 per cent). Pakistan (17.8 per cent), India (15.3 per cent) and Mongolia (13.0 per cent) perform relatively poorly on this score. Thailand, Vietnam and Indonesia constitute the medium performers on this index, with around 10 per cent of their population not likely to live till the age of 40. It should be noted, however, that Thailand was ranked second in terms of HDI among the nine countries considered.

Finally, India and Pakistan perform poorly in respect of malnutrition, with the percentage of children under five years of age who are underweight for age placed at 47 per cent and 38 per cent, respectively. Indices of this kind enter the UNDP's Human Poverty Index (denoted as HPI-1 for developing countries) (Table 1.5). Of the nine countries covered in this Report, the HPI-1 rank for Malaysia is not available. Of the rest, Thailand and China come out on top, with ranks of 22 and 24 out of 95 countries. They are followed by Indonesia (35), Sri Lanka (36), Mongolia (38) and Vietnam (41), with almost successive ranks according to this scale. India, ranked 48, and Pakistan, ranked at a distant 71 as per the HPI-1, are again the laggards in the fight against deprivation.

The gender divide

The other danger is that rapid ICT diffusion and development, if unaccompanied by appropriate policies, could widen the digital divide leading to different degrees of marginalization. Inadequate human development also implies a higher degree of discrimination against particular sections, such as women and indigenous populations. Thus, human development advance cannot be registered without addressing such divides. And as long as they remain unaddressed, any increase in the application and use of ICTs would be accompanied by a worsening of the digital divide as well.

Table 1.5 ***Human Poverty Index (HPI-1)* and indicators***

Country	Probability at birth of not surviving to age 40 (% of cohort) (2000-05)[a]	Adult illiteracy rate[b] (age 15 & above) (%) (2001)	Population without sustainable access to an improved water source (%) (2000)	Children under-weight for age (% under age 5) (1995-2002)[b]	Population below income poverty line (%)			HPI-1	
					US$ 1 a day (1993 PPP US$)[c] (1990-2002)[b]	US$ 2 a day (1993 PPP US$)[d] (1990-2001)[b]	National poverty line (1987-2000)[b]	Rank (out of 95 coun-tries)	Value (%)
China	7.1	9.1[f]	25	11	16.6	46.7	4.6	24	13.2
India	15.3	38.7[f]	16	47	34.7	79.9	28.6	48	31.4
Indonesia	10.8	12.1	22	26	7.5	52.4	27.1	35	17.8
Malaysia	4.2	11.3[f]	—	12	<2	9.3	15.5[g]	—	—
Mongolia	13.0	2.2[f]	40	13	13.9	50.0	36.3	38	19.1
Pakistan	17.8	58.5[f,h]	10	38	13.4	65.6	32.6	71	41.9
Sri Lanka	5.1	7.9	23	29	6.6	45.4	25.0	36	18.2
Thailand	10.2	7.4[f]	16	19[i]	<2	32.5	13.1	22	13.1
Vietnam	10.7	9.7[f,h]	23	33	17.7	63.7	50.9	41	20.0

Source: UNDP Human Development Report, 2004.
* Refers to Human Poverty Index for developing countries.
[a] Data refer to the probability of not surviving to age 40, multiplied by 100. They are medium variant projections for the period specified.
[b] Data refer to estimates produced by UNESCO Institute for Statistics in July 2002, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution.
[c] Data refer to the most recent year available during the period specified.
[d] Poverty line is equivalent to $ 1.08 (1993 PPP US$).
[e] Poverty line is equivalent to $ 2.15 (1993 PPP US$).
[f] Census data.
[g] Data refer to year or period other than that specified.
[h] Data refer to a year between 1995 and 1999.
[i] Data refer to a year or period other than that specified, differ from the standard definition or refer to only part of a country.

Women are key agents of development and their equal participation in decision-making processes is an essential precondition for equitable and holistic development. Unfortunately, wide gender gaps remain a weak aspect of human development in Asia. For example, Pakistan is not just a poor performer in terms of many human development indicators, but a country in which the indicators for females are worse than those for males. For instance, the life expectancy figure (Table 1.6), which is generally higher for females than males, is 60.7 years for females in Pakistan, lower than that for males (61.0 years). This compares poorly with the situation in the other countries covered in this study where, as expected, female life expectancy exceeds male life expectancy.

Similarly, a comparison of male and female literacy rates reveals a dismal situation in Pakistan and India, with high male-female gaps. In Pakistan the female literacy rate is only 28.5 per cent, which is 24.9 percentage points below the male literacy rate. In no country covered does the female literacy rate exceed the male literacy rate, although in Mongolia the male-female gap is only 0.5 of a percentage point. The combined school enrolment ratio also reveals significant male-female gaps, especially in India (14 percentage points), followed by Pakistan and Mongolia (12 percentage points). It should, however, be noted that the combined enrolment ratio for females exceeds the male ratio in Mongolia, which perhaps reflects the effect of privatization of ownership of animals that results in male children being made responsible for herding. Malaysia and Sri Lanka are the other two countries where the combined enrolment ratio for females is higher than that of males, although the gap is much narrower than that in Mongolia.

Discrimination with regard to education spills over into the work sphere as well, where participation rates tend to be lower in the case of

While Asian nations have made considerable progress on the human development front, substantial divergences and many critical challenges remain

Table 1.6 ***Gender-related Development Index (GDI) and indicators***

Country	Life expectancy at birth (years) 2002		Adult literacy rate (% ages 15 and above) 2002[a]		Combined gross enrolment ratio for primary, secondary and tertiary level schools (%) 2001/2002[b]		Estimated earned income (PPP US$) 2002[c]		Gender-related Development Index (GDI)	
	Female	Male	Female	Male	Female	Male	Female	Male	Rank (out of 144 countries)	Value
China	73.2	68.8	86.5[d]	95.1[d]	64[e]	69[e]	3,571	5,435	71	0.741
India	64.4	63.1	46.4[d]	69.0[d]	48[f]	62[f]	1,442	3,820	103	0.572
Indonesia	68.6	64.6	83.4	92.5	64[g]	66[g]	2,138	4,161	90	0.685
Malaysia	75.6	70.7	85.4[d]	92.0[d]	72[g]	69[g]	5,219	13,157	52	0.786
Mongolia	65.7	61.7	97.5[d]	98.0[d]	76	64	1,316	1,955	94	0.664
Pakistan	60.7	61.0	28.5[d,h]	53.4[d,h]	31[f]	43[f]	915	2,789	120	0.471
Sri Lanka	75.8	69.8	89.6	94.7	66[i]	64[i]	2,570	4,523	73	0.738
Thailand	73.4	65.2	90.5[d]	94.9[d]	72[f]	74[f]	5,284	8,664	61	0.766
Vietnam	71.4	66.7	86.9[d,h]	93.9[d,h]	61	67	1,888	2,723	87	0.689

Source: UNDP Human Development Report, 2004.

[a] Data refer to estimates produced by UNESCO Institute for Statistics in July 2002, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution.

[b] Data refer to the 2001/02 school year, unless otherwise specified. Data for some countries may refer to national or UNESCO Institute for Statistics estimates. Because data are from different sources, comparisons across countries should be made with caution.

[c] Because of lack of gender disaggregated income data, female and male earned income are crudely estimated on the basis of data on the ratio of the female non-agricultural wage to the male non-agricultural wage, the female and male shares of the economically active population, the total female and male population and GDP per capita (PPP US$). Estimates are based on data for the most recent year available during 1991-2000, unless otherwise specified.

[d] Census data.

[e] Data refer to the 1999/2000 school year.

[f] Data refer to the 2000/2001 school year.

[g] Preliminary UNESCO Institute for Statistics estimate, subject to further revision.

[h] Data refer to a year between 1995 and 1999.

[i] Data refer to the 1998/1999 school year.

Given the range of features and indicators that are the proximate determinants of the human development situation, the ways in which ICTs can be used to advance the human development agenda would be manifold

women and earned incomes often substantially lower. The latter occurs because of discrimination in the kind of jobs left open for women and partly because of differential wages being paid for similar work to males and females.

These forms of discrimination apply not just to poor or uneducated/illiterate women or to poor performers in terms of the HDI. An important indicator used in the Gender Empowerment Measure (GEM) is the proportion of seats in the national parliament held by women. Going by that measure, Sri Lanka is the worst performer, with just 4.4 per cent of parliamentary seats held by women, followed by Indonesia, India and Thailand. At the upper end, Vietnam is a clear leader with 27.3 per cent of parliamentary seats held by women followed by Pakistan and China (Table 1.7).

It should be obvious that, given the range of features and indicators that are the proximate determinants of the human development situation, the ways in which ICTs can be used to advance the human development agenda would be manifold. The information collation, storage and manipulation capabilities of the technology can be used to reduce the capital and operating costs of programmes that help improve one indicator or another. That is, they

Table 1.7 ***Gender Empowerment Measure (GEM) and indicators***

Country	Seats in parliament held by women[a] (% of total)	Female legislators, senior officials and managers[b] (% of total)	Female professional and technical workers[b] (% of total)	Ratio of estimated female to male earned income[c]	GEM Rank (out of 78 countries)	GEM Value
China	20.2	—	—	0.66	—	—
India	9.3	—	—	0.38	—	—
Indonesia	8.0	—	—	0.51	—	—
Malaysia	16.3	20	45	0.40	44	0.519
Mongolia	10.5	30	66	0.67	62	0.429
Pakistan	20.8	9	26	0.33	64	0.416
Sri Lanka	4.4	4	49	0.57	74	0.276
Thailand	9.6	27	55	0.61	57	0.461
Vietnam	27.3	—	—	0.69	—	—

Source: UNDP Human Development Report, 2004.

[a] Data are as of 1 March 2004. Where there are lower and upper houses, data refer to the weighted average of women's shares of seats in both houses.

[b] Data refer to the most recent year available during the period 1992-2001. Estimates for countries that have implemented the recent International Standard Classification of Occupations (ISCO-88) are not strictly comparable with those for countries using the previous classification (ISCO-68).

[c] Calculated on the basis of data on estimated earned income in Table 1.6. Estimates are based on data for the most recent year available during the period 1991-2001.

can make a given volume of expenditure go that much further. They can also render financially viable, programmes that may otherwise have been unsustainable.

Given the commercial nature of these technologies and the multiple opportunities they can provide for gainful employment, varying from production to service delivery, they could directly increase employment and incomes, and therefore increase the wherewithal available to realize a better quality of life.

ICTs' capacity to render easier, more interactive and cheaper communication could help deliver, at a relatively low cost, high quality services to wider sections of the population, including to those in remote locations who have hitherto been marginalized from the system. They could, thus, help campaigns with objectives as varied as increasing access to education and medical diagnoses and treatment, reducing female infanticide and improving sanitation or promoting universal immunization. These features also help build networks of those who can formulate policies, undertake campaigns and lobby for change, whether they be civil society organizations, political activists or even committed government officials.

Initial conditions, available resources, consciousness and commitment would determine which of these features would be used, in which area and to what extent. However, use of the technology seems inevitable, especially since the challenges to human development are immense. As argued in our brief survey above, while Asian nations have made considerable progress on the human development front, substantial divergences and many critical challenges remain. This diversity and these persisting challenges provide the background for an exploration of the ways in which ICTs can be used as human development enablers, the constraints to realizing the promise of these technologies and the dangers of a widening divide as ICT application and use increase. It is on the basis of such an analysis that policies to use ICTs to strengthen people's capabilities, and widen their choices, can be devised.

ICTs' capacity to render easier, more interactive and cheaper communication could help deliver, at a relatively low cost, high quality services to wider sections of the population, including to those who have hitherto been marginalized

Photo: Gabriel Accascina

MDGs

Chapter 2

Asia's march towards the Millennium Development Goals

The most basic needs for human development are living a long and healthy life, being educated, having a decent standard of living and enjoying political and civil freedoms to participate in the life of one's community. All of these requirements were recognized by the Member Countries of the UN, when they adopted the Millennium Declaration, which defined a set of Millennium Development Goals and corresponding targets.

The human development concept is, no doubt, much wider in scope than can be captured by the MDGs, but there are strong links between the two (Box 2.1). The three key dimensions of human development that are captured by HDI, namely a decent standard of living, education and health (for which longevity is a proxy), are entirely consistent with Goals 1 to 7, which focus on eradication of poverty and hunger, and on improving healthcare and education. Progress on Goal 3, which focuses on gender equality and empowerment, is captured by gender-related indices, developed as supplementary indices for human development measurement. Thus, while the human development approach has a broad thrust that advocates expansion of human choices, the MDGs are constructed as goals and targets that provide a useful framework to monitor progress as well as build and widen the constituency for human development.

The MDG targets cover a majority of the most critical development challenges. These include a wide range of interrelated issues each of which cannot be addressed in isolation. Apart from the eradication of poverty and hunger, the targets deal with education (achieving universal primary education), healthcare (eradicating major diseases such as HIV/AIDS and malaria as well as reducing child mortality and improving maternal health), gender equality and empowerment of women, environmental sustainability and global partnerships for development.

From the point of view of this Report, which is concerned with the use of ICTs to advance the human development agenda, the MDGs are a useful point of departure. Any effort to deploy ICTs for human development must specify the problem to be dealt with, assess the infrastructure and hardware requirements, develop appropriate software and make the necessary institutional/organizational adjustments. This requires a clear identification of the task at hand in each specific context. The goals and targets prescribed under the MDGs spell out the human development agenda in a form that is appropriate to examining the ways in which ICTs can and have been deployed to realize this agenda. Given these features of the MDGs and the global consensus around them, this Report specifically explores how ICTs can serve as an instrument to provide an enabling environment for realizing those goals and targets.

Even in Asia, which, as we have seen, is a better performer on average in terms of the HDI and where many nations are ahead or on track in realizing the MDGs, a number of countries have a long distance to travel if those goals are to be attained. The global HDR 2002 categorizes progress across indicators as 'achieved', 'on track', 'lagging', 'far behind' and 'slipping back'. These assessments that have tracked the performance of countries in terms of MDG progress clearly show that there are remarkable disparities between and within regions, with human development reversals seen in some cases in sub-Saharan Africa, Central and Eastern Europe and the CIS. Even in countries where the record

Among the principal contributions of the declaration adopted at the Millennium Summit of the United Nations in September 2000 was the delineation of a set of goals and time-bound targets that provide that much-needed focus to accelerate progress towards the overall objective

Box 2.1 ***Relationship between human development capabilities and the MDGs***

Key capabilities for human development	**Corresponding Millennium Development Goals**
Living a long and healthy life	Goals 4, 5 and 6: Reducing child mortality, improving maternal health and combating major diseases
Being educated	Goals 2 and 3: Achieving universal primary education, promoting gender equality (especially in education) and empowering women
Having a decent standard of living	Goal 1: Reducing poverty and hunger
Enjoying political and civil freedom to participate in the community life	Not a Goal but an important global objective included in the Millennium Declaration
Essential conditions for human development	**Corresponding Millennium Development Goals**
Environmental sustainability	Goal 7: Ensuring environmental sustainability
Equity – especially gender equity	Goal 3: Promoting gender equality and empowering women
Enabling global economic environment	Goal 8: Strengthening partnership between rich and poor countries

Source: UNDP Human Development Report, 2003, p. 28

This Report specifically explores how ICTs can serve as an instrument or provide an enabling environment for realizing the Goals and targets

has been good on average, there are specific areas of poor performance that are cause for concern. Thus even though most Asian countries, including some of the poorest countries of South Asia, show advances, the importance of sustaining the effort to realize some or all of the MDGs remains.

The findings of this and many similar studies highlight the difficulties faced by most regions/countries, when they seek to register all-round progress while trying to attain their MDG targets. East Asia and the Pacific, on the whole, has made remarkable progress in its attempt to halve income poverty and is well on track towards the goals of reducing child hunger and achieving universal primary education. However, at its current rate of progress, it will still not be able to meet the MDG targets for gender equality, reducing child mortality and providing sustainable access to improved water sources and sanitation by the year 2015.

South Asia needs to make significant progress in almost all areas if it is to achieve its MDG targets. While official figures suggest that India has made significant progress towards reducing income poverty, according to a ESCAP/UNDP study on the MDGs and poverty reduction,[1] the pace of poverty reduction has been much slower in the other countries in the region. Thus success in halving the number of people who live on less than US$ 1 a day by the year 2015 is not assured. Further, the region lags far behind in the reduction of hunger and will be able to reach its target in this area only after 2100. South Asia is 'on track' for only two indicators – reducing poverty and providing sustainable access to improved water sources. At its current rate of progress, South Asia will fail to reach the other goals by 2015; for example, the goals of achieving universal primary education, gender equality and reducing child mortality are expected to be reached long after 2020.

These differences were noted by the ESCAP/UNDP study, which points out that this region is characterized by considerable differences in achievement across countries. The report found that a few countries would meet all goals and even surpass them. On the other hand, there would be some which would meet none of the goals. The majority, however, were expected to fall in between, meeting some goals not others.

The nine country studies on which this Report is based highlight these differences across countries. While Malaysia has completed its immedi-

ate tasks on many fronts, Pakistan and India tend to lag behind in a wide range of areas. Differences are visible in terms of the pace of progress. This has been fast in Vietnam, raising hopes of success by target date 2015, but it has been much slower, and in some areas almost non-existent, in Pakistan and India.

In almost all countries, slow progress in many MDG areas is the result of the inadequate spread of advances in the relevant area to all its regions. With market signals encouraging concentration of economic activity and governments short of funds to reach out to remote locations, geography becomes an unwitting barrier to human development. A much-noted feature of ICTs is that, besides directly enhancing productivity in diverse activities from production to service provision, they substantially increase the reach of individuals, organizations and governments at extremely low costs. This makes the task of bridging the regional divide, especially that between well-endowed urban areas and relatively remote locations, that much easier. However, the ability to exploit that potential of ICTs rests on an adequate spread of the relevant infrastructure. If investment in the requisite infrastructure is inadequate or unevenly distributed across space and segments of the population, the introduction of ICTs could aggravate existing divides.

Performance varied across the Goals as well. It is useful, therefore, to follow progress as per each Goal for the nine countries covered by this Report, as a prelude to assessing the role that ICTs can play in this area. A Goal-wise assessment of progress towards the MDG targets is also a useful way of identifying the less-noticed bottlenecks to human development advance in the region.†

Goal 1: Eradicate extreme poverty and hunger

This Goal relates to the most basic capability that people must have, which is enough income for subsistence and access to sufficient food to ensure the minimum nutritional intake. The principal targets are to halve, between 1990 and 2015, the proportion of people whose income is less than US$ 1 a day and those living in hunger. While there are many problems with the data, the evidence points to considerable success in Asia and the Pacific in the effort to reduce income poverty. Over the 1990s, countries of the region as a whole are estimated to have reduced the incidence of income poverty from 34 to 24 per cent.[2] Although this left an estimated 768 million people in the region living on less than US$ 1 a day, it represented striking progress.[3] If this trend continues, realizing the Goal of halving poverty to 17 per cent by 2015 should not be difficult.

Even in Asia, where many nations are ahead or on track in realizing the MDGs, a number of countries have a long distance to travel if the Goals are to be realized

Progress appears to have been particularly remarkable in the case of the most populous countries of the region, which are also home to the largest share of the world's poor. Going by the PPP US$1-a-day consumption definition of the poverty line, it appears that China, Indonesia, Malaysia, Sri Lanka and Thailand

Table 2.1 ***Percentage of population below US$ 1 (PPP) per day consumption***

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
China	33	—	—	28	—	—	17	—	—	18	—	17	—
India	42	—	—	42	—	—	42	—	—	35	—	35	—
Indonesia	—	—	—	17	—	—	14	—	26	15	7	—	8
Malaysia	—	—	0	—	—	1		0	—	—	—	—	—
Mongolia	—	—	—	—	—	14		—	27	—	—	—	—
Pakistan	48[c]	25	34[e]	—	—	—	7[a]	—	13[b]	—	—	—	—
Sri Lanka	4	—	—	—	—	7[d]		—	—	—	—	—	—
Thailand	—	—	6	—	—	—	2	—	0	2	2	—	—
Viet Nam	—	—	—	15	—	—		—	18	—	—	—	—

Note: The years presented are those for which data are available for the countries selected in the period 1990-2004. [a] 1996-97; [b] 1998-99; [c] 1990-91; [d] 1995-96; [e] 1992-93

Source: World Bank, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005

† The discussion that follows is based on the country studies prepared as the basis for this Report.

would be meeting the MDG in this area, while the others are performing less well and are likely to miss the target. Figures for Pakistan are characterized by dramatic fluctuations that raise doubts regarding the data.

However, there are problems involved in using an international poverty line based on PPP estimates. Using the official, national poverty line, equivalent to less than a quarter of a dollar per day or RMB 625 (US$ 75) per year, China's rural poor decreased dramatically from 250 million in 1978 (30.7 per cent of the rural population) to 85 million in 1990 (9.4 per cent of the rural population), and then to 29.2 million in 2001(3.2 per cent of the rural population). China has already achieved the target of halving its poor. While using a standard international poverty line of US$ 1 per day yields a substantially greater absolute number of poor people, the trend in reduction of poverty is still impressive.

A much-noted feature of ICT is that, besides directly enhancing productivity in diverse activities from production to service provision, they substantially increase the reach of individuals, organizations and governments at extremely low costs

Even in India, the official National Sample Survey Organization's (NSSO's) 55th Round survey results relating to 1999-2000 point to a substantial decline in poverty in comparison with 1993-94. The figures indicate that poverty declined by 10 percentage-points, from 35.97 per cent to 26.10 per cent between 1993-94 and 1999-2000. This was not only much larger than the 2.9 percentage-points reduction during the previous five-year period from 38.9 per cent in 1987-88 to 36 per cent in 1993-94, but also meant that while the number of poor had increased from 307 million in 1987-88 to 320 million in 1993-94, that number had fallen sharply to 260 million by 1999-2000.

However, the 55th Round, rather than leading to unanimous recognition of the major gains registered on the poverty reduction front, has led to controversy with some arguing that a change in methodology adopted in that Round had substantially contaminated the data. According to Abhijit Sen[4]: "Although it is now the official position that poverty declined very substantially between 1993-94 and 1999-2000, this is a claim which is vitiated by serious problems of comparability. Different recall periods were used in the 50th (1993-94) and 55th (1999-2000) Rounds of the National Sample Survey and this has led to two sources of non-comparability. First, the 55th Round used only a 365 days recall for clothing, footwear, durable goods, education and institutional medical care, whereas the available 50th Round results for these items are by a 30 days recall. Secondly, while estimates of consumption of food, *paan*, tobacco and intoxicants had been collected using only a 30 days recall period in the 50th Round, all respondents were asked both the 30 days and 7 days questions in the 55th Round. Since a 7 days recall is known to elicit a substantially higher consumption estimate for food etc., the presence of this question in the 55th Round Consumption Survey might have affected responses to the 30 days question."

Following the controversy, some analysts placed the estimate of poverty incidence for 1999-2000 at around 33 per cent. The latter makes the pace of poverty reduction the same during the two five-year periods 1987-88 to 1993-94 and 1993-94 to 1999-2000. Taking the rate as indicated by the official poverty figures, India is well on the way to realizing the MDG in this area. Poverty would have stood at 35.06 per cent in 1990-91 and would fall to just 3.06 per cent by 2015-16, which is way below half. The goal of halving poverty would be achieved as early as 2004-05. On the other hand, if the rate of reduction suggested by the independent estimate is taken into consideration, poverty would touch 22.38 per cent in 2015-16, which is close to 4 percentage points "short" of the MDG target.[5]

There are some countries where the record is unambiguously positive. Malaysia has an outstanding record on poverty eradication. The MDG target does not appear relevant here. A comprehensive and aggressively interventionist policy adopted by the government resulted in reducing the incidence of poverty from 49.3 per cent of the households in 1970 to 7.5 per cent in 1999. Currently, the focus of poverty eradication is on addressing pockets of poverty in remote areas and among the indigenous Orang Asli and other Bumiputera minorities in the states of Sabah and Sarawak.

Similarly, Sri Lanka has undoubtedly achieved a great deal in reducing poverty since Independence. These gains are reflected in impressive human development indicators which distinguish Sri Lanka from other low-income countries. Another striking case is Vietnam, which has reduced the proportion of people living on less than US$ 1 (PPP) a day from 50.8 to 9.6 per cent in the 1990s. Given the differences in the per capita income levels of these success stories, there is reason to believe that a concerted effort at poverty

reduction can have significant effects. It is this expectation that makes the use of ICT relevant to directly contributing to or facilitating poverty reduction.

However, a positive picture gives no room for complacency as the experiences of Indonesia and Thailand suggest. During the period of high economic growth in Indonesia, the government had managed to reduce the incidence of poverty significantly. The total number of poor people dropped from 54.2 million (or 40.1 per cent of the total population) in 1976 to 22.5 millions (or 11.3 per cent) in 1996. During the period of the financial and economic crisis in 1997-98, the rupiah exchange rate plunged from 2,500 to 15,000 against the US dollar; consequently, the prices of essentials rose substantially. This resulted in an increase in the total number of poor people to 47,974 million (or 23.43 per cent) in 1999. As the economy stabilized and improved, poverty statistics also improved. The total number of poor people dropped to 38.4 million (or 18.2 per cent) in 2002.[6]

Similarly, the percentage of Thailand's population under the national poverty line steadily declined from 32.6 per cent in 1988 to 11.4 in 1996. The economic crisis reversed this trend; 15.9 per cent of Thais were classified as being "poor" in 1999, revealing the vulnerability of the marginal groups. In 2001, as the country was moving out of the crisis, 13 per cent or 8.2 million people still lived under the poverty line.[7]

The country studies also point to instances where progress has been extremely slow. In Mongolia, the Living Standard Measurement Surveys (LSMS) conducted in 1995 and 1998 showed that the poor and very poor constituted 36.3 per cent and 35.6 per cent of the population, respectively. This amounts to an annual decline of less than a third of a percentage point, suggesting that if current trends persist the MDG in this area will not be realized. An even more disconcerting case is Pakistan, where trends in rural poverty point to significant increases between 1987 and 1998, rising from 18 per cent to 35 per cent; while urban poverty has risen more gradually from 15 to 21 per cent. The rural trend has driven the country overall to a nearly 15-point increase in poverty (from 17 to 31 per cent of the population) during this time frame.[8] It would seem at first blush that Pakistan is losing ground with regard to MDG 1.

Thus the nine countries studied as part of this project corroborate the substantial inter-country and intra-country variations in the pace of progress toward Goal 1 of the MDGs. While this illustrates the potential for progress in the low achievers, it also indicates the distance that remains to be travelled. The country studies also illustrate the possibility of individual countries that register substantial progress in poverty reduction slipping back. Thus ICT needs to be harnessed not merely to contribute to and facilitate poverty reduction, but also to constantly monitor poverty trends and alert policy makers of likely or actual reversals of past achievements.

Poverty is the product of economic processes occurring at a variety of levels – local, national and international. Existing social and economic relations structure the impact of external factors and determine who will have access to subsistence and livelihood opportunities as well as access to education and assets, which can help to increase these choices. In the medium term, success depends on changes in these areas but ICTs can be used to ameliorate poverty in many ways.

Thus, ICTs can be used to increase access to market information, reduce transaction costs for poor farmers and traders, and facilitate the development of alternative marketing strategies. Micro-finance institutions in rural and urban areas, which support these agents and activities, could benefit from the use of ICTs. They can also increase the efficiency, competitiveness and market access of developing country firms, particularly small and medium scale enterprises (SMEs). ICTs can also enhance the cost effectiveness and reach of government services, enhance the provision of public services with a pro-poor focus (e-government) and facilitate development of integrated solutions. Finally, ICTs can facilitate poverty mapping and monitoring, help evaluate the impact of poverty reduction strategies and mediate enhanced support to the poor.

The nine countries studied for this Report corroborate the substantial inter-country and intra-country variations in the pace of progress toward Goal 1 of the MDGs

The battle against hunger

The mixed picture on the poverty reduction front is supported by similar evidence with regard to reduction of hunger. Across the Asia-Pacific region, over the 1990s, the proportion of underweight children fell only from 35 to 31 per cent, making the pace of reduction inadequate

Table 2.2 ***Children under five moderately or severely underweight, per cent***

Country	1990	1991	1992	1993	1999	2000	2001	2002
China	19.1	—	—	—	—	10.0	—	—
India	—	—	—	53.4[a,b]	47.0[c,d]	—	—	—
Indonesia	—	—	—	—	26.4	—	—	26.1
Malaysia	—	—	—	23.3	—	—	12.4	—
Mongolia	—	—	12.3[e]	—	—	12.7	—	—
Pakistan	—	40.4[f]	—	—	—	—	—	38.0[h]
Sri Lanka	—	—	—	—	—	29.4[g]	—	—
Thailand	—	—	—	18.6	—	—	—	—
Vietnam	—	—	—	—	—	33.1	—	—

Note: The years presented are those for which data are available for the countries considered in the period 1990-2002. [a] Data for 1992-93; [b] Age group is 0-47 months; [c] Data for 1998-99; [d] Age group is 0-35 months; [e] Age group is 0-48 months; [f] Data for 1990-91; [g] Age group is 3-59 months; [h] Data for 2001-02

Source: UNICEF estimates, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005

ICTs can be used to increase access to market information, reduce transaction costs for poor farmers and traders, and facilitate the development of alternative marketing strategies

to realize the MDG in this area.[9] This is also true of the proportion of people who could not ensure food intake adequate to meet minimum calorie requirements, which fell from 20 to 16 per cent over the 1990s.[10] According to figures from the global HDR 2002, with respect to the target for the "percentage of undernourished people", while six out of nine countries covered in this study are 'on track', India is 'far behind' and Mongolia is categorized as 'slipping back'. Data are not available for Malaysia.

Pakistan's experience suggests that progress towards realizing the target of reducing hunger and malnutrition can be stymied if the overall poverty alleviation effort is lagging. Two key indicators are used to measure progress in this area: the prevalence of underweight children (under five years of age) and the proportion of the population below a minimum level of dietary energy consumption.

In the past, Pakistan had made modest progress in lowering the number of malnourished children. While in 1978, nearly half (49 per cent) of all children under five years of age were malnourished, the figure dropped steadily, if slowly, to 40 per cent in 1990 and 38 per cent in 1995.[11] UNICEF data suggest that the figure had not changed by 2002 (Table 2.2). Further, the Pakistan Human Condition Report[12] states that malnutrition in children under five years of age stood at 42 per cent in 1998. In human terms, this translates into 10 million malnourished children, two-thirds of whom are stunted, 40 per cent underweight, and nearly 10 per cent wasted. Clearly, these are unacceptable levels. This situation has arisen because ground on poverty reduction, in general, is being lost. According to FAO measures used for the World Development Indicators database, nearly a quarter of the population in Pakistan lacked the necessary calorie intake for a reasonable subsistence in 1990, as did 20 per cent in 2001 (Table 2.3).

As has been repeatedly stated, hunger and malnutrition are not the result of inadequate food availability. Thus, although Thailand is one of the top producers and exporters in the world food market, 18 per cent of its population, or 11.5 million people, are undernourished, and 19 per cent of children under five are under-

Table 2.3 ***Proportion of population below minimum dietary energy consumption***

Country	1991	1996	2001
China	17[a]	12[b]	11[c]
India	25[a]	21[b]	21[c]
Indonesia	9[a]	6[b]	6[c]
Malaysia	3[a]	2[b]	2[c]
Mongolia	34[a]	46[b]	28[c]
Pakistan	24[a]	19[b]	20[c]
Sri Lanka	28[a]	26[b]	22[c]
Thailand	28[a]	21[b]	20[c]
Vietnam	31[a]	23[b]	19[c]

Note: The years selected in the period 1990-2004 are those for which data are available for the nine countries considered. [a] 1990-92 average; [b]1995-97 average; [c]2000-02 average

Source: FAO estimates, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005.

Table 2.4 ***Net enrolment ratio in primary education***

	1990	1998	1999	2000	2001
China	97.4	—	—	92.8[a]	94.6
India	—	—	83.8	83.3	82.8
Indonesia	96.7		91.1[a]	91.9	92.1
Malaysia	93.7[a]	97.4	99.1	96.9	95.2
Mongolia	90.1[a]	89.4	90.6	90.0	86.6
Pakistan	34.7[a]	—	—	59.1[a]	—
Sri Lanka	89.9[a]	99.8	—	—	—
Thailand	75.9[a]	79.6[a]	84.2[a]	86.8[a]	86.3
Viet Nam	90.5[a]	96.7	96.3	95.4	94.0[a]

Note: [a] UNESCO Institute for Statistics (UIS) estimation.
Source: UNESCO, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005.

weight. Although ICTs may not be able to have a direct impact (as in the case of education) by way of increasing food supply and reducing hunger, they can have an impact through a variety of related processes. ICTs can decrease the vulnerability of deprived people and improve poverty mapping, particularly in times of drought and famine. The effectiveness and impact of development programmes in the affected regions can be increased through the use of ICTs. More generally, ICTs can assist in mitigating poverty and hunger by providing systems that improve the provision of public services and enhance access to government programmes (e-government) for the poor. For example, ICTs can enhance the effectiveness, reach, functioning and transparency of public distribution and related systems, as illustrated by the Right To Know initiative in Rajasthan, India. By providing market and price information they could improve the efficiency of markets, and thereby help reduce the cost of access to food. Lastly, ICTs help to facilitate research and development, and information sharing on agricultural farm extension technologies and approaches, development of effective seed technologies, etc., particularly those that can work to enhance food security and subsistence.

Goal 2: Achieve universal primary education

The target of ensuring, by 2015, that children everywhere, boys and girls alike, will be able to complete a full course of primary schooling is important for human development. Having an educated workforce is the key to future national prosperity, and a basic requirement in that direction is for all children to be enrolled in primary school. Net enrolment† in the Asia-Pacific region has remained static at about 93 per cent between the early and the late 1990s.[13] However, in this area, the limited data available suggest that country level achievements have been significant. According to UNICEF data, China, Malaysia and Vietnam are significant performers in the target pertaining to the indicator 'net enrolment ratio', though there are marginal reversals of past achievement. China and Malaysia are also close to achieving the target for the indicator 'proportion of children reaching grade 5', closely followed by Sri Lanka and Thailand (Tables 2.4 and 2.5).

ICTs can assist in mitigating poverty and hunger by providing systems that improve the provision of public services and enhance access to government programmes (e-government) for the poor

National figures suggest that progress in some countries has indeed been remarkable. The net primary school enrolment rate (NER) in China was reportedly raised from 98 per cent in 1990 to 99 per cent in 2000. Meanwhile the NER of secondary schools was raised from 75 per cent in 1990 to 95 per cent in 2000. Youth above 15 years of age received 7.85 years of education in 2000, which was much longer than the 5.33 years estimated for 1983.[14]

However, the picture is not the same everywhere. India's record on the educational advancement front after five-and-a-half

† Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. However, what matters is the net enrolment ratio, which is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age.

Table 2.5 ***Proportion of pupils starting grade 1 and reaching grade 5***

	1990	1998	1999	2000
China	86.0	97.3	—	98.0[a]
India	—	62.0	59.0	—
Indonesia	83.6	—	—	89.2
Malaysia	98.2	—	—	—
Mongolia	—	—	—	—
Pakistan	—	—	—	—
Sri Lanka	94.4	—	—	—
Thailand	—	94.1[a]	—	—
Vietnam	—	82.8	85.7	89.0

Note: [a] UNESCO Institute for Statistics (UIS) estimation.
Source: UNESCO, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005.

The target of ensuring, by 2015, that children everywhere, boys and girls alike, will be able to complete a full course of primary schooling is important for human development. Having an educated workforce is the key to future national prosperity

decades of Independence is indeed poor. The slow rates of improvement in literacy and education for both men and women remain major failures of the Indian development process. India still contains the largest number of illiterate people in the world, and also the largest number of illiterate women. According to the Census of India, the literacy rate did rise from 43.57 per cent to 52.21 per cent between 1981 and 1991 and touched 65.38 per cent in 2001. Further, the literacy requirement is set so low that, in most cases, being literate would be inadequate to be competent enough to become digitally literate. A minimum of school education would be a prerequisite beyond a point. Here too the picture is dismal. To quote the Public Report on Basic Education in India[15], "at the time of the 1991 Census and the National Family Health Survey (1992-3):

- half of the country's population (61 per cent of women and 36 per cent of men, aged seven and above) was unable to read and write
- only 30 per cent of all adults had completed eight years of schooling, and
- one-third of all children aged six to 14 years (about 23 million boys and 36 million girls) were out of school."

India's record on the education front, while indicating progress, shows that much remains to be done. School enrolment ratios show a significant increase across India, although there is substantial evidence from micro studies and other surveys that these are typically overestimates. Gross enrolment ratios measure the ratios of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. These were close to or at 100 per cent throughout the 1990s. However, what matters is the net enrolment ratio, which is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age.

Here, though there have been some signs of improvement, the Education For All goal is far away. According to National Family Health Surveys (NFHS) of 1992-93 and 1998-99, the proportion of children in the six to14 age group attending school rose between these two periods from 62.6 to 75.7 per cent in rural India and 82.4 to 87.6 per cent in urban India. This implies that in the latter period more than one in every five children in the six to 14 age group was not attending school.

Further, the proportion of pupils starting grade 1 who reach grade 5, or persistence to grade 5 (measured as percentage of cohort reaching grade 5), is estimated at a virtually stagnant 59 per cent in 1993 and 60 per cent in 1998. Official figures of the drop-out rate for 1997-98 in the Class I-V category was 39.38 per cent, in the Class I-VIII category was 54.14 per cent and in the Class I-X category was 69.33 per cent.[16] Thus there appears to be little progress towards achieving the goal of a full course of primary schooling for children by 2015.

To deal with this kind of problem, Indonesia recently revised the law of compulsory primary education that changed the mandatory period from six to nine years. However, compulsory

education there is not the same as in the western world where the law ensures that the government would have to guarantee that all school-age children attend school. Indonesia is unable to provide such a guarantee due to a limited education budget. Thus the decision to declare nine years of compulsory education appears more relevant from the point of view of encouraging the State to pay more serious attention to education by allocating a larger share of the budget to that sector. In the interim, the management of primary education is much better in affluent regions than in those with little or no resources and potential. In remote areas that have no basic infrastructure such as service roads and utilities, the condition of primary education is barely adequate at best.

In Malaysia the national education system recommended by the Education Committee Report of 1956 stipulated that every child be given a place in primary school. Based on these recommendations, primary school fees were abolished in 1961 and the school-leaving age was raised to 14 years. Basic education was extended to include not only the primary level but also three years of lower secondary schooling during the First Malaysia Plan (1966-70). The introduction of a comprehensive education system in 1965 raised the years of school-level education to 15. Free education for children right up to the upper secondary level was introduced during the Fourth Malaysia Plan (1981-85) and this extended free universal education from nine to 11 years.

As a result of these changes, enrolment rates for primary education rose from 53.2 per cent in 1970 to 98.8 and 97.7 per cent in 1990 and 2000, respectively, for ages six to 11. For secondary education (ages 12-18), the figure rose from 47.1 per cent in 1980 to 52.0 and 59.3 per cent in 1990 and 2000, respectively. Increases in the number of primary schools (4,443 in 1970 and 7,231 in 2000), the student-to-teacher ratio (31.5 in 1970 and 19.0 in 2000) and the number of primary school students (617,406 in 1970 and 2,933,877 in 2000) have all contributed to early achievement of the MDG target.[17]

Sri Lanka now enjoys a high literacy rate, which is 91.6 per cent overall, 94 per cent for men and 89 per cent for women. The school enrolment ratio is also higher than that in most developing countries. Both these features bring Sri Lanka on par with developed countries. In 1996-97, 20.7 per cent of the population had had some sort of tertiary education while about 35 per cent had completed secondary schooling and another 35 per cent primary schooling. The percentage of the population, which had never had any formal education, was only 8.6 per cent – a sharp decrease from 41.8 per cent in 1953.[18]

Thailand too has a high rate of literacy for those in the 15-24 age group. ESCAP/UNDP[19] reports that in 2002 the literacy rate for females was 98.5 per cent and for males as high as 99.5 per cent.[20] Until recent reform, six years of primary schooling was compulsory in Thailand. Consequently, Thailand has achieved nearly universal primary education since 1995. However, despite the high enrolment rate, the retention ratio within the education system gradually declines throughout the schooling years. Only 80 per cent of those Class 1 students who enrolled in the year 1990 have reached the last year of primary schooling. Just over 60 per cent of those students have continued further to the last year of lower secondary education. And less than half of those students attended upper secondary school.[21]

Vietnam's primary education enrolment rates have also increased considerably to over 90 per cent.[22] This is especially impressive given the country's low level of income. Still, there are a number of underlying qualitative shortcomings that would need to be redressed to fully meet this MDG. Almost one-third of children do not complete grade 5. Moreover, 70 per cent of drop-outs are girls, reflecting their traditional roles and obligations at home. In addition, primary school pupils spend less than half the normal school day in class. Disparities in both quantity and quality of primary education widen as poor families are unable to top up schooling hours on a private basis. Furthermore, net primary enrolment rates in the 12 weakest performing provinces are more than 20 percentage points lower on average than in the 12 best performing provinces. Whereas Ho Chi Minh City achieves a net enrolment rate of over 90 per cent in primary education, Binh Phuoc, hardly four hours down the road, scarcely achieves 50 per cent. Such disparities increase further at higher levels within the education system.

Besides inadequate progress towards the MDG in some cases, most countries are characterized by poor progress in rural areas and specific remote locations. Poverty is an important determinant of educational attainment

In other cases, performance has been poor and there are even signs of reversal of earlier achievement. In Mongolia, which has a creditable literacy rate that stood at 96.5 per cent in 1989 and 97.8 per cent in 2000, the net enrolment ratio in primary and secondary schools of children in the age group eight to 15 fell from 93.5 per cent to 86.5 per cent.[23] Similarly, in terms of enrolment in primary education, Pakistan shows a relatively poor performance, lagging behind countries at similar income levels by as much as 20 per cent. Much of this lag is accounted for by the gender gap: 40 per cent fewer girls attend primary school in Pakistan than in similar countries. Thus, the challenge in Pakistan in meeting this Goal is to increase overall primary school enrolment and, in doing so, to close the enrolment gender gap.

In recent years, however, national figures suggest that the country has lost ground on enrolment, with overall net enrolment dropping during the 1990s from 46 to 42 per cent. Not surprisingly, the decline was more abrupt in rural areas than urban. Interestingly, the percentage of females enrolled, while significantly lower than males in terms of overall enrolment, dropped out less than male enrolment during this same period (e.g., from 31 to 30 per cent in rural areas, compared to a decrease in male enrolment from 50 to 43 per cent).[24] Small gains and losses at the margins aside, Pakistan has a formidable task ahead in bringing net primary enrolment to 100 per cent by 2015. Seen against this background the UNICEF figure, though low at 59 per cent in 2000, is reassuring (Table 2.4).

In sum, besides inadequate progress towards the MDG in some cases, most countries are characterized by poor progress in rural areas and specific remote locations. Poverty is an important determinant of educational attainment. Even in those countries where primary schooling is free, expenses are still incurred for purchasing items such as books, equipment and uniforms. The most deprived families may also rely on their children not only to contribute to the family income but also to attend to domestic work and child care. Young girls are particularly vulnerable to pressures to drop out of school for this reason. In addition, families have even less incentive to send their children to school when the schools may be poorly equipped or staffed.

These factors notwithstanding, there is adequate cross-country evidence to suggest that supply-side adjustments can substantially influence educational achievement. This makes the role that an enabler like ICT can play in an area such as education quite significant. It can do so by improving the delivery and administration of educational services by providing wider access to educational material, and improving the quality of content and pedagogy. Given the ability of ICT to provide access to quality educational resources at low cost over a wide geographical area, its role is obvious. It can not only help boost the effort at providing education, but can help reach it to the marginalized, irrespective of their location. Above all, it can serve these purposes by reducing the cost of provision of educational services as well as improving quality – two features that may keep children back at school and stem the rise in the drop-out rate as the years of schooling increase.

There is adequate cross-country evidence to suggest that supply-side adjustments can substantially influence educational achievement. This makes the role that an enabler such as ICT can play in an area like education quite significant

In fact, education is one area where ICTs have been shown to have the most impact. However, countries should not begin with pre-conceived notions of educational applications (distance learning), but focus on content, solutions and capacity development. One objective should be to improve the efficiency and effectiveness of educational administrators, authorities and enablers through the strategic application of ICTs and through ICT-enabled skill development. The technology can also be used to support teacher training, learning and capacity development. Finally, ICTs can be used to broaden the availability of quality educational materials and resources.

All of this depends on cost reduction, an issue discussed later. ICTs can enable the realization of MDGs only if they provide cost effective tools that can be used in adequate measure. This requires efforts in both developed and developing countries and the forging of partnerships between public and private sectors.

Goal 3: Promote gender equality and empower women

An area where progress has been disconcertingly slow across the region is gender equity. The crucial target for this goal is the elimination of gender disparity in primary and secondary education, preferably by 2005, and at all levels of education no later than 2015. In terms of primary education there is still some way to go in

the Asia-Pacific region. The data collected by ESCAP/UNDP[25] for 46 of the 58 countries in the region point to the persistence of moderate or severe disparities. Overall, countries have performed modestly in terms of female gross enrolment ratios for both primary and secondary education.

However, the picture in countries such as Pakistan and India is far less encouraging. Although literacy rates have increased in the 1990s for both males and females, the gender gap in 1999 continued to be quite high, with literacy rates for males being 58.3 per cent and for females 33.5 per cent.[26] The problem is compounded by the lack of access by women to education; women constituted only 28.9 per cent of the student body in the 26 public sector universities, and there were only 10 vocational colleges for women out of a total of 172 in Pakistan.[27]

Associated with India's unsatisfactory progress on the literacy and education fronts, are substantial gender differentials in even the modest achievements that have been recorded. The percentage of females among pupils at the primary education stage rose from 41 in 1990 to 43 in 1992, stagnated at that level till 1996 and rose to 45 in 1998. This is a pace of change where the likelihood of the realization of the MDG target is close to nil. The proportion of females among secondary school pupils stagnated at 37 per cent between 1992 and 1995 and then rose marginally to 38 per cent in 1998, where it remained even in 1998. Drop-out rates too tend to be much higher for girls than for boys. Typically, by middle school the ratio of girl to boy students falls sharply, especially in rural areas.[28]

What is more, the ratio of illiterate female to male 15-to-24-year-olds remained stagnant at 1.6 from 1990 to 2001. Female literacy rates are much lower (with the illiterate proportion usually between 50 and 70 per cent) among Scheduled Tribes and Scheduled Castes, as well as among certain minority groups.

However, the experience in other countries leads one to be optimistic. In the case of China, improvement through the 1990s had ensured that in 2000, the ratio of primary school girls to boys increased to 91 per cent, and the ratio in secondary education to 85 per cent. However, rural and minority girls have much less of an opportunity to receive a full primary education and an even lower probability of completing secondary education. Further, in 1999, the average duration of education for men and women was, respectively, 8.1 years and 6.6 years. On the literacy front, between 1990 and 1999, the ratio of female adult illiterates declined by 10 percentage points. However, the ratio of female adult illiterates is, at 22 per cent, higher than that for male adults by 9 percentage points.[29]

China, like India, reveals a wider gender gap in secondary rather than in primary education (Tables 2.6 and 2.7), though China is 'on track' and India is rated as 'far behind' in maintaining gender equality. China has room for improvement in this area although the ratio rose from

ESCAP/UNDP data on 46 out of 58 countries in the region point to the persistence of moderate or severe disparities in female gross enrolment ratios

Table 2.6 ***Progress towards MDG 3 by nine Asian countries***

Goal 3: ***Promote gender equality and empower women***

Target 4: ***Eliminate gender disparity in all levels of education***

Indicator 9: ***Female gross primary enrolment ratio as % of male ratio***

Country	Achieved	On track	Lagging	Far behind	Slipping back
China	●				
India		●			
Indonesia		●			
Malaysia	●				
Mongolia	●				
Pakistan (NA)					
Sri Lanka		●			
Thailand (NA)					
Vietnam		●			

Source: UNDP Human Development Report, 2002.
NA: Data not available

Table 2.7 ***Progress towards MDG 3 by nine Asian countries***

Goal 3: ***Promote gender equality and empower women***

Target 4: ***Eliminate gender disparity in all levels of education***

Indicator 9: ***Female gross secondary enrolment ratio as % of male ratio***

Country	Achieved	On track	Lagging	Far behind	Slipping back
China		●			
India				●	
Indonesia		●			
Malaysia	●				
Mongolia	●				
Pakistan (NA)					
Sri Lanka	●				
Thailand (NA)					
Vietnam		●			

Source: UNDP Human Development Report, 2002.
NA: Data not available

Participation of women in decision-making at the national parliamentary level is less satisfactory: this is typically below 10 per cent in most developing countries in the region

0.71 in the early 1990s to 0.82 in the late 1990s. Malaysia and Sri Lanka are categorized as 'achieved' while Vietnam is 'on track'. In the case of Pakistan and Thailand data were not available.

In Indonesia, the expansion in the education system has benefited women, particularly after the government introduced the policy on compulsory basic education till nine years and abolished the payment of primary school fees. At the primary school level, enrolment of girls and boys is equal. The proportion of illiterate women aged 10-44 years decreased from 7.6 per cent in 1996 to 5.3 per cent in 1999, while that of illiterate men fell from 3.8 per cent in 1996 to 2.7 per cent in 1999.[30]

The most striking case is Mongolia, where there are far more girls than boys enrolled in secondary education, with the enrolment ratio of girls to boys at 1.11.[31] Also male enrolment rates, particularly at the higher grades, have declined more sharply than female rates. This could be related to the privatization of ownership of animals, when more boys were required to undertake herding. In 2000, the number of boys dropping out was 42,078, which amounted to 61.7 per cent of total drop-outs. However, girls' secondary school enrolment rate, although high, is still below the target of 95 per cent.[32] The transition has had a sharp impact on enrolment rates for girls and boys, eroding the achievements in the previous period.

In Thailand, thanks to the expansion of the formal and non-formal education system, and the compulsory education decree covering nine years of schooling, girls and women have enjoyed equal opportunities, and have even outperformed boys and men in various ways. In 2000, the ratio of girls to boys was 0.93 at the primary level and 1.01 at the secondary level.[33] This pattern of gender equality is observed across all regions including the poverty-stricken Northeast, and some Muslim-dominated provinces in the South. There are also more women than men in public universities. The ratio had increased steadily over the past decade to 1.15 in 2001. The numbers are more staggering in private universities that have become an important provider of higher education. The female-to-male enrolment ratio was 1.51 in 2000, while the female-to-male graduate ratio was 1.70. Gender equality was also observed in youth literacy (aged 15-24).[34] The ratio of female-to-male literate youth was 0.97. Women accounted for 53 per cent of the small proportion (2 per cent) of illiterate youth. There is, however, more illiteracy among both men and women and more gender imbalance in older groups. The most disadvantaged group is women over 60. One in three women over 60 is illiterate, compared with one in five for men.

In Vietnam, gender disparities in education are significant but smaller than in countries with similar levels of economic development. However, while net enrolment rates for primary education are nearly equal between boys and girls, access to lower and upper secondary school for girls remains significantly lower than that for boys. Girls also account for 70 per cent of all drop-outs, which must be redressed to achieve greater equality.[35]

Finally, Malaysia ranks among the top in the world in terms of the ratio of females-to-males in primary, secondary, and tertiary education. In fact, Malaysia has more than achieved the targets in the MDG area of eliminating gender disparity in primary and secondary education well before the preferred 2005 timeline. It has also already achieved the goal of parity at the tertiary education level where the targeted timeline for the MDG goal is 2015.

Women's participation in work

Data on the proportion of women who are actively involved in wage employment in the non-agricultural sector is scarce. Available data suggest that, despite substantial differences in levels, the proportion of women engaged in wage employment is on the rise. By 2002, the share of women is estimated to be, despite the increase in the 1990s, as low as 8.9 per cent in Pakistan, followed by India with 17.3 per cent. Vietnam and Mongolia top the list, with 51.4 per cent and 49.4 per cent, respectively (Table 2.8).

Less satisfactory though is the participation of women in decision-making at the national parliamentary level: this is typically below 10 per cent in most developing countries in the region. A notable exception is Vietnam, where the proportion of women in the national parliament has increased significantly from 18 per cent in the early 1990s to 26 per cent in the late 1990s.[†36] It needs to be noted, however, that women's representation in parliaments and local governments does not necessarily reflect empowerment in the full sense of the term. There is substantial evidence of proxy representation in political structures, as the decision-making usually lies in the hands of male party workers. However, once women come to occupy these positions, they can be supported in ways that empower them over time. ICTs can play a major role here, such as through the provision of access to information and analysis relating to issues that fall in their ambit of decision-making.

In China, women constituted 47 per cent of the total work force in 2000. Further, 39 per cent of working women were employed in the non-agricultural sectors. In addition, contrary to trends elsewhere, 36 per cent of all government officials and 20 per cent of all entrepreneurs were women.[37]

However, income gaps between men and women continued to widen. The Second Survey of the Social Status of Women conducted in 2000 in China showed that during the second half of the 1990s, although the income of employed women greatly increased, income gaps compared with men grew wider. The survey showed that the average monthly income for men in Shenzhen was 5,098 Yuan (approximately US$ 616), while that for women was 2,947 Yuan (US$ 356). Thus, the monthly income of men was 1.7 times higher than that of women. In Hefei, the average monthly income of men was 847 Yuan (US$ 102), while that of women was only 616 Yuan (US$ 74).

The status of women in the administrative and political fields has also improved steadily in China. Almost all the provinces, autonomous

Available data suggest that, despite substantial differences in levels, the proportion of women engaged in wage employment (non-agricultural sector) is on the rise

Table 2.8 ***Share of women in wage employment in the non-agricultural sector***

Country	1990	1995	2000	2002
China	37.7	38.7	39.1[a]	39.4[a]
India	12.7	14.4	16.6	17.3
Indonesia	29.2	29.0	31.7	29.7
Malaysia	37.8	35.9	36.7	37.7
Mongolia	47.5	47.0	48.5	49.4
Pakistan	6.6	7.5	7.4	8.9
Sri Lanka	39.1	44.0	46.0	37.3
Thailand	45.3	44.0	46.1	46.7
Vietnam	45.2	48.7[a]	50.7[a]	51.4[a]

Note: [a] Imputed values prepared using statistical models.
Source: ILO, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005.

[†] Figures in this paragraph are from the United Nations, Common Database: Millennium Indicators Database (UNESCO, ILO, IPU).

regions and municipalities have female officials in government and the proportion of female officials had reached 36.2 per cent of the total. Despite the progress in women's social and political participation, the level of women's participation in national and social decision-making is still low. In 2000, the proportion of female leaders in provinces and municipalities was 8 per cent, marking an advance of just 2 percentage points since 1995.

In India, figures from the NSSO reveal that the percentage of women in the 15+ age group who were either working in a casual, principal and secondary status or seeking or available for work fell from 44.4 per cent in 1983 to 42 per cent in 1993-94 and 38.5 per cent in 1999-2000. This was not only far greater than the fall from 87.1 to 85.4 and 83.5 per cent, respectively, in the case of men, but was due to a much sharper fall in rural than in urban areas.

Throughout the region a range of measures is required to reduce gender inequality, varying from creation of employment opportunities specifically for women to reforming social practices that work against them

Within the category of paid employment, gender differentials in wages are lower in India than elsewhere in Asia, including, in East and South East Asia. However, in recent times those differentials appear to be widening in both urban and rural areas. Thus, besides general worsening of conditions of employment, gender-based job segregation, which ensures that women find work at the lower end of the skill and value-added spectrum, appears to have played a role.

In Indonesia, the labour force participation rate of females aged 10 and above was 45.6 per cent in 1999 and that for males 73.5 per cent.[38] According to the global HDR 2002, the share of employment in the agricultural sector in total employment (1995-2001) for men and women was almost equal, with the figure for women at 42 per cent and that for men at 41 per cent. In the case of the industrial sector, the employment share in total was only 16 per cent for females, while it was 21 per cent for males. The service sector's contribution to total employment was higher for women (42 per cent) than for men (39 per cent). However, two years of severe economic crisis (1997-99) had affected women adversely. According to a National Development Planning Board Study,[39] about 17.8 per cent of the total population lived below the national poverty line. Almost half of the poor were women.

Although, in 2001, Indonesia had its first female President, the number of women in positions of policy- and decision-making in the government remains low. There were only two women cabinet ministers in the government as of April 2003. In the parliament also the number of women representatives remained low. In 2002, only 8 per cent of members of parliament were women. In 2004, only 8 per cent of members of parliament were women.[40]

The figure for women in wage employment in the non-agricultural sector has held steady at 36 per cent in Malaysia for the past decade, indicating room for some measures to increase their participation in the industrial economy. The female labour force participation rate has stagnated at around the mid-40 per cent level. However, close to 60 per cent of women outside the labour force have at least upper secondary education or above and a significant number of women, including those with tertiary education, opt out of the labour force starting at the relatively young age of 45+ years. In the political arena, the proportion of seats held by women in the national parliament amounts to slightly more than 10 per cent of elected representatives.[41]

In Mongolia, women's share in employment is within the ideal range but has fallen since 1989, as a result both of the decline of industry and industrial employment, and women's share within the sector. The privatization of herds, housing and state enterprises has overwhelmingly benefited men rather than women. Women have had to find alternative means of survival, usually through self-employment in the informal sector. Their representation in decision-making is also very limited. As of 2000, women held 11.8 per cent of the seats in parliament, and 4.5 per cent of the speakerships of *aimag* and capital citizen's *khurals*, and accounted for 12.9 per cent of their members. Similarly, 13 per cent of the speakers of *soum* and district *khurals*, and 25 per cent of their members, were women. Except for one vice cabinet secretary, one vice minister and one ambassador, there are no women ministers or even *aimag* governors. Sixteen per cent of the heads of departments within line ministries and 3.3 per cent of *soum* and district governors are female.[42]

Fundamental rights of women in Pakistan are curtailed through a combination of discriminatory laws, cultural practices and social exclusion. The situation was further aggravated by a

controversial suite of "Islamic laws" introduced during General Zia's military regime (1977-88), which have sanctioned discriminatory treatment of women.

A telling statistic, which reflects the adverse ratio for life expectancy as well as cultural bias towards male children is the overall ratio of men and women in the population. In contrast to many other countries, in which women outnumber men in the total population, the gender ratio in Pakistan in 2000 was, at 108:100, in favour of men. Not surprisingly, the female labour force participation rate of 13.7 per cent is far below the 70.4 per cent participation rate for men, and the proportion of women in the non-agricultural work force has consistently remained below 9 per cent.[43]

While basic gender development indicators are satisfactory for Sri Lanka, the empowerment of women still remains a challenge. The female labour force participation rate in 2001 was 32.4 per cent, while the rate for males was 66 per cent. The total labour force of Sri Lanka by the end of 2001 consisted of 33.5 per cent women and 66.5 per cent men. Fifty-two per cent of working women (as compared with 37.8 per cent of working men) are involved in the agriculture and fisheries category, crafts and related work. Interestingly, while nearly 10 per cent of working women are professionals, the corresponding percentage for men is less than half of that. Notwithstanding this, only 1.5 per cent of the working women are in the senior official or manager category, whereas 2.2 per cent of working men are at this level. Among the senior officials and managers in Sri Lanka's public and private sectors, 25.6 per cent are women and 74.4 per cent are men.[44]

Though Sri Lanka currently has a woman head of state and had the first woman prime minister in the world in 1960, the number of women seeking election to public office remains low. Parliamentary seats held by women as a percentage of the total number of seats was 4 per cent in 2000 – a decline from 4.8 per cent in 1994. There was only one woman cabinet minister in the government as of April 2003 and she headed the ministry of women's affairs.

Empowerment is also the weakest link in the overall gender situation in Thailand. Over the 1990s, the percentage of women in the national parliament increased from 2.23 per cent to just 9.57 per cent in 2001. Thailand has a rather high labour participation rate, and that rate is higher in the non-agricultural sector. Women workers play an important role in manufacturing, where docile and disciplined workers are sought for the assembly lines. These women earn only around four-fifths of the wage paid to their male counterparts. Similarly, while women constitute a large part of the work force in the public sector, they have only 14.19 per cent of high-level management positions.[45]

In Vietnam, the socio-economic situation of women appears to have improved substantially over the last 10 years. Female representation in Vietnam's National Assembly is high relative to other countries, with women comprising some 25 per cent of delegates in the 11th Legislature of the National Assembly. At the provincial level, at the turn of the decade, the number of female representatives in People's Councils was significantly lower than that for men, though there were significant variations across provinces. In provinces like Tuyen Quang, Dong Nai and Son La nearly one-third of representatives were female, while in others such as Tra Vinh and Khanh Hoa the figure was below 10 per cent.

Thus, it is clear that throughout the region a range of measures is required to reduce gender inequality, varying from creation of employment opportunities specifically for women and ensuring equal pay for equal work to changing mind-sets and reforming social practices that work against giving women an equal position in the economic, social and political mainstream. The use of ICTs for realizing the MDG in this area must be assessed in terms of its ability to influence outcomes on one or more of these fronts.

To cite some obvious applications, ICTs can deliver educational and literacy programmes specifically targeted at poor girls and women, using appropriate technologies in both formal and non-formal educational settings (e.g., public access centres). In addition, such technologies can be used to influence public opinion on gender equality through information and communication programmes using a range of ICTs.

Goal 4: Reduce child mortality

With regard to the goal of reducing under-five mortality, the region as a whole appears to be 'on track' to achieving the target of reducing

With regard to the Goal of reducing under-five mortality, while the region as a whole appears to be on track to achieving the target of reducing the rate by two-thirds, there are still millions of children dying before reaching five

the rate by two-thirds. However, there are still millions of children dying before reaching five because of significant inter-country disparities in achievement. Of the 44 countries for which data were available, ESCAP/UNDP[46] projected that only 18 will succeed, while 26 will fall short of the goal.[47] Of the nine countries that are the focus of this study, HDR 2002 categorized Indonesia, Malaysia, Mongolia, Sri Lanka and Thailand as 'on track' towards achieving this goal, while India and Vietnam were lagging. Pakistan and China were categorized as 'far behind'. In 2003 Pakistan had the highest under-five mortality rate (103), 'far behind' its 2015 target of 42 per 1,000 live births (Table 2.9). China was also similarly placed according to this assessment.

In fact, in China, rapid improvements in health-care before 1990 gave hope that mortality rates of under-fives could be cut by two-thirds in the following 25 years. However, the experience since then points to the persistence and widening of rural-urban differentials as a result of which the rural mortality ratio is three times higher than the urban. This could affect its realization of the MDG in the area.

Even in an area where the effort to realize the MDG is less difficult, such as the Goal of reducing child mortality, and where some countries have already achieved the target, there are many who are slipping or falling far behind

The experience in India is similar. Evidence from the Registrar General's Sample Registration Surveys (SRS) suggests that, while Infant Mortality Rates (IMRs) have declined over time, the rate of decline has decelerated over the 1990s. This problem is more pronounced among girls. The IMR for males fell by 26 per cent between 1981 and 1991 (from 110 to 81 per 1,000) but only by 12 per cent over the subsequent decade, to 71 per 1,000.[48] The deceleration in the rate of decline of infant mortality among girls over the two decades was even sharper, with the rate of improvement falling from 27 per cent to 10 per cent, such that the female IMR was 72 per 1,000 in 2001. Of course, this conceals the extent of female foeticide which is likely (if anything) to have brought down female IMRs. Even by the mid-1990s, of the more than 25 million children born every year, close to 2.5 million were expected to die before they were one year old and another 1.2 million before reaching the age of five. A major cause of morbidity is, of course, malnutrition. Nearly one out of every two children was malnourished on both weight-for-age and height-for-age bases. More than a third of women were undernourished as per the Body Mass Index (BMI) and over a half of ever-married women and three-fourths of children suffered from anaemia.

Indonesia recorded a 30 per cent decline over 15 years in IMR. The figure fell from 65 deaths per 1,000 live births in 1982-87 to 46 per 1,000 live births in 1992-97. During the same period, under-five mortality declined at a faster rate (39 per cent) from 95 per 1,000 live births to 58 per 1,000 live births.[49] In 2003 UNICEF-WHO data indicate that infant and under-five mortality rates stood at 31 and 41 per 1,000 live births, respectively.

With free access to pre-natal care, infant and child mortality rates in Sri Lanka are significantly lower than elsewhere. This achievement is primarily due to the educational levels of women who are the primary care-givers of children. A gender and health survey carried out in 1997 discovered that in 93 per cent of the cases surveyed, mothers made decisions regarding the health of children.

Table 2.9 ***Children under-five mortality rate***

Country	1990	1995	2000	2003
China	49	46	40	37
India	123	104	94	87
Indonesia	91	66	48	41
Malaysia	21	12	9	7
Mongolia	104	89	75	68
Pakistan	130	118	108	103
Sri Lanka	32	25	20	15
Thailand	40	34	29	26
Vietnam	53	44	30	23

Source: UNICEF-WHO, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005.

In Mongolia, UNICEF-WHO figures estimated that infant and under-five mortality rates fell significantly in the last decade. IMR declined from 74 in 1990 to 56 per 1,000 in 2003, while the under-five mortality rate declined from 104 per 1,000 in 1990 to 68 in 2003 (Tables 2.9 and 2.10).

In Vietnam too, under-five child mortality rates have been reduced significantly from 53 per 1,000 live births in 1990 to 23 per 1,000 live births in 2003. Similarly, IMRs have been reduced from 38 per 1,000 live births in 1990 to 19 per 1,000 live births in 2003. However, regional disparities are enormous. IMR for the 12 weakest provinces is of the order of 60 per 1,000 live births, which is more than thrice that of the 12 best performing provinces (17 per 1,000 live births). The number of children dying before one year of age in a province like Kon Tum is, on average, eight times higher than in Ho Chi Minh City. In addition, malnutrition also remains a serious problem. One-third of all children under five are underweight.

Finally, Malaysia is either close to realizing the target or is 'on track' in this area. The child mortality rate per 1,000 live births was 21 in 1990 and 7 in 2003 and the infant mortality rate 16 and 7, respectively.

The implications of the above description of the experience with reducing child mortality should be clear. Even in an area where the effort to realize the MDG is less difficult, where many countries are 'on track' to realizing the Goal and some have already achieved the target, there are many who are slipping or falling far behind. The majority of children who die before turning five do so because of a combination of malnutrition and preventable diseases such as diarrhoea and measles. Very similar factors seem to explain current levels of infant and under-five mortality. The Indonesia Demographic Health Survey 1997 showed that almost half (47 per cent) of infant deaths occurred in the first month of life (neonatal deaths), and over two-thirds (71 per cent) of those happened in the first six days, the cut-off point for early neonatal death. The Indonesia Household Health Survey 2001 showed that perinatal complications ranked first among the causes of infant deaths (34.7 per cent) followed by acute respiratory-tract infection (ARI) (27.6 per cent) and diarrhoea (9.4 per cent). The leading causes of under-five mortality were ARI (22.8 per cent), diarrhoea (13.2 per cent) and nervous system disorders (11.8 per cent). Neonatal and infant mortality rates are significantly associated with factors determined by the socio-economic status of mothers, such as their health, nutritional status and their access to healthcare from pregnancy through the postnatal period. Two of the three major causes of child mortality were related to communicable diseases. Low birth weight, nutrition and immunization status and influencing factors such as the status of housing, sanitation, clean water supply and healthcare increase child susceptibility to infectious diseases.[50]

Goal 5: Improve maternal health

In the case of maternal mortality, where the goal is to reduce the rate by three-quarters between 1990 and 2015, data to properly assess trends is not available. However, ESCAP/UNDP[51] concluded that there appears to have been very little progress in the 1990s. Across the Asia-Pacific region, it is still common for women to die of childbirth-related circumstances, due to

Across the Asia-Pacific region, it is still common for women to die of childbirth-related circumstances, due to haemorrhage, sepsis, puerperal complications, obstructed or prolonged labour, anaemia and lack of access to health facilities

Table 2.10 ***Infant mortality rate***

Country	1990	1995	2000	2003
China	38	37	32	30
India	84	74	68	63
Indonesia	60	46	35	31
Malaysia	16	11	8	7
Mongolia	74	67	60	56
Pakistan	100	93	85	81
Sri Lanka	26	21	16	13
Thailand	34	29	25	23
Vietnam	38	32	23	19

Source: UNICEF-WHO, http://millenniumindicators.un.org/unsd/mi/mi_goals.asp, accessed in March 2005.

haemorrhage, sepsis, puerperal complications, obstructed or prolonged labour, anaemia and lack of access to health facilities. Teen pregnancies due to early marriage, inadequate child spacing and high parity births combined with deliveries at the hands of untrained birth attendants and poor hygiene, all contribute to avoidable maternal mortality. In many Asian countries where women have a low status, the ability of women to negotiate for control over their own bodies even within marriage cannot be taken for granted.

Data for this MDG is difficult to obtain because estimating Maternal Mortality Rates (MMRs) requires current information on the number of deaths of women of reproductive age and the cause of death. Registration systems needed for such information-gathering are inadequate in most countries in the Asia-Pacific region. Given the lack of reliable data, the tracking of trends in MMRs becomes a formidable challenge.

Progress in dealing with HIV/AIDS and infectious diseases like malaria has also been disappointing in the Asia-Pacific region. HIV/AIDS has been spreading rapidly over the last 15 years, with the number in the region infected as of end 2001 placed at 7 million

However, the available evidence suggests that in China the MMR dropped from an estimated 95 per 100,000 live births in 1990 to 56 in 2000 (Table 2.11). The proportion of births attended by skilled health workers in hospitals increased from 45 per cent in 1990 to 66 per cent in 2000. However, as usual, these national figures mask the great contrast between rural and urban areas. In the urban areas, better economic growth led to medical services for women and good access to emergency obstetric care.

In India, maternal mortality claimed 570 lives for every 100,000 live births in 1990. MMR for the country as a whole was estimated to have declined to 440 per 100,000 live births in the mid-1990s. But available estimates seem to suggest that this rose to 540 in 2000.[52] Thus the slow decline of maternal mortality in India appears to have been reversed during the second half of the 1990s. Once again, there are significant rural-urban differentials, with the rural rate estimated to be nearly double the urban rate.

A part of the reason for the slow decline and even reversal of maternal mortality is that the nutritional problems associated with effective child-bearing remain significant and widespread. Poor nutrition for girls during adolescence (and resultant anaemia and inadequate calcium intake) contributes to future obstetric risk and also affects the reproductive process. While the all-India average intake of calories is substantially below the Recommended Dietary Allowance (RDA) for both men and women, the largest deficits are in the case of pregnant and lactating mothers. This can contribute to foetal loss, low birth weight and death during infancy. Deficiencies of micronutrients are rampant: not only calcium for pregnant and lactating women, but iron, riboflavin and vitamin C for all women.

The MMR for Indonesia was reported to be 650 per 100,000 live births during in 1990, 470 in 1995 and 230 in 2000. Despite the significant decline, the 2000 figure is still high relative to that which prevails in China, Malaysia and Thailand. In response to the continued high MMR and its slow rate of progress, the Ministry of Health had adopted a number of strategic policies. The most recent one was the National Strategy for "Making Pregnancy Safer" (MPS) 2001-2010 that set the target of MMR for 2010

Table 2.11 ***Maternal mortality ratio per 100,000 live births***

Country	1990	1995	2000
China	95(5)	60(5)	56(5)
India	570(1)	440(5)	540(4)
Indonesia	650(1)	470(6)	230(1)
Malaysia	80(3)	39(5)	41(5)
Mongolia	65(3)	65(1)	110(2)
Pakistan	340(1)	200(1)	500(1)
Sri Lanka	140(3)	60(5)	92(5)
Thailand	200(1)	44(5)	44(5)
Vietnam	160(1)	95(1)	130(1)

Source: WHO, UNICEF, UNFPA World Bank, Millennium Indicators Database

1 No national data on maternal mortality available. Estimates derived from model.
2 Data derived from vital registration: countries with good death registration and good attribution of cause of death.
3 Data derived from vital registration: countries with good death registration but uncertain attribution of cause of death.
4 Data from household surveys or census.
5 Data derived from the Reproductive Age Mortality Study. This method involves identifying and investigating the causes of all deaths of women of reproductive age.
6 Data derived from the direct sisterhood method adjusted estimates: The direct sisterhood method is a variant of the sisterhood method – a survey-based technique that obtains information by interviewing respondents on the survival of all their adult sisters

at 125 per 100,000 live births. The MPS strategy has three key messages:

- all deliveries should be handled by trained health providers
- every obstetric and neonatal complication should receive adequate services, and
- every woman at reproductive age should have access to means of prevention of unwanted pregnancy.

In Mongolia, maternal mortality per 100,000 live births appears to have increased since the mid-1990s, though the level in 2000 was better than in some other countries studied. Approximately 60 per cent of the maternal mortality occurred in rural areas. This high mortality is caused by several factors, among which is the lack of information and knowledge about pregnancy and childbirth among both women and men. In rural areas, a member of a family living under the poverty line gets food with 1,587 calories or around two-thirds of the required daily calorie intake. This negatively affects women's health leading to anaemia and antenatal, delivery and after-delivery complications. For example, mothers living above the poverty line died from abortion or ectopic pregnancy, while mothers living below the poverty line died from serious complications at later stages of pregnancy, sepsis and haemorrhage.

Maternal health in Pakistan among poor women is an issue of particular concern. Antenatal and childbirth care by trained staff reaches only 29 per cent of the population. Estimates for the annual number of maternal deaths vary widely, with studies from the mid-1990s reporting approximately 25,000, to more recent press reports of 30,000 in only the country's second-largest province, Sindh. Each year over 375,000 women suffer from pregnancy-related complications. Contraceptive use is low, with estimates varying from 12 to 29 per cent. Available estimates suggest that MMR stood at 340, 200 and 500, respectively, in 1990, 1995 and 2000.

As compared with these cases and due to the wide availability of healthcare, maternal mortality is low in Sri Lanka: it was as low as 65 per 100,000 live births in 1995 and an estimated 92 in 2000. The use of prenatal services is almost universal in Sri Lanka. Surveys have indicated that around 99 per cent of mothers receive some prenatal care. Delivery rarely takes place at home, with 95 per cent of births now taking place in medical institutions. Both factors explain the relatively lower levels of maternal mortality.

In Thailand, the reported MMR fell sharply during the first half of the 1990s and stood at 44 per 100,000 live births in 2000. Health coverage with four antenatal visits was 83.4 per cent in 1995 and the coverage of deliveries attended by health personnel or a trained healthcare worker was 97.9 per cent in 2001. Among pregnant women, the incidence of anaemia was 13.4 per cent in 1995, and was targeted to be reduced to less than 10 per cent by 2000 in the Eighth National Plan of Action on Public Health.

Available data suggest that MMRs in Vietnam have been reduced from an estimated 160 deaths per 100,000 live births in 1990 to 130 per 100,000 live births in 2000, due partly to the decline seen during the first half of the 1990s. Thus, while some progress appears to have been achieved over the past decade, the trend appears disconcerting. Here again, significant regional disparities prevail. More than 40 per cent of women in rural areas still deliver at home, often without professional healthcare assistance, compared with only 7 per cent in urban areas. Similarly, the MMR in the isolated areas of the Central Highlands is estimated to be more than four times higher than the national rate. This is due, in large part, to inadequate access to essential obstetric care, lack of infrastructure in remote and mountainous areas and lack of basic knowledge on maternal healthcare at the household level.

Goal 6: Combat HIV/AIDS, malaria and other diseases

Progress in dealing with HIV/AIDS and infectious diseases such as malaria has also been disappointing in the Asia-Pacific region. HIV/AIDS has been spreading rapidly over the last 15 years. The number of those infected in the region as of end-2001 was placed at 7 million, including 1 million who had become infected in that year alone.[53] On the other hand, "old" diseases such as malaria and tuberculosis are also on the increase with signs of strong drug resistance. The first target associated with this Goal is to halt and begin a reversal of the spread of HIV/AIDS by 2015. The extent of the problem is enormous in the more populous

Since HIV/AIDS tends to be concentrated among certain vulnerable groups and segments of the population, ICTs, including radio and television, can play a major role in targeting these groups

countries. For example, in China, the prevalence rate among adults may be relatively low at 0.1 per cent, but this translates to around 850,000 people and infections have been on the rise. Similarly in India, a prevalence rate of 0.6 per cent means that 4 million people are infected.[54] In Indonesia, infections have been rising among drug users, sex workers and men who have sex with men. However, the case of Thailand is an encouraging example: high prevalence rates have been brought under control through State action. Comprehensive measures have been taken, including the distribution of anti-retroviral drugs to HIV-positive pregnant women.

The second target is to halt the spread of malaria by 2015, and ensure the reversal of the incidence of malaria and other major diseases. The need to curb the spread of malaria has gained urgency recently due to the malarial parasite developing drug resistance and insecticides becoming less effective in controlling mosquitoes. Another serious concern is the spread of tuberculosis (TB). In South East Asia alone there are around 3 million cases reported every year.[55]

ICTs can be shown to have an impact both within the context of the formal healthcare system as well as in facilitating knowledge-sharing, awareness-raising and co-ordination. ICTs can help in identifying affected populations and individuals

Information in this area is a real problem. For example, due to the lack of political and cultural openness, estimates of the number of people living with HIV/AIDS in many countries are uncertain. Social taboos of various kinds also restrict the acknowledgement of AIDS. Yet, the evidence points to rapid spread. In China, since the first detected case in 1985, the epidemic has been expanding dramatically. The Ministry of Health acknowledged that there were more than 1 million people living with HIV/AIDS in China in 2002 and warned that this number could increase to 10 million by 2010 unless effective prevention measures were taken.[56]

While perhaps not a nation-wide health problem, malaria occurs in 22 provinces of China. Hainan and Yunnan are the most seriously affected provinces accounting for more than 50 per cent of the national total of reported cases in 2000. These two provinces also have the more dangerous *falciparum* form of malaria. The less severe *vivax* form of malaria occurs in all 22 affected provinces. The reported 24,000 cases per year are believed to be only 10 per cent of an actual number of 240,000 cases per year.[57]

In 2000, there were approximately 4.5 million active TB cases in China and 1.5 million had the highly infectious smear-positive form of TB. The national prevalence rate of smear-positive TB in 2000 was 122 cases per 100,000 persons, a mere 9 per cent decline from the 1990 rate. TB is about 50 per cent higher in the poorer central-western provinces compared to the wealthier eastern provinces. The incidence of TB is nearly twice as high in villages than in the cities of China. It is clearly linked to poverty and to poorer access to healthcare.[58]

In India, after hunger, the principal health threats stem from some "old" diseases such as cholera, tuberculosis, malaria, kala-azar and, "newer" ones such as HIV/AIDS. Some of these have staged a comeback because of insecticide resistance among vectors, resistance to antibiotics and poor public health practices. Thus malaria, whose incidence was estimated at 75 million cases and 0.8 million deaths in 1947, and which had retreated to incidence levels of 0.1 million cases and no deaths in 1964, staged a comeback with 7 million cases in 1976. Though this incidence rate has come down since, it has stagnated at around 2 million cases over the last few years ending with 2001. In the case of kala-azar, endemic in the states of West Bengal, Jharkand and Bihar, the official Economic Survey for 2002-03 reports that there has been no significant decline in reported cases and deaths due to inadequate insecticide spraying operations and poor outreach of diagnostic services. Inadequate public expenditure on health is an obvious problem here. Kala-azar had virtually disappeared by the mid-1960s, but returned in epidemic form by the late 1970s. In 1991, 77,100 cases were reported, with an estimated 5,000-7,000 deaths. Similarly, recent estimates suggest that there are 1 million new cases of TB every year and 300,000-500,000 deaths every year, even though the government claims that the Revised National TB Control Programme covers 515 million people in 248 districts, making it the largest public health programme against TB in the world.[59]

The National Aids Control Organisation (NACO) reported the number of HIV infections in India at 5.1 million in 2003. The number of HIV infections was 4.58 million in 2002, 3.97 million in 2001, and 3.86 million in 2000. With these estimates, it is argued that while the epidemic is still spreading in the country, there is

no significant upsurge in the number of new infections. In fact, in comparison to the 4.58 million HIV infections in 2002, there has been an increase of 0.52 million in 2003, as compared to that of 0.61 million in 2002. However, the officially reported number of new infections, at 0.11 million in 2001, is still extremely high. The cumulative number of actual AIDS cases was reported at 48,933 as on 31 March 2003.[60] Of these cases, 36,411 are males. With more than 85 per cent of these cases identified as having acquired the infection through sexual transmission, this rather than perinatal transmission, use of blood products or of injectable drugs, seems to be the principal means of transmission in the country.

With the combined public and private expenditure on health estimated at 5.1 per cent of GDP, India spends more of its income on health than most other developing countries and almost as much as many developed countries. However, just 17 per cent is expenditure by the State, pointing to the predominance of private expenditure in the total health expenditure. The predominance of private outlays implies that public health initiatives to reduce morbidity due to common communicable diseases and nutritional deficiency would be inadequate.

A UNAIDS monitoring report released in 2001 included Indonesia as one of the countries that is experiencing explosive epidemics in different population groups.[61] During the past few years, the country is experiencing new, rapidly developing sub-epidemics of HIV in several provinces and communities, and now perceives HIV/AIDS to be a serious threat. Since the first case of AIDS was reported in Indonesia in 1987, there has been considerable debate on the extent of transmission of HIV that would occur in the different population groups across the country. Due to a lack of reliable statistics, the number of the infected is not known. Nonetheless, it has been recognized that the social and behavioural environment in many parts of Indonesia has factors in common with countries that have already experienced major epidemics of HIV/AIDS.

According to the UNAIDS 2004 Report on the Global AIDS Epidemic, at the end of 2003 the number of adults (15-49 years) living with HIV/AIDS in Indonesia was estimated to be 110,000, and the estimated number of AIDS deaths was reported at 2,400. Given the current features of Indonesia's social transition, the actual number of HIV sero-positive cases is probably far higher than the reported figures although this number cannot be determined with precision due to limitations in the healthcare reporting and surveillance systems. The challenges facing the HIV/AIDS prevention effort in Indonesia include a highly mobile population, vast unreported sex industries, changes in social norms, low levels of condom use, low awareness of preventive measures, an increasing number of intravenous drug user (IDUs), and economic crisis (women in search for survival, increasing number of street children).

In 2003, Indonesia's National AIDS Commission (NAC) revised the National HIV/AIDS Strategy, originally developed in 1993, as a result of the increase in HIV infections over recent years and, just as important, to respond to the commitments made at the UN General Assembly Special Session on HIV/AIDS.

Among other diseases, malaria remains a major public health problem in Indonesia. Malaria cases were reported at 33 per 100,000 of the population. TB also continues to be a major killer that ranks third in the mortality list after cardio-vascular and respiratory diseases and is the primary cause of death attributable to infectious diseases in adults in Indonesia.[62]

Pakistan's recorded experience of the HIV/AIDS epidemic began in 1986 when the National Institute of Health in Islamabad conducted its first HIV/AIDS test.[63] Since then, of the 3,136,000 tests conducted as of December 2002, there have been 222 AIDS cases and another 1,164 infected with HIV. UNAIDS and WHO data estimate a total of 78,000 cases, and the Government of Pakistan's National AIDS Control Programme reports 80,000. However, there is significant variance in the number of reported cases of people living with HIV/AIDS. UNAIDS cites 210 reported cases of HIV/AIDS, whereas the government reported 231 cases of AIDS and 1,942 cases of HIV. In 1996, estimates of the total number of people with HIV/AIDS in Pakistan ranged from less than 35,000 to over 60,000. At that time, the number of reported cases was 55.

The first case of AIDS in Thailand was detected in 1984. Recent statistics (January 2003) show

The possibility of using ICTs for educating people to adopt better practices and ensure immunization as well as to monitor the availability and quality of social services to combat such causes of infant and child mortality is also substantial

the prevalence of HIV/AIDS cases in Thailand to be 285,517, of which 65,469 patients had died.[64] The incidence of HIV infected patients rose steadily to its peak level in the year 1998 (44.27 cases in 100,000 of the population, after which the rate has declined each year to 14.56 cases in 100,000 of the population in 2002.

The HIV/AIDS epidemic has a disproportionate impact on children. The child mortality rate has been estimated to be 13 per cent higher than it would have been in the absence of AIDS. An estimated 14,000 children under the age of 15 years were living with the HIV/AIDS at the end of 1997, and 48,000 children have become orphans due to AIDS since the beginning of the epidemic.

The AIDS epidemic has hit Thailand very hard, with prevalence among some groups reaching 50 per cent or more during the last decade of the 20th century. However, the Thai AIDS control campaign has achieved international recognition as the first in the developing world to halt the growing incidence of new cases of HIV and to sustain a steady decline. The current overall prevalence is about 2.2 per cent of the adult population.

The HIV/AIDS epidemic has a disproportionate impact on children. The child mortality rate has been estimated to be 13 per cent higher than it would have been in the absence of AIDS

Although Thailand has succeeded in its malaria control effort over the past two decades, leading to a considerable reduction in the incidence and mortality rates, the disease is endemic along the international borders, making it one of the major public health problems in the country. During 1996-99, the incidence of malaria climbed from 1.5 to 2.1 per 1,000 in the population.[65] Most of the cases were found along the Myanmar, Cambodia and Lao borders with Thailand. This was due to the high malaria receptivity in the border areas, particularly, Thailand-Myanmar, where the malarial parasite is predominant because of the nature of the geographical terrain. In addition, health facilities are inadequate and housing conditions and sanitation poor.

According to the WHO Global Tuberculosis Control Report for 2003, Thailand is ranked 16th among the 22 high-burden countries for tuberculosis. Over the past 40 years, the incidence of tuberculosis had decreased until 1991 after which it showed an upward trend. Currently, there are approximately 100,000 new TB cases (of all types) per year. Although mortality due to tuberculosis has shown a declining trend from 1990 to 1994, the reported figure for smear-positive TB has increased from 34 per 100,000 to 50 per 100,000 in the 12 years since 1990. The resurgence of TB has been marked in areas of HIV prevalence and HIV is the most important epidemiological factor contributing to the increase of TB in several parts of the country. It is estimated that approximately 1 million Thais have been infected with HIV and in 2001, there were 695,000 people living with HIV. Hence, there is a large pool of people that are at risk of being infected with tuberculosis. Not surprisingly, TB has become the number one killer of people living with HIV, many of whom are in the 20-35 years age group.

Of the communicable diseases, pneumonia is the leading cause of death for children under five years. In 1994, 16.72 deaths per 100,000 children under five years were reported. Acute diarrhoea is also an important cause of death, with a rate of 1.56 per 100,000 children under five years. Currently, the importance of malaria as a cause of mortality has declined, with only 856 deaths reported in 1995.

In Vietnam too, HIV/AIDS is a potentially explosive challenge. Projected cases had crossed 50,000 at the turn of the decade and are now rising exponentially. Experts fear the number is far higher. Urban centres, tourist areas, provinces through which major highways pass and border provinces are the most affected. Quang Ninh, Hai Phong and HCMC all project more than 200 HIV cases per 100,000 people, whereas the 12 provinces least affected by HIV/AIDS project less than 10 cases per 100,000 people. However, even in these latter provinces, the rate has been growing fast in recent years.[66]

Malaria remains an important public health issue in the remote areas of Malaysia too. Approximately 70 per cent of cases occur in the state of Sabah. According to WHO statistics, the incidence of malaria per 1,000 of the population in the year 2000 was 0.559. Until recently, tuberculosis was kept under control. However, TB has re-emerged as a major disease following the influx of migrant workers into Malaysia. In the 1970s and 1980s, an average of 10,000 TB cases was reported annually, but in 1999, the number of cases reported went up to 14,150.[67]

A total of 51,256 cases of HIV infection were reported between 1986 and December 2002.

During this period, 7,218 AIDS cases were reported while the number of deaths caused by AIDS totalled 5,424. Malaysia has put in place specific policies and programmes that will work towards the MDG target of halting and beginning to reverse the spread of HIV/AIDS by 2015. Given Malaysia's pace in implementing these programmes throughout the 1990s, it has been acknowledged that it is likely that the MDG targets will be achieved within the specified time, particularly with the current level of political commitment towards wiping out HIV/AIDS.

Mongolia is unique amongst the countries studied. In 2003, it had only four officially reported cases of HIV detected in 1991, 1998, 2001 and 2002 and acquired reportedly through contact with foreigners. However, the situation is changing. The number of cases of sexually transmitted infections has increased sharply, consisting of 40.8 per cent of the total number of infectious diseases reported in 2002. Between 48-52 per cent of the cases of sexually transmitted infections are among teenagers and youth below 25 years of age. Poverty, a large adolescent and youth population, and the epidemic situation in border countries contribute to the potential growth of sexually transmitted infections and HIV/AIDS. The threat is great also because, despite high prevalence of sexually transmitted infections, condom use is low in Mongolia.[68]

In these areas of health discussed above, ICTs can be shown to have an impact both within the context of the formal healthcare system as well as in facilitating knowledge-sharing, awareness-raising and co-ordination. ICTs can help in identifying affected populations and individuals. The possibility of using ICTs for educating people to adopt better practices and ensure immunization as well as to monitor the availability and quality of social services to combat such causes of infant and child mortality is also substantial, as discussed later in this Report. In particular, since HIV/AIDS tends to be concentrated among certain vulnerable groups and segments of the population, ICTs, including radio and television, can play a major role in targeting these groups. This would help empowerment of and advocacy by stakeholders and contribute to mitigation of impact in health emergencies.

ICTs can be used to enable governments, NGOs and the health establishment to increase access to reproductive health, childcare and AIDS prevention information, by making available locally-appropriate content in local languages. Also, they are able to support the networking of healthcare workers, vulnerable groups and civil society organizations engaged in advocacy aimed at behavioural change. In addition, ICTs can facilitate intra-government co-ordination on healthcare planning and service delivery. They can also enhance the delivery of basic and in-service training for health workers, and increase the access of rural care-givers to specialist support and remote diagnosis. Lastly, they can increase mapping, tracking and information-sharing on HIV/AIDS and other infectious diseases, with a view to enhancing support in the most vulnerable regions and countries.

Goal 7: Ensure environmental sustainability

The environment refers not to a single entity or issue, but rather a range of economic and social resources and interactions that shape the physical surroundings of human beings (water, air, soil, natural resources, plant and animal species), possessing a number of possible uses on which humans are dependent in all of their activities. Its centrality to the development paradigm is rooted in the concept of sustainable development, which has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

A variety of IT applications – such as GIS – have long been used to enhance sustainable development. The focus is now shifting to more powerful mapping and monitoring tools in the context of a networked environment

While there seems little hope that the environmental degradation in Asia resulting from deforestation, industrial pollution, domestic wood burning and human waste can be reversed in the near future, progress is underway in some countries to meet some targets under the sustainable environment head. Reforestation in some instances has been helpful; for example, forest cover in China and Vietnam appears to have increased slightly, between 1990 and 2000. However, losses in forestry continue to occur in countries such as Indonesia, Malaysia and Sri Lanka.[69]

According to a senior government official, Pakistan's economy suffers a loss of over US$ 1.8 billion annually due to environmental degradation.[70] Pakistan's environment therefore has a profile that is similar to many developing countries, but far below the world average.

The most serious problems regarding clean water access arise in the rural areas, where millions lack water from protected sources

The environmental indicators show deforestation and freshwater resources to be two pivotal areas of concern. Freshwater resources, in particular, present a major challenge to the formulation and implementation of viable policies, indicated by Pakistan's position among the top 20 per capita freshwater using countries in the world, as well as the top 15 freshwater withdrawers in the world.

At present, the most pressing environmental problems in Thailand are forest degradation, water pollution and lack of effective waste management, especially industrial and hazardous waste. Air pollution was a serious problem in Bangkok, but the situation has improved considerably due to the switch to lead-free gasoline. Energy efficiency and carbon dioxide (CO_2) emission are also becoming a concern as the country struggles to balance the need for further growth and to protect the national and global environment.

Deforestation is a problem everywhere leading to desertification. Desertified lands in North China total 334,000 square kilometres, of which 176,000 square kilometres are already encroached upon by sands and another 158,000 square kilometres are at risk from potential sand encroachment. Desertification affects 212 counties in Heilongjiang, Jilin, Liaoning, Inner Mongolia, Hebei, Shanxi, Shaanxi, Ningxia, Gansu, Qinghai, Xinjiang, and other provinces.[71]

After a period of substantial deforestation, which still continues in some areas, around a fifth of the land in India is under forest cover and has been so for the last two decade. It is estimated that dense forest cover has stabilized at around 36 million hectares.

Indonesia is facing a major environmental challenge as a result of forest fires, which have become a yearly problem in the islands of Sumatra and Kalimantan during the dry season. The fires result in the spread of dark clouds of burnt particles that cover a wide area in a number of provinces in Sumatra and Kalimantan, as well as in the neighbouring countries of Singapore and parts of Malaysia. The clouds have caused health consequences such as lung and eye irritation problems, and hamper the operation of air transportation due to lack of visibility. Once started, the fires are difficult to put out due to the vastness of the fire area, inadequate personnel and equipment, and because these provinces are sparsely populated and do not have a wide network of roads.

The fires, partly caused by land clearing for farming by the indigenous people, are principally the result of the activities of large forest concession companies. Indonesia is a major exporter of logs and wood products such as plywood and paper. Logging is therefore a major industry and source of employment in provinces that have large tropical forests. The woods are inadequate to meet even the legal requirements of factories with forest production concessions. In addition, illegal logging flourishes to meet demands from these factories and the international market. Unprocessed logs are smuggled to meet international demand. Illegal logging is done by local people and, occasionally, by foreigners along the Indonesia-Malaysia border.

In Malaysia forest management efforts have helped marginally increase the permanent forest reserve to 14.33 million hectares in 2000 from 14.29 hectares in 1995. Malaysia had also committed itself to the International Tropical Wood Organization's Year 2000 objective whereby all timber in international trade must be from forests that are sustainably managed. Towards that end, Malaysia expanded the practice of certifying timber from its forests. Reforestation programmes and the establishment of forest plantations enabled the percentage of forested land to total land area to increase from 58.9 per cent to 67.1 per cent between 1990 and 2000. In addition, Virgin Jungle Reserves (VJRs) were established to serve as permanent nature reserves and natural arboreta. Since their inception, a total of 87 VJRs covering 23,002 hectares were established in Peninsular Malaysia.[72]

According to the information provided by the Ministry of Nature and Environment, 60,000 hectares of forests in Mongolia have been lost between 1990 and 2000, of a total 18.8 million hectares of the country's forest resources. More than 7 million hectares of forest have been affected by fires during this period. Wrong policies, poor enforcement; poor logging techniques and infrastructure; and increased domestic demand for fuel-wood and timber have combined to yield this outcome. Seventy per cent of total pastureland that feeds 25 million head of livestock has been degraded due to inappropriate land use practices and climate changes.

The sharp decline in natural forests – comprising mainly dry mixed evergreen forest and rainforest – has been a major environmental concern in Sri Lanka as well. Once extensive and widespread, they have now been reduced to around 23.8 per cent of the land area, and even these remaining forests have been severely degraded by excessive logging and encroachment. The forests are mostly State owned and are under the charge of either the Forest Department or the Department of Wildlife Conservation.

Thailand rapidly lost forest land in the past decades due to illegal logging, and the expansion of cash crop cultivation. Thanks to serious efforts by various parties and a variety of measures including a forest logging ban since 1989, forest land has expanded from 28 per cent of the total in 1990 to 33.4 per cent in 2000. During 1991 to 2001, natural conservation and recreation areas, namely national parks, forest parks, wildlife conservation areas, no hunting areas, wildlife parks, botanical gardens and arboreta have also increased from 13.5 per cent to 17.6 per cent of the total land area. However, during the first half of the 1990s, the country lost a significant amount of mangrove area due to commercial shrimp farming and coastal pollution.

In Vietnam, forest cover has begun to increase in recent years, but still remains low at some 34 per cent. At the same time, there is a high risk that the quality of reforestation is reducing biological diversity. The environmental treasure in Vietnam, including some 700 endangered species, is at high risk of being lost forever unless meaningful policy and institutional actions are taken soon.

The next target in the environmental area is to halve the proportion of people without sustainable access to safe drinking water by 2015. It is estimated that, for Asia as a whole, urban water supply coverage is 93 per cent but rural coverage is only 75 per cent.[73] Thus, the most serious problems regarding clean water access arise in the rural areas, where millions lack water from protected sources. There has been some progress in individual countries; for example, in India, rural coverage went up from 61 per cent in 1990 to 79 per cent in 2000.[74] However, based on current trends, it is likely that the region as a whole will miss the target. Sri Lanka is the only country that has 'achieved' the target while China is rated as 'far behind' and Vietnam is 'lagging' in terms of the share of the population using improved water sources (Table 2.12).

Water scarcity and deteriorating water quality, particularly in north China, increase the competition between urban, industrial and agricultural consumers, and between upstream and downstream users. Rivers, lakes and groundwater are heavily polluted because most industrial, municipal and agricultural sewage and drainage waters are discharged untreated. The main problems are regional disparities in water access, improper water usage, water pollution, sinking ground water tables, coastal and marine pollution, and discontinuous river runoff in some rivers in north China, such as the Yellow River.

In all areas, an effort to raise consciousness with regard to alternative intervention possibilities, best practices and a greater degree of monitoring are a must to ensure progress. The role that ICTs can play here is obvious

Table 2.12 ***Progress towards MDG 7 by nine Asian countries***

Goal 7: ***Ensure environmental sustainability***

Target 10: ***Halve the proportion of people without sustainable access to safe drinking water***

Indicator 30: ***Population using improved water sources (%)***

Country	Achieved	On track	Lagging	Far behind	Slipping back
China				●	
India		●			
Indonesia		●			
Malaysia (NA)					
Mongolia (NA)					
Pakistan		●			
Sri Lanka	●				
Thailand		●			
Vietnam			●		

Source: UNDP Human Development Report, 2002.
NA: Data not available.

Water is the central environmental issue in India too, with major public health ramifications in the form of the twin, related problems of safe water and sanitation. While organic and bacterial contamination of water can occur through many routes, inadequate sewage treatment facilities and improper disposal of industrial effluents constitute the principal sources of contamination. There are large flows of untreated municipal sewage and industrial effluents into the main water bodies that monitoring and regulation by the Central Pollution Control Board has not been able to arrest. While official statistics claim that 90 per cent of the population in urban areas has access to safe drinking water, only 49 per cent has access to proper sanitation facilities, which results in a very real threat of continued and increasing contamination. Further, while there are some instances of State and community action against the release of untreated effluents, a large number of industrial units in the country get by without adequate investment in the proper treatment and disposal of effluents.

While ICT opportunities can be identified for each of the MDGs, there is a need to prioritize the Goals where ICTs can be demonstrated to have the greatest impact, e.g. education and healthcare, as opposed to addressing the hunger reduction Goal

Indonesia also has the problem of fresh water pollution due to irresponsible and illegal dumping of unprocessed industrial waste into the rivers by factories. This is aggravated by the tendency among city dwellers to flush domestic waste into the open sewage that ends up in the river. Water pollution is especially a major problem in the industrial and densely populated areas of big cities such as Jakarta and Surabaya. Major water pollution is also present around mining and quarrying areas. Illegal miners do not adopt safety standards and release heavy metals and (as in the case of gold mining) dangerous and toxic materials into the rivers. The government has been working to clean up the rivers through a project called Prokasih (Proyek Kali Bersih – Clean River Project) for years. The result has not been satisfactory.

Water quality in Malaysia, reflected in terms of the percentage of clean rivers, deteriorated from 53.5 per cent or 48 rivers out of the total 90 rivers monitored in 1990 to 28.3 per cent or 34 rivers in 2000.[75] This has been attributed to sewage from households and livestock farms, effluents from the manufacturing sector and agro-based industries, suspended solids from soil erosion and heavy metals from factories as well as the occurrence of drought in parts of the country.

The share of the population with access to safe water in Vietnam has increased to 53 per cent, growing at 13 per cent per annum in recent years. However, disparities remain dramatic. While the average share of population with access to safe water is 96 per cent in the better-off areas, this compares with only some 28 per cent in the 12 weakest provinces. Effectively targeted assistance appears especially needed in Dong Thap, Vinh Long, and Ben Tre.[76]

In most countries, while legislation is usually adequate, enforcement in remote areas poses a great challenge to the authorities and is complicated by corruption. ESCAP has rated the progress for this target in the Asia-Pacific region as poor so far, with few countries giving this target sufficient attention.

A variety of IT applications – such as Geographical Information System (GIS) – has long been used to enhance sustainable development. The focus is now shifting to more powerful mapping and monitoring tools in the context of a networked environment. For example, ICT and GIS tools are able to assist in areas like the management of village resources such as water wells and tube wells, and to create thematic resource maps of villages for sustainable development. Also, GIS mapping has been carried out in the field of arsenic contamination in ground water. Remote sensing technologies and communications networks also permit more effective monitoring, management and mitigation of environmental risks.

In addition, ICT tools can increase access to and awareness of sustainable development strategies in areas such as agriculture, sanitation and water management, and mining. Another potential result of ICT use is greater transparency through monitoring of environmental abuse, and better enforcement of environmental regulations. Lastly, they can be used to facilitate knowledge exchange and networking for policy makers, practitioners and advocacy groups.

Goal 8: Develop a global partnership for development

The strategy of building and strengthening global partnerships as part of the effort to advance human development is aimed at enhancing the effectiveness of policies adopted

in all the other MDG areas. Because of this, the fact that ICTs can play a major role here needs to be stressed. ICTs are increasingly being used to streamline, aggregate and organize relevant "global" and local information, facilitating easy dissemination in developed and developing countries. As a result, ICTs have substantially increased the strength of previously voiceless NGOs. This, in turn, has led to their growing international presence and a major role for them individually, collectively and in partnership with other organizations in influencing policies and implementing strategies in many of these areas. ICTs can also be used to manage information needed to effectively provide official development assistance (ODA) as well as to level the playing field in terms of the availability of international and regional market information among all countries.

Some implications

Thus, assessments of Asia's march towards achieving the MDGs point to a mixed and varied performance. Countries such as Malaysia, Thailand and even China show significant progress and are 'on track' to achieve most of their goals and targets. Sri Lanka's performance with reference to most of the goals and targets is also commendable. Pakistan, India and Mongolia lag behind the other six countries in almost all the MDGs, while Indonesia stands between the successful countries and the laggards with a very mixed record overall. Similarly, progress in certain areas such as combating extreme poverty, overcoming illiteracy or reducing infant mortality has been faster than progress in other areas, even if not always adequate.

This increases the significance of using an enabling technology such as ICT to support the effort to realize the MDGs. In all areas, an effort to raise consciousness with regard to alternative intervention possibilities and best practices, and a greater degree of monitoring are a must to ensure progress. The role that ICTs can play here is obvious.[†] In addition, in specific areas the technology can directly contribute to the realization of the MDGs, as discussed below. Our assessment of the current use of ICTs for development and the potential for harnessing the technology to yield benefits in these areas needs to distinguish between these general purpose and specific uses, in order to maximize the returns from investment in the area.

Moreover, while ICT opportunities can be identified for each of the MDGs, there is a need to prioritize the Goals where ICTs can be demonstrated to have the greatest impact, for example, education and healthcare as opposed to addressing the hunger reduction Goal. This is not to suggest that ICT solutions should not be developed to enhance the responsiveness and effectiveness of relevant agents in addressing other development priorities and challenges but to identify major MDG priorities for national e-strategies. Similarly, there is a need to cost and prioritize alternative ICT opportunities within the context of each of the MDGs.

[†] The discussion on ICTs and the MDGs in this chapter has benefited greatly from UNDP 2003 Working Paper: *The Role of ICT in Enhancing the Achievement of Millennium Development Goals.*


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Photo: Amit Khullar

MDGs

Chapter 3

ICT for enhancing human development: potential and promise

Developments in ICT during the last quarter of the 20th century are widely seen as having heralded an information age in which economic and social activity has been widened, deepened and transformed. Optimistic projections would have it that a computerized and networked world will not only change work practices, attitudes to leisure and lifestyles, but also allow for a more widespread and rapid growth of employment, productivity and output. In effect, these technologies are seen as having the potential to advance human development as well as spread the capabilities to benefit from that potential.

At the core of this perceived transformation lies the dramatic increase in computing power ensured by the emergence and rapid evolution of microprocessor technology and the coming of the digital signal processor.† The pace of this increase is captured by the oft-quoted observation made by Gordon Moore as early as 1965 that newer chips that entered commercial production every 18-24 months incorporated twice the number of transistors as their predecessor. That trend has since persisted. As a result, in the three decades starting 1971, the number of transistors on a chip increased from 2,250 on the first Intel 4004 microprocessor to 42 million on the Pentium 4 processor. The cost of a MHz of computing power has fallen from US$ 760 in 1970 to 17 cents in 1999.[1] This has helped PC makers and those incorporating computer chips into their products deliver far more powerful systems at the same or declining prices.

The growth in computing power has triggered a veritable race in the development of digital devices that can exploit that power, and peripherals that extend that capability. These devices acquire, record, organize, retrieve, display and disseminate information. Here too technological change has reduced costs substantially. The cost of a megabit of storage has fallen from US$ 5,257 in 1970 to 17 cents in 1999.[2] Computing devices also help manipulate and modify stored information, by searching through the information, displaying it in a chosen format, performing simple and complex scientific and engineering calculations, and solving a range of non-numerical problems. The power that this offers is considerably enhanced by the growing possibility of linking computing devices and allowing them to communicate with each other, based on some common protocol. This process has been aided by improvements in communication technology that have reduced the cost of transmitting a trillion bits of information from US$ 150,000 to 12 cents over the last three decades.

The wide availability of enhanced computing power and the consequent ability of networked individuals, households, organizations and institutions to process and execute a huge number of instructions in imperceptible time spans can have revolutionary implications. First, it has the potential of creating and massively expanding industries catering to the market for a range of computing devices, especially personal computers that have now become accessories in the home and not just at the workplace. Second, it paves the way for changes in the nature of a whole range of products, and stimulates many new product innovations, such as cellular telephones and palm-sized personal organizers. The stimulus

The wide availability of enhanced computing power and the consequent ability of networked individuals, to process and execute a huge number of instructions in imperceptible time spans can have revolutionary implications

† Digital signal processing (DSP) is the study of signals in a digital representation and the processing methods of these signals. DSP and analogue signal processing are subsets of signal processing. It has three major subfields: audio signal processing, digital image processing and speech processing.

SPECIAL CONTRIBUTION

Foundation for capacity-building for knowledge societies

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Regardless of how we define 'knowledge societies', digital networks and information have significant implications for everyone. The global, albeit uneven, spread of networks brings change for those who can participate easily and fluidly in the electronic sphere and for those who cannot. The importance of promoting an increasingly central place for the use of advanced ICTs is acknowledged today to a much greater degree than it was a decade ago. However, there is a great deal of controversy over the priority that should be given to different kinds of ICT expenditure and about the specific contexts in which these technologies can play a positive role.

For some, the principle priority for investment is in ICT applications that can foster 'knowledge-driven' economic growth. For others, service applications in support of health, education and other public services are the highest priority. Investment priorities shape the deployment of networks and ICT applications and there is growing evidence that the new technologies are being applied in distinctive ways around the world. The ways in which businesses, governments and citizens are taking advantage of the potential of the new technologies when they are able to access them are enormously varied. The greatest need is for initiatives that encourage learning and capability building in different local contexts and that which facilitate exchanges of these experiences.

The prices of ICTs are declining, but the construction of new kinds of knowledge societies comes at a high cost. The exclusion of some people is a persistent feature of recent development. Those who are already marginalized may be further disadvantaged when they are bypassed by the new e-services. This feature of the 'digital divide' is about more than simply accessing e-services. It is about being able to draw upon a whole range of resources from online and offline places in order to function in today's world.

Even when initiatives to introduce various forms of e-commerce or e-government appear to be successful initially, the costs of sustaining e-service development and of scaling up these initiatives are substantial. More attention needs to be given to supporting initiatives that can be sustained financially. It must also be recognized that although digital information can be replicated and circulated within global networks at very low cost, the costs of creating information in the first instance (the 'first copy' costs) remain high. This raises issues about the scope of the public domain for information sharing that is encouraged alongside markets for information 'commodities'.

We are only now absorbing the full consequences of this compacting of economic and social space

to innovation in sectors completely outside the computing business itself, resulting in the emergence, creation and servicing of a host of new needs, makes the employment consequences of the new technologies virtually impossible to calculate.

Third, it can substantially transform industrial processes, since firms can now use the capacity to store information and execute instructions to automate and change the manner in which they conduct and manage their operations. Information technology is, in part, revolutionary because it ensures and necessitates the transformation of productive capacity in almost all sectors. Finally, the computing revolution leads to a dramatic expansion of the size and scope of the services sector (across a wide spectrum including finance, banking, trade, entertainment and education). This results from associated technological developments that find new uses for the massive computing power that is cheaply available. It also comes from the huge market that developments in communications and networking technology create, and from the fact that the increasingly ubiquitous PC becomes the vehicle to deliver a range of services, besides being a device in its own right. The microprocessor is not just the core of the IT revolution, but stands at the centre of the convergence of the information, communication and entertainment sectors.

When all of these benefits are combined with developments in communication, individuals,

Careful consideration needs to be given to stimulating investment in local knowledge within any framework of strategies for promoting access to knowledge resources.

'Digital divides' cannot be overcome purely by relying on market forces. Public, private and civil society coalitions and partnerships play a crucial role in influencing ICT diffusion and the extent to which people find creative ways of applying the new technologies. These coalitions are essential if there is to be a realistic chance of applying ICTs to address problems of poverty and to enabling greater participation in a globalizing world. A very important observation is that social and economic development priorities must come first. ICTs must be seen as enablers, not as investment targets in their own right. 'ICT for Development' initiatives must not be allowed to overwhelm a country or region's absorptive capacity or to distort the goals of social and economic development initiatives. New coalitions of resources and partnerships must be encouraged *in line with each country's and region's development priorities*. This message needs to be heeded by all those who actively promote the emergence of knowledge societies.

'Digital divides' are manifestations of much deeper social and economic inequalities. ICTs on their own will never be sufficient to address the deeper problems. Fundamental issues that hinder social and economic development must be addressed as a first priority. The lesson of the past decade's experience with new ICTs, including the Internet, is that they can be valuable enablers; they are not the solutions.

The prevailing 'knowledge society' vision often privileges economic goals of competitiveness and market-led development. However, evidence is accumulating to show that failures to experience the potential benefits of ICT investment stem from ignoring non-market issues. These issues involve governance and institutions at all levels. A variety of social capabilities must be developed and these cannot be left to the market. Investment in ICTs must be accompanied by measures to strengthen skills and capabilities, and to foster the kinds of changes that people can accept and welcome. This means ensuring the participation of all stakeholders in shaping their own knowledge societies. This presents real challenges because there is a tendency to assume that ICT issues are too technical for non-specialists to understand. However, knowledge society services must be responsive to people's needs and preferences if they are to be accepted and widely used.

This means a commitment to encouraging a reasonably equitable distribution of capacities for living in technologically mediated societies. This is much more than a simple ICT skills issue. It is a matter of human rights and entitlements to the capacities for improving livelihoods. There is an increasing need be proactive in creating awareness of the potential of knowledge societies, in building up technical and policy capacities, in strengthening institutions and processes, and in provide access to information about international developments. The foundation for capability building for knowledge societies in all these areas is the understanding that development priorities must lead investment in ICTs.

organizations and corporations are able to both secure a presence on the Web as well as easily traverse cyberspace. This creates the basis for establishing links between individuals, individuals and government agencies, individuals and business, business and government, and business and business. The full consequences of this compacting of economic and social space are even now only being absorbed and analysed. One area where the effects are tangible is electronic commerce which allows for trading in virtual space, reduces transaction costs, cuts down on retail infrastructure and slashes retail margins.

This revolution in ICTs and the widening of economic and social space that it has wrought, have given rise to widespread speculation and debate on the potential of ICTs to enhance human development. Proponents of the view that ICTs can, in fact, have a powerful positive impact on human development focus on the important role the technology can play in areas such as dissemination of health and reproductive information, training of medical personnel and teachers, provision of equitable access to education and training facilities, opening up of opportunities for women, and expansion of the scope for citizen participation. Through these means, it has been argued, ICTs provide developing nations with an unprecedented opportunity to meet vital development goals such as poverty reduction, provision of basic healthcare, and improving access to quality education, far more effectively than before.[3]

The prices of computing hardware and the proprietary software that dominates the sector still remain extremely high

Based on these and other features of the technology, international institutions and many developing-country governments, businesses and citizens' groups are pushing ICTs as a means to transcend the structural and historical weaknesses of developing nations in the economic, political and social spheres. They argue that ICT offers the developing world the opportunity to 'leapfrog' several stages of development and join industrialized nations in the information age. This is possible, they feel, given its wide ramifications and the fact that it is less expensive, is accessible from knowledge in the public domain and, therefore, is characterized by lower barriers to entry.

The principal problem with this argument is that the decline in computing and connectivity costs notwithstanding, the prices of computing hardware and the proprietary software that dominates the sector still remain extremely high. Thus, the cost of a computer has only come down from around US$ 800 20 years ago to about US$ 300-400 today. This does appear small, when compared with what has happened with mobile phone costs, for example. A mobile phone that cost around US$ 1,000 10 years back is today available for US$ 50-60. Very often the decline in hardware costs is notional, in the sense that it involves a similar or slightly higher price for much more powerful equipment. Since most users and most applications do not need such power, what would have been of use is if less powerful equipment remains available at a lower price. But with manufacturers of microprocessors and supporting hardware phasing out production and support of earlier technologies and rendering them technically obsolescent, even if not economically and socially so, there is a considerable degree of "downward stickiness" of entry-level equipment prices. This makes the cost reduction substantially notional rather than real.

Many new products generated by the technology, such as cellular telephones, personal digital assistants (PDAs) and forms of digital infotainment do not displace exiting products and jobs but create new ones, releasing new demands because of the felt need to which they cater

This problem is aggravated by the fact that liberalization involving easier entry of transnational firms into developing country markets as well as the reductions on imported components and peripherals is seeing a decline for non-branded PCs offered by low cost domestic assemblers. For example, in 2003-04, India's domestic IT market, which includes a INR 8,750 crore (US$ 1.94 billion) market for PCs, registered the best growth in 10 years of 24 per cent, with desktop volumes registering a rate of growth of 21 per cent. However, in that year, the share of assembled PCs in the total reportedly fell by 7 percentage points from 65 per cent. Industry analysts expect this trend to continue so that by the end of 2004-05, the assembler segment's share may move below even the 50 per cent level.[†] The consolidation in the PC market implies that a growing dominance of branded PCs led by transnational brands is likely to increase the stickiness of entry-level prices and dilute the benefits that cost reduction can deliver.

Finally, the prices of computing facilities of different kinds have been kept high because of the dominance of proprietary software controlled by large transnational firms and protected by copyright that makes software extremely expensive and encourages large-scale piracy. In addition, software producers exploit the rapid increase in computing power to add on new features into higher versions of specific software. Many of these features are unnecessary for the ordinary user. Additionally, they result in downward stickiness in entry-level prices and in an increase in the costs of the upgrade necessitated by compatibility problems and network effects. This makes the success of the open source software (OSS) movement crucial as a means to keep software costs low directly, and through its indirect effects on the pricing policies of proprietary software producers.

All these issues are of relevance because our concern here is with the possible human development implications of the ongoing ICT revolution in poor countries. If the costs of hardware, software and connectivity are brought down substantially, ICT use can advance human development through a variety of routes. To start with, the technology and product offshoots of the phenomenon can directly contribute to the creation of new productive employment. Many new products generated by the technology, such as cellular telephones, personal digital assistants (PDAs) and forms of digital infotainment do not displace exiting products and jobs but create new ones, releasing new demands because of the felt need they cater to. The production and distribution of such products obviously create new employment opportunities, and thereby improve economic well-being. In many developing countries, the product whose manufacture and sale is registering dramatic increases is the personal computer. Reduced prices and

[†] Information taken from "Enter the Dragon", *Dataquest*, 31 December 2004, p. 90.

Box 3.1 ***Computers for the masses in Thailand***

In early May 2003, the Ministry of Information and Communications Technology (MICT) of Thailand launched a project named "Computer ICT". It aimed to offer Thai citizens the opportunity to acquire their own PCs at a low cost relative to the then prevailing open market prices (US$ 261 for a desktop and US$ 467 for a notebook) and under easy payment conditions.

The sales target was first set at 100,000 PCs but a new target of a million PCs was set due to the overwhelming response. The project was initiated when MICT teamed up with local brand PC manufacturers and commissioned them to make low-cost PCs. As for software, MICT opted for open source software, using Linux Operating System TLE 5.0.

The project's aim was to increase PC penetration in Thailand, particularly among the low income earners. It also hoped to generate "spin-off" effects, by further inducing demand and competition in the low-end PC segment. Other PC manufacturers, dealers and resellers have also come up with strategies to reap the benefit of the market boom. For instance, a group of provincial PC resellers joined forces and launched a new product called "SME PC" at a price of US$ 333.

Source: Thuvasethakul *et. al.* 2003

new applications have transformed the PC from a tool for office automation to a consumer durable at home. The consequent growth in demand and production has had significant employment effects. Government policy has been crucial to this, as in Thailand (Box 3.1). In other instances, such as in India, there has been a substantial increase in the employment generated in the provision of a range of software and IT-enabled services, linked to or facilitated by the ICT revolution. However, such employment opportunities directly benefit the middle classes, whose improved well-being has only a marginal impact on various human development indicators. Its effect on the poor is more a result of the indirect, demand-generating consequences of such employment and income increases, the extent of which cannot be easily estimated.

The second way in which ICT use can improve the quality of life is through its productivity-enhancing and cost-reducing effects that increase the returns accruing to small and medium producers from productive activity. A striking case of such effects is the introduction of ICT devices into the management of operations of the National Dairy Development Board in Gujarat, India. (Box 3.2)

The third way in which ICTs can contribute to improved welfare is to provide access to information as well as help impart skills and develop capabilities. Interviews with focus groups and pro-poor activists reveal that there is substantial demand for information that has a significant economic content, e.g., real-time information on prices, weather and pests; advice on agricultural technology, water use, soil management, livestock management and livestock diseases (agricultural extension); and availability and conditions of bank credit, micro-credit, and governmental grants and subsidies. In the social domain, health-related information is particularly valuable. In the political arena, access to government forms, information on government projects and personnel, and activities of NGOs have a market. To these one may add a possible final cluster, even if the demand for it is still tacit, and diffuse information on:

- export opportunities in small industry, crafts production, and horticulture
- changing requirements in global markets, and
- the opportunities provided by information technology itself.

Besides, provision of straightforward access to information, ICTs can be used for skill and capability development, with significant effect. The experience of the Karakoram Area Development Organization (KADO) in Pakisan illustrates this possibility (Box 3.3).

Fourth, ICTs can be used for better and more widespread provision of social services such as education and health. In China, for example, the constraints created by its geographical vastness

ICT use can improve quality of life through its productivity-enhancing and cost-reducing effects. This increases the returns accruing to small and medium producers from productive activity

SPECIAL CONTRIBUTION

Using ICT for human development

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ICT provides uncommon opportunities for reaching the unreached and including the excluded in terms of knowledge and skill empowerment. Poverty persists in conditions where the human resource is under conditions where it is under-valued and material resources are over-valued. An old Chinese saying goes:

If you are thinking one year ahead, plant rice;
If you are thinking ten years ahead, plant trees;
If you are thinking hundred years ahead, educate the people.

Several countries in our region have experienced rapid economic and social development only because of education and the acquisition of skills relevant to market-driven enterprises. This Report which brings together the experience of Asian countries in harnessing ICT for achieving the MDGs is timely. Such sharing experiences will help nations to purchase time in mobilizing ICT for accelerating the pace of human, social and economic development.

The M S Swaminathan Research Foundation (MSSRF) has been working in this field for several years. Our programme has been based on Mahatma Gandhi's *Antyodaya* principle, i.e., ensure that the poorest person in the village gains from the technology and that technology does not further enlarge the rich-poor divide. Based on this principle, we have recently established a Virtual Academy for Food Security and Rural Prosperity (VARP). This Academy will help to spread demand-driven and user-friendly information through the integrated mobilization of the Internet, cable TV, community and Ham radio and vernacular newspapers. The Fellows of the Academy, chosen by a peer review process, are semi-literate or literate rural women and men who have shown extraordinary capabilities in mastering new technologies and applying them for the common good of all the families in the village. The first Fellows of the Academy (four women and two men) come from very poor families and are products of the day-to-day struggle of women and men belonging to small farm families in meeting their livelihood needs. Therefore, their leadership of the Rural Knowledge Centres carries a high degree of credibility and acceptability. It is our hope that by 2015, there will be a million Fellows of the Academy comprising at least one woman and one male knowledge manager from each village. This will enable the emergence of a Farmer Participatory Knowledge System.

The Rural Knowledge Centres of MSSRF are spearheading a movement for imparting a pro-nature, pro-poor and pro-woman orientation to job-led economic growth in rural areas. They give concurrent attention to on-farm and non-farm employment, and to production and post-harvest technologies. They also demonstrate the power of partnership among data generators, knowledge managers and the users of information and knowledge. This trilateral symbiotic partnership holds promise for achieving the MDG even before 2015.

Another feature of these Rural Knowledge Centres is their linkage with institutions that can help rural families to convert the scientific know-how into field-level do-how. Thus, linkages with appropriate hospitals have enabled the organization of cataract-free zones. Some of the lessons we have learnt are:

- Connectivity, content and sustainability should receive concurrent attention.
- Constraints must be removed on the basis of a malady-remedy analysis; for example, wired and wireless technologies could be used where telephone connections are not adequate or satisfactory. The approach should be based on the principle that there is an implementable solution for every problem.
- The information provided should be demand-driven and should be relevant to the day-to-day life and work of rural women and men. Also, semi-literate women should be accorded priority in training to operate the Knowledge Centre, since this is an effective method of enhancing the self-esteem and social prestige of women living in poverty.
- Knowledge dissemination should be linked to access to inputs needed to apply the knowledge for economic activities.
- The Knowledge Centres should operate on the principle of social inclusion, presenting a win-win situation for all.
- The local population should have a sense of ownership of the Knowledge Centre. It should be client managed and controlled, so that the information provided is demand- and user-driven.
- The local population should be willing to make contributions towards the expenses of the Knowledge Centre, so that the long-term economic sustainability of the programme is ensured. Contributions in cash or kind generate a sense of ownership and pride, and create an economic stake in the operation of the Centre.

Box 3.2 ***ICT enhances productivity and raises income: DISK in Gujarat***

The major advances made by the cooperativization of milk production and processing at Amul Dairy in Gujarat, India, have been widely recognized. Village-level primary producers are organized under a supervisor from the district-level Cooperative Dairy Union which owns a processing plant. Milk is sold only to the cooperative at local collection centres. ICT is being used to improve collection and payment, substantially improving the prices received by farmers. Earlier, the quality and quantity of the milk was computed through manual calculations made by the cooperative staff. This not only led to allegations of underpayment, but resulted in substantial delays. The fat content in the milk supplied by the primary producers was calculated a few hours after the milk was received and farmers were paid every 10 days or so. With the introduction of ICT, each producer is provided with a card that is read electronically at the collection centre and his/her ID sent to a personal computer. Milk is poured into a steel container on a weighbridge that displays the weight and transmits the information to the PC. An operator takes a small sample of the milk and a fat testing machine reads the fat content electronically in three seconds. With this information being displayed and transferred to the PC as well, the computer calculates the payment due to the producer and provides him/her with a payment slip using which he/she can immediately collect his/her payment. The milk vending system costs around US$ 2,000 per centre. Two private manufacturers currently produce the equipment. Nearly 600 such systems are in operation in the Kheda district in Gujarat. There are 70,000 village societies in India, of which 2,500 have been computerized.

Once this facility was put in place, the opportunities offered by computerization could be exploited and the benefits further extended. Using the Dairy Information System Kiosk (DISK) software developed by the Indian Institute of Management (IIM) Ahmedabad, which connects to a dairy information portal, it is now possible to maintain and access a computerized database. This database includes all details of the cattle owned by the cooperative's members, historical information on milk production, information on the prices and availability of a range of commodities needed by cooperative members, and information on best breeding practices. In addition, the system can be used to deliver services such as inoculation alerts that can be printed onto the payment slip. The benefits that this transparent and efficient system delivers in terms of improved productivity and earnings should be obvious. Its effects on poverty are also an obvious corollary.

Source: Bhatnagar 2000

and diverse terrain to provide schooling and improve its quality are being tackled with a large range of distance education programmes that exploit the potential of ICTs (Box 3.4). In addition to the use of computers and the Internet, radio and TV are also deployed to promote education. For instance, there are 2,735 radio and TV universities at national, provincial, prefecture and county levels and the number of total classes is 18,136. In 2001, 174,300 people completed their college programmes in these universities and 216,600 new students were enrolled, thus taking the total number of students in all these universities to 562,900.[4] According to incomplete statistics, over 10 million students have graduated from all the radio and TV universities. It is to be expected that, soon, information technology would become an important tool in the functioning of these organizations.

Malaysia's Telehealth programme is an example of the use of ICTs for provision of a range of health services. Telehealth is a joint initiative of the Ministry of Health and the private sector using ICTs to deliver, among other things, high quality health content to the public. The initiators of this project believe that empowering individuals with medical knowledge will enable them to make informed decisions and take care of their own health. This is the 'wellness paradigm', which is envisaged by the Ministry of Health to be the future of health care in the new millennium.

Telehealth (www.telehealth.com.my) has four components: Teleconsultation, Mass Customised/ Personalized Health Information and Education (MCPHIE), Continuing Medical Education (CME) and a Lifetime Health Plan (LHP).

ICTs can contribute to improved welfare by providing access to information as well as helping impart skills and develop capabilities

Box 3.3 ***Capacity building in the Karakorams: KADO***

Established in 1995, the Karakoram Area Development Organization (KADO) is funded by the Aga Khan Development Network (AKDN) and the Swiss Agency for Development Corporation (SDC). Its objective is to work closely with the communities inhabiting the Karakoram area in the northern mountainous region of Pakistan. KADO has three programmatic areas that employ ICTs:

- an e-commerce initiative called Threadnet Hunza (http://www.threadnethunza.com)
- an ICT training and capacity building programme for villagers, and
- a website for information sharing called the Karakoram-Hunza Cybersite.

Both Threadnet Hunza and the ICT training programme have yielded important lessons on the benefits of using ICTs for poverty alleviation. Threadnet Hunza is an e-commerce website that offers the products of local handicrafts, such as carpets and household accessories, for sale over the Internet. With technology support from KADO's staff, the website has established a small and loyal clientele in Europe and the US (figures on the sales from the site were unavailable, although KADO claims that the website is self-sufficient and provides significant premiums to villagers on their products).

The ICT training programme of KADO assisted the local community in establishing 10 village training centres, training master trainers and providing seed funds to entrepreneurs. These training centres provide access to new technologies (such as basic computing and the Internet) for a nominal fee that sustains their activities. As in the case of Threadnet Hunza, the training centres are financially feasible small enterprises. The village training centres thus meet two complementary objectives:

- the generation of sustainable incomes for the poor, and
- the establishment of mechanisms for ICT capacity building among the rural poor.

ICTs can be used for better and more widespread provision of social services such as education and health

Teleconsultation provides a platform for specialists to make decisions without physically examining patients. MCPHIE involves creating and delivering high quality health content to equip individuals with medical knowledge to allow them to make informed decisions and take care of their own health. CME increases the knowledge and skills of healthcare providers while LHP delivers a network-based personalized health plan for each individual, based on medical records.

As part of the Telehealth initiative, two IT-based specialist hospitals in Selayang, Selangor and Putrajaya were commissioned in 2000. Currently, six hospitals are being built incorporating the computerized Total Hospital Information System (THIS). They are located in Ampang, Serdang and Sungei Buloh in Selangor, Alor Setar and Sungei Petani in Kedah and Pandan in Johor. In addition, 25 small and medium-sized hospitals including 12 in the states of Sabah and Sarawak, incorporating the Health Information System, are now in various stages of planning and development.

Currently, selected health clinics and health centres in Johor, Negri Sembilan, Kuala Lumpur, Sabah and Sarawak are also being equipped with teleprimary healthcare networks which are connected to state and district hospitals. This will facilitate teleconsultation and access to specialized diagnostic services such as radiology and pathology.

ICTs are also an excellent tool to create a citizen-friendly administration that provides free access to information, exploits the technology's interactive capabilities that allow for a better citizen-government interface, and uses its delivery and monitoring capabilities to improve the efficiency of services provision. At a decentralized level, nLogue Communications, a division of TeNet group[†] has undertaken a

[†] Information from http://www.tenet.res.in/Press/digi_partners.html, accessed 30 December 2004.

Box 3.4 ***The popularity of on-line schooling***

The 101 Distance Learning Centre (www.chinaedu.com) is the first distance-learning centre specializing in basic education in China. It was established in Beijing in September 1996. As of 2003, there were 200 distance-learning middle schools in China with over 0.6 million registered students coming from 70,000 common middle schools. Remarkable achievements have been made in many big cities such as in Beijing where there are more than 30 online secondary schools with 50,000 to 100,000 students.

project that seeks to harness the Internet's ability to access and disseminate information. As part of its effort to commercialize cheap WLL-based connectivity in underserved rural areas, TeNet has set up nLogue, which seeks to develop a network of local entrepreneurs to provide front-line implementation and services to local subscribers. These Local Service Partners (LSPs) will be in the business of setting up Access Centres in small towns and rural areas, which will provide simultaneous Internet and telephony access to subscribers within a 30 km (19 mile) radius.

As part of their obligation to nLogue, Local Service Partners are required to:

- actively market nLogue services
- provide after-sales service to subscribers, satisfying their queries and offering product support
- manage equipment at the Access Centre
- actively educate subscribers where needed and create awareness of available technologies
- facilitate the building of Internet communities within their subscriber base, and
- identify opportunities for commerce over local networks.

In rural areas, conveniently located kiosks will service surrounding villages. In addition to local and long-distance telephone service, these village kiosks will offer residents information on commodity prices, land records, certificates, weddings, etc., all of which is collected and stored at the Access Centre.

Governmental efforts have also been important in this area. In India, for example, e-governance initiatives are at the centre of the ICTs for development agenda. The concern of governments at national, state/provincial and local levels to incorporate ICTs into their development agenda is visible in the large number of 'e-governance' projects that have been initiated in the country. These projects constitute by far the most numerous and include the largest and the most noticed of ICTs for development projects in the country. An early and relatively large-scale example of an e-governance project is the computerization of the Mandal Revenue Offices (MROs) in the state of Andhra Pradesh. As part of the project, all the MROs (totalling 1,124), the revenue divisional offices (78), the collectorates (23), the Office of the Commissioner of Land Revenue, and the Directorate of Economics and Statistics at Hyderabad have been computerized. This involves data collection, development and implementation of appropriate databases and developing human resources through intensive training. A substantial part of the funding comes from a World Bank Hazard

ICTs are also an excellent tool to create a citizen-friendly administration that provides free access to information, exploits the technology's interactive capabilities that allow for a better citizen-government interface, and uses its delivery and monitoring capabilities to improve the efficiency of services provision

Mitigation and Emergency Cyclone Recovery Project, "which supports the government's efforts to improve data collection and communication of relevant hazard and vulnerability reduction information from the district and mandal level to citizens".[5]

The system is expected to automate and facilitate:

- the maintenance of statistical information on population, landholding, cropping patterns, weather and climate, livestock, irrigation facilities, housing and a range of other economic information needed for design and management of development schemes
- the issue of integrated certificates (detailing caste, place and date of birth), birth and death certificates, income certificates, pensions and ration cards
- the maintenance of village records, including records relating to transfer of land rights, revenue demands, and allocation of government/surplus lands
- the monitoring of public grievances, welfare schemes, hazard mitigation plans and rescue operations
- the monitoring of the performance of every employee of the state government, and
- the provision of a government-citizen interface in which complaints can be registered directly by the affected party and grievances redressed in a transparent manner with substantial saving of time.

The concern of governments at national, state/ provincial and local levels to incorporate ICTs into their development agenda is visible in the large number of 'e-governance' projects that have been initiated in India

The system sits on the Andhra Pradesh Statewide Area Network (APSWAN), which uses an optic fibre link to connect the state secretariat with 23 district headquarters. Voice, video and data services made possible by this backbone are expected to ensure better coordination between state headquarters and district offices, and improve the efficacy of the different regulatory, developmental and hazard mitigation programmes of the state government.

The storage of a wide range of information, including documents relating to property rights, in computerized databases and providing public access to these databases is seen as promoting transparency of a kind that strengthens democracy. It empowers people and speeds up decision-making when compared with a situation where information was sealed into files locked with red tape that were accessible only to a bureaucracy sworn to secrecy on all matters.

One noted e-governance project is the Bhoomi project in the state of Karnataka. The Government of Karnataka launched the Bhoomi initiative in 1998, which has been described as a major initiative to computerize land records to ensure a more secure title and decrease rural graft. According to reports, all of the 177 Talukas in the state have already been computerized, and the information transferred from the pre-existing manual registers to a computerized database. Besides providing access to land records, that database is expected to be used for a number of other developmental applications including better agricultural and financial planning for farmers in collaboration with the Centre for Knowledge Societies, Bangalore.

The Maharashtra Emergency Earthquake Rehabilitation Project (MEERP), being implemented in the state of Maharashtra, is an example of an e-governance project that has a more targeted objective, but infrastructure from which can support many other activities. It is aimed at minimizing the adverse effects of natural disasters. Complete with a disaster management centre located at the Yashwantrao Chavan Academy of Development Administration (YASHADA), computerized control rooms across the state, a VSAT- and VHF-based communication network and area-specific GIS-based disaster-management plans, the system provides critical support for the disaster management functions of the administration. It can help plan exit and evacuation activities in case of natural or man-made disasters, locate resources that could be easily and quickly deployed in the affected areas and identify potential disaster management facilities in case of need. Supported by the World Bank, the Department for International Development (DFID) and UNDP, the project is now reportedly complete in all districts across the state.

Given the resources available with the government, the international support for these projects and the government's own desire to computerize operations, these are the projects that are relatively large in scale and are likely to be sustained. There can be little doubt that these do provide the necessary interface for more citizen-friendly and transparent governance. However, unless practices and mindsets in the

bureaucracy and the state administration themselves change, the difference this interface can make would be marginal.

Finally, ICTs are powerful tools for human development since they provide a platform for building networks, exchanging information and ideas, launching campaigns and lobbying for change. One area where this is visible is in the struggle for redressing the sharp gender inequalities that characterize all societies, independent of level of development or institutional features. Perhaps the most significant positive impact of ICTs on women's empowerment is the enhanced capacity of women's advocacy and support groups to exchange information, coordinate action, and undertake concerted advocacy campaigns.

For example, the Human Rights Commission of Pakistan has been able to extend its outreach precisely because of email and the Internet. One initiative that was critical in making such interaction possible is the construction of email lists and list archives on specific issues by the Sustainable Development Network of Pakistan (SDNP). Indeed, this is among the true success stories of Pakistan's IT experience. The network provides the most comprehensive source of news and information about various social and human development issues in Pakistan available on the Internet. The Gender and Sustainable Development List (GSD-List) (gsd-list@isb.sdnpk.org, archives at http://lists.isb.sdnpk.org/mailman/listinfo/gsd-list) provides a daily news update on women's issues, both from mainstream and alternative media sources. The GSD list has helped in the evolution of a vibrant community of women's activist organizations in the country by placing the power of electronic communication at their disposal. By understanding the convening power of the Internet, they have leveraged it to great effect in several cases of atrocities against women – bringing unprecedented attention to the state of women's empowerment in Pakistan.

Given these possible routes through which ICT diffusion and use can contribute to human development, it is not surprising that it is not the employment and income growth effects in the ICT sector itself that have been emphasized in the ICT for development literature, but the gains in the form of directly facilitating human development.

The literature on the role of ICT in promoting economic development, despite its short history, makes its generalizations based on the large number of ongoing experiments with using the technology and is characterised by some diversity in the opinions it reflects. The Final Report of the Digital Opportunities Task Force[6] highlighted the transformational impact of ICT by examining over 300 ICTs for development initiatives from around the world. These initiatives illustrate the role of ICTs in generating new economic opportunities, delivering improved healthcare and education, promoting sustainable environmental management, fostering democratic governance by empowering people and organizations, and making government processes more efficient and transparent.

Although such studies have suggested that ICT spread has a positive impact on income and employment growth, much of the evidence pertains to the developed countries. In the case of developing countries where non-ICT investments could have a higher pay-off than ICT investments, the positive relationship could be weak or absent. Hence, there are some who have argued that ICT should not become a 'techno-quick-fix' for solving development problems as there may be unacceptable trade-offs with realization of specific MDGs in less developed countries. According to this view, we are only beginning to understand how the application of ICT affects economic growth and the achievement of specific social goals and there are still serious doubts as to 'whether the benefits truly outweigh the costs'. The evidence suggests that ICTs have a strong positive effect on the process of socio-economic development only when governments create and maintain a conducive, enabling environment.

In this report, the development effects of ICT are traced through four channels:

- ICT as a sector of economic activity
- ICT as an enabler or input for enhancing human productivity
- ICT as a means of improved provision of better quality services, and
- ICT as a means of enhancing capabilities, especially by increasing access to information and knowledge that directly enlarge people's choices and by facilitating the formation of groups and networks that contribute to human development advance.

First, and this is perhaps where the impact of ICTs is immediately visible, attention is paid to

The storage of a wide range of information, including documents relating to property rights in computerized databases and providing public access to these databases is seen as promoting transparency of a kind that strengthens democracy, empowers people and speeds up decision-making

the contribution of the ICT sector to the overall economic growth of a nation or even to the global economy. According to the third-quarter 2003 version of the industry-standard IDC Black Book, worldwide IT spending was set for a 5 per cent growth to US$ 916 billion in 2004, while spending on telecom services was expected to show 4 per cent growth to US$ 1 trillion.[7] The ICT sector and industry have witnessed unprecedented growth in the past decade. In the mid-1990s, the ICT sector became the world's first industry to surpass leading industrial sectors such as automobile and steel. In the latter part of the 1990s, the average annual growth rate of the world economy was around 3 per cent, while the growth of the ICT sector was two or three times that of the growth rate of the world economy. These rates of growth have been sustained despite the growing role of the ICT sector in major economies.

ICTs are powerful tools for human development since they provide a platform for building networks, exchanging information and ideas, launching a campaign and lobbying for change. One area where this is visible is in the struggle for redressing the sharp gender inequalities that characterize all societies independent of level of development or institutional features

Developing countries such as India have also benefited from rapid growth in IT and related sectors. The growth of India's ICT sectors, especially IT components, has attracted attention for a number of reasons. To start with, the pace of that growth has been rapid, albeit from a low base, tallying with the dynamism seen as typical of the industry and captured by the oft-quoted Moore's Law. Thus, according to data collated by *Dataquest*, over the 14-year period from 1990-91 to 2003-04, the annual compound rate of growth of output was above 35 per cent.[8]

The area where the ICT revolution has opened up whole new opportunities for developing countries such as India is in the services sector. Prior to the digital revolution's transformation of service activity, the provision of most services required the presence of a service provider at the point of delivery of the service. As a result, services export took the form of migration of personnel to the location where the service was provided, as epitomized by the migration of skilled technicians, doctors and nurses to the US, and of semi-skilled and unskilled workers (carpenters, masons, chauffeurs and housemaids) to the Gulf countries from India.

The digital revolution has changed all that. Now there is a range of services being provided by workers located in a country different from the one in which the service is actually delivered. These services are delivered via telecommunication or data networks, and are either outsourced or organized by agents in the country of origin of the service to whom the provision of these services are contracted out or outlocated by subsidiaries of corporations from the country of delivery of certain services. Examples of services outsourced/outlocated include customer interaction services; the processing of credit card accounts, insurance claims and business payrolls; the creation and maintenance of information bases in the form of networked data centres and their use in the provision of information services such as help desks; and the generation of digitized records as in the case of medical transcription. Other examples of outlocation include investment in design subsidiaries and back-office facilities.

The possible range of IT-enabled services in an environment where the service sector's role is growing worldwide is immense. The reasons why such relocation occurs are obvious. It substantially reduces the cost at which such services are obtained or provided, and so long as an appropriate location in terms of the availability of manpower with the requisite skills (say, basic computer literacy) and the necessary characteristics (e.g., knowledge of English) is chosen, the quality and efficiency of the service is also ensured.

Estimates made by the National Association of Software and Service Companies (NASSCOM), India, during the period 1990-91 to 2003-04, indicate that IT software and services exports have been growing at 50 per cent per annum or doubling every 18-24 months. There has been a trend shift in the rate of expansion of IT sector output since 1996-97, driven by exports. While the trend rate of growth of output valued in dollars rose from 23.7 per cent during 1990-91 to 1996-97 to 35.7 per cent during 1995-96 to 2002-03, the rate of growth of exports rose from 32.5 per cent to 51.9 per cent during these two periods. As a result, the share of IT software and services exports in India's total exports is estimated to have risen from 3.2 per cent in 1996-97 to 21.3 per cent in 2003-04, and the ratio of IT software and services revenues to GDP rose from 0.72 per cent in 1997-98 to 1.81 per cent in 2000-01 and 2.64 per cent in 2003-04.[†]

Second, ICTs enhance the process of human development because of their impact on eco-

[†] Based on data collated from www.nasscom.org

nomic growth through productivity gains that it generates in every sector. ICTs are increasingly being used as the means to design and control processes and operations in the resource extraction industries, manufacturing sector and services. ICTs have, in fact, become indispensable ingredients in all forms of economic activity ranging from design and manufacturing to maintenance of inventories, provision of product and service information and marketing. They have become vital to the conduct of national and international business transactions, facilitating stock market operations, international trade and the functioning of global currency markets. They also play a critical role in computational activities supporting scientific and technological research, and thereby contribute to the generation of productivity enhancing technologies and processes. Along these channels, however, quantitative assessments of the impact of ICTs become difficult, as they are embedded and integrated into the functioning of almost all industrial and services sectors. This makes it difficult to isolate and then quantify the contributions made by ICTs alone.

Third, ICTs allow government, cooperatives, civil society organizations and the private sector to offer better and more easily accessed services in even remote locations. These could vary from simple user charge collection services to sophisticated health services delivered by specialists to patients in remote locations. Other examples revealed by the experiments under way involve provision of veterinary services, grievance redressal relating to availability of government facilities and access to market and official information of commercial value. Many e-governance projects are directed at using ICTs to provide these and other services.

Fourth, perhaps the most significant and long-term impact of ICTs lies in their ability to directly expand human choices through increased access to information and knowledge. Knowledge plays a critical role in people's ability to process, interpret, evaluate and deploy information in their own context and in the pursuit of their own interests. Knowledge empowers individuals, organizations and communities by providing them with choices far beyond those that may be available to them otherwise. These choices generate opportunities for increased participation – economically, socially, politically and culturally. ICTs enable the flow of knowledge across geographical, political, economic and social borders, thereby breaking earlier forms of knowledge monopoly which led to the marginalization of large sections of the world's population.

Its role as a carrier technology allows ICT to break barriers to human development in at least three ways not possible before or with other forms of technology:

- *Breaking barriers to human knowledge*. Access to information and education is indispensable in building human capabilities. The Internet and other ICTs are increasingly becoming the key delivery mechanisms for information and education to sections of the population that did not have access to educational infrastructure and content. Moreover, these new delivery mechanisms provide access to global and diversified sources of information and educational content thereby enhancing, dramatically, the quality of educational inputs that are available to even the most remote and deprived populations. ICTs are also being actively used in promoting life-long learning and continued education as well as reintegrating unemployed people into the workforce through re-education and retooling of skills. Women and other excluded groups stand to benefit particularly from this.
- *Breaking barriers to participation*. The world has witnessed innovative uses of the Internet and other ICTs in enhancing political participation as well as in bringing about greater transparency and accountability. In many parts of Asia, where the mass media have been and continue to be strictly controlled by governments, the Internet has offered a new medium of political mobilization and participation. In Malaysia, the emergence of alternative news and online websites such as Malaysiakini have provided a channel for opposition groups and parties as well as critics of the government to express dissent, thereby creating a new space for political debate and expression. The Internet has also become a major means for interaction between civil society groups and for raising awareness and running campaigns that lobby for change. Such Internet- and ICT-based news and information groups have contributed to the creation of a more vibrant public sphere. They increase social, political, economic and cultural participation, which enhances

There are some who have argued that ICT should not become a 'techno-quick-fix' for solving development problems as there may be unacceptable trade-offs with realization of specific MDGs in less developed countries

networking and social mobilization and can make governments more accountable and transparent.

- *Breaking barriers to economic opportunity*. Since the ICT sector requires less initial investment than the more traditional sectors of industrial activity, it lowers the barriers to entry into the economy for people who could never break into the industrial sector. ICT provides new and unprecedented opportunities to whosoever has proficiency in handling ICT tools and has an idea or service to sell. This is what helped people with ICT skills in countries such as India, China and Malaysia to overcome the traditional barriers to employment and wealth creation by joining the computer software industry or related ICT industries. ICTs have also created new outsourcing opportunities whereby services are provided in one country and delivered to another country. The large and rapidly expanding global software and IT-enabled services outsourcing market provides an array of opportunities to developing countries with labour that is proficient in ICT and relatively cheap. These new avenues of employment have benefited some hitherto less privileged sections as well; for example, in India, women constitute a large section of the workforce in call and transcription centres.

Photo: Amit Khullar

MDGs

Chapter 4

Status of ICT diffusion and the digital divide in Asia

The world has witnessed a rapid process of diffusion of ICTs since the mid-1990s. In 1997, there were 173 fixed lines and mobile telephones per 1,000 people. Over a five-year period ending 2002, the figure more than doubled to 364 fixed lines and mobile telephones per 1,000 people.* The telecommunication landscape also began to change from one dominated by landlines to one based on wireless technology. Although wireless communication is still considered a recent innovation in the evolution of telecommunications, adoption rates in developed and developing countries have been astounding. Analysts of diffusion processes and their determinants have correctly argued that wireless communication will experience exponential growth to surpass landline diffusion, due to faster deployment, lower costs and greater ease of use. On a global scale, the penetration rate for mobile telephones in 2002 was 19.07 per 100 inhabitants, overtaking the penetration for main telephone lines which stands at 17.90 per 100 inhabitants. Most regions such as Africa, Asia, Europe and Oceania have a higher mobile telephone penetration rate compared to their main telephone line penetration rate (Table 4.1). Gartner believes that by 2007, 60 per cent of people aged 15 to 50 in the EU and the US will carry or wear a wireless communications device for at least six hours a day.[1]

Diffusion rates for relatively newer ICT innovations like the Internet are also fast catching up.† The Internet first began as ARPANET (Advance Research Projects Agency Network) in 1969, which linked US scientific and academic researchers and consisted of four host computers. In 1980, there were 213 host computers in less than 12 North Atlantic Treaty Organization (NATO) countries. In the mid-1980s, the ARPANET took its first step out of the US Department of Defence and became the Internet. By the end of the 1980s, connectivity had spread to more than 20 countries with 100,000 host computers. The millionth host was connected in 1992 and, in 2003, more than 200 countries had full TCP/IP (Transmission Control

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Table 4.1 ***Global telephone penetration rates (2002)***

	Main telephone lines (per 100 inhabitants)	**Cellular mobile phone** subscribers (per 100 inhabitants)
Global	17.90	19.07
Africa	2.77	4.59
Americas (North and South)	34.73	29.90
Asia	11.99	12.42
Europe	41.34	51.26
Oceania	40.40	48.87

Source: International Telecommunication Union, World Telecommunications Indicators 2004: Access Indicators for the Information Society, electronic version, updated October 2004 and downloaded 2 January 2005.

* World Bank, World Development Indicators Online, accessed 2 January 2005.

† It must be noted that as of now the faster rate of growth of mobile lines vis-à-vis fixed lines does slow Internet growth as the latter provides better Internet access.

SPECIAL CONTRIBUTION

ICTs and MDGs: Efficiency and equity
Some policy issues relevant for human development in Asia and the Pacific

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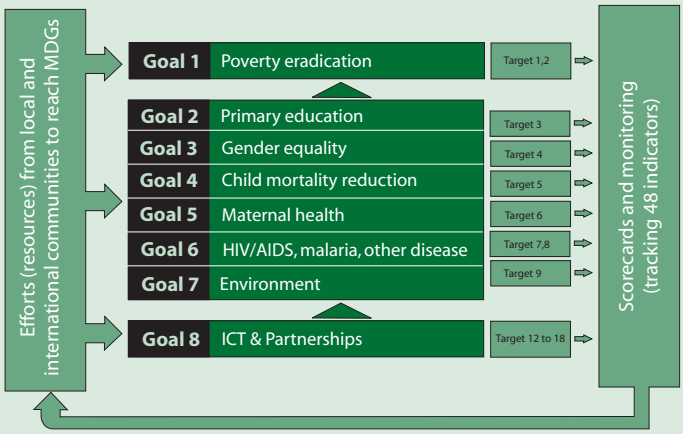
In 2000, the G-8 Digital Opportunity Task Force (DOT Force) concluded that "when wisely applied, ICTs offer enormous opportunities to narrow social and economic inequalities and support sustainable local wealth creation, and thus help to achieve the broader development goals that the international community has set. (. . .) ICTs can provide new and more efficient methods of production, bring previously unattainable markets within the reach of local producers, improve the delivery of government services, and increase access to basic social goods and services. There need therefore be no trade-off between investment in ICT and the achievement of development objectives".[1]

A hierarchical view of MDGs

As many analysts have underlined already, Goal 8 (which covers both ICT and partnerships) can increase the efficiency with which the international community will pursue Goals 1 to 7, considering the fact that Goals 2 to 7 are actually fundamental components of a concerted strategy to achieve Goal 1 (poverty eradication). Schematically, this 'hierarchy of MDGs' can be represented as follows:



Efficiency cum equity

From the hierarchy suggested above, one can easily deduct that investing in ICTs will be an important way to:

- increase the efficiency of investments made in sectors such as education or health (e.g., by increasing the range and lowering the cost of delivering such services), and
- accelerate the fight against poverty.

Protocol/Internet Protocol) connectivity with over 500 million users.[2]

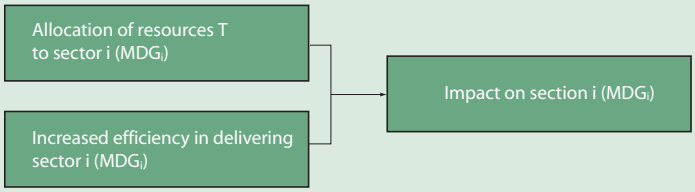
The pervasiveness and growth of ICT is also seen in the number of personal computers (PCs) owned by people. In 1995, there were 42.1 personal computers per 1,000 people and this number almost doubled to reach 100.8 computers per 1,000 people in 2002. The number of Internet users per 1,000 people has also risen more than 10-fold from 9.6 users in 1995 to 130.7 users in 2002 (Table 4.2).

A recent report reveals that, in 2004, the number of Internet users worldwide had risen to a staggering 935 million (Table 4.3).[3] Though the US topped the country-list with 185 million users, China with close to 100 million users was fast catching up. In fact, according to Egil Juliussen, the author of the report, most future growth in Internet users would come from

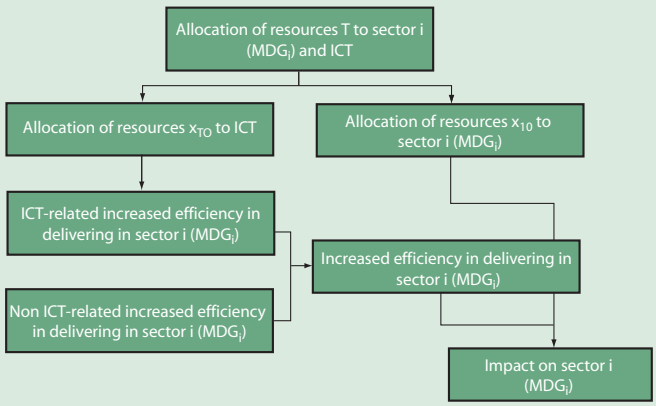
In other words, when considering efforts to be made to pursue a particular MDG, one needs to keep in mind that the ultimate effect on that particular sector (and its relevant MDG) will be a combination of two factors:

- the resources allocated to the sector, and
- the increased efficiency with which the services appropriate to that particular sector will reach their beneficiaries.

Graphically, this can be represented as follows:



If one regards ICTs as a significant tool through which efficiency gains can be realized in the delivery of services such as education and health, it becomes useful to consider that any allocation of resources (T) can usefully be shared between direct allocations to the relevant sectors, on the one hand, and support to ICT infrastructure and services, on the other. Using the same type of graphical representation as above, we now have a slightly more complex chain of causalities:



Since the realization of MDGs 2 to 7 will ultimately be necessary to the realization of Goal 1 (poverty reduction), investing in ICT should indeed be considered as a tool through which both efficiency and equity concerns can be addressed while pursuing the MDGs.

populous countries such as China, India, Brazil, Russia and Indonesia. These countries are also expected to registerk strong growth of wireless Web usage and the cell phone will be the only Internet access device for many new Internet users. The Human Development Report (HDR) 2001 predicted that, by 2005, there will be well over a billion Internet users with access to more information than ever at a rapidly decreasing cost. At that time, there were 2.5 billion unique and publicly accessible Web pages on the Internet with 7.3 million new ones being added every day.

As a result of such diffusion, Asian nations are well placed to leverage the use of ICTs for socio-economic and human development. In just over a decade, several Asian nations have emerged as global leaders in terms of ICT use and penetration. Telephone availability, PC ownership and Internet access are increasing rapidly, pushed by

Table 4.2 ***Global diffusion of ICTs***

	1995	2000	2002
Personal computers (per 1,000 people)	42.1	79.9	100.8
Internet users (per 1,000 people)	9.6	84.7	130.7

Source: World Development Indicators database, January 2005

growing government support with pro-ICT policies and regulations as well as much lower start-up costs than those developed countries experienced initially.

This evidence is heartening because ICT availability and connectivity are crucial to exploiting the benefits of the technology for human development. Overall, the promise that the ICT revolution holds for development in poor countries takes three forms. First, it is expected to result in the growth and diversification of the ICT sector itself, leading to the rapid expansion of output and employment in the production of currently available ICT products as well as myriad new products the technology is expected to deliver. The consequent income and employment growth, it is argued, cannot but have positive human development implications.

Second, the use of ICT in the agricultural, non-ICT manufacturing and services sectors is expected to fundamentally transform the nature of production in these sectors with major implications in terms of labour productivity, growth and employment.

Third, the penetration of ICT into activities outside of production is expected to reshape the way work, markets and leisure will be organized, and the way in which individuals and communities can trade and access information and services. This, in turn, will lead to changes in the structure of markets, improvements in the quality of life, a deepening of democracy, and major advances in terms of human development indicators.

Needless to say, each of these routes through which ICTs are expected to affect development is predicated on a certain kind and degree of diffusion of the technology within the country. The first presumes a process of cross-country diffusion, whereby the technologies and the industries that constitute the ICT sector move from early to late entrants.

The second route by which ICTs are expected to impact growth and development is predicated

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Table 4.3 ***Top 15 countries in Internet usage***

Year-end 2004	Internet users ('000)	Share %
1. US	185,550	19.86
2. China	99,800	10.68
3. Japan	78,050	8.35
4. Germany	41,880	4.48
5. India	36,970	3.96
6. UK	33,110	3.54
7. South Korea	31,670	3.39
8. Italy	25,530	2.73
9. France	25,470	2.73
10. Brazil	22,320	2.39
11. Russia	21,230	2.27
12. Canada	20,450	2.19
13. Mexico	13,880	1.49
14. Spain	13,440	1.44
15. Australia	13,010	1.39
Top 15 Countries	662,360	70.88
Worldwide Total	934,480	100

Source: Computer Industry Almanac at http://www.c-i-a.com/pr0904.htm, accessed January 2005.

on a horizontal intra-country diffusion process. ICT use in the manufacturing sector, it is predicted, will transform the production process and organizational structures of firms, and raise productivity, investment, growth and employment. Similarly, in the services sector, it is expected to change the structure of markets, and the extent and ease of access to and delivery of a range of services.

The third route by which ICTs are anticipated to impact development is crucially dependent on a vertical intra-country diffusion process that results in an increase in the level of penetration of the technology, leading to increased community and individual access to the benefits of the technology. This impacts human development by making these devices the means of service delivery, of ensuring transparency and of enhancing participation.

One simple indicator of diffusion is the rate of increase of ICT-related expenditure. Expenditure on ICT, which includes external* and internal† spending on information technology, is on the rise for some Asian countries (Table 4.4). In all countries where data were available (except Indonesia), ICT expenditure is seen to have increased both in absolute terms and as a share of GDP between 1995 and 2001. The extent of increase has varied, with a high absolute increase of around 227 per cent in China and a low increase of a little over 6 per cent in Thailand. India also shows a remarkable increase, more than doubling its ICT expenditure over this period. Indonesia is the only country that actually experienced a decline of a little over 18 per cent. In terms of GDP shares the variations recorded are lower, with all countries showing increases including, interestingly, Indonesia.

ICT related infrastructure development has also been diverse across Asia. Between 1997 and 2001, the Asian region (East Asia and the Pacific, and South Asia) recorded the highest percentage increases in tele-density (fixed and wireless), PC penetration and number of Internet users as compared with the world as well as Europe and Central Asia (Table 4.5). The percentage increases were exceptional, with East Asia and the Pacific recording around 342 per

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Table 4.4 ***Increase in ICT expenditures of nine Asian countries in years 1995 and 2001***

	Total ICT expenditure (million US$)		ICT expenditure as % of GDP	
	1995	2001	1995	2001
China	20,401.0	66,612.0 (226.51%)	2.9	5.7
India	7,250.0	19,662.0 (171.20%)	2.1	3.9
Indonesia	4,337.0	3,540.0 (-18.37%)	2.1	2.2
Malaysia	4,438.0	6,325.0 (42.51%)	5.0	6.6
Mongolia	NA	NA	NA	NA
Pakistan	NA	NA	NA	NA
Sri Lanka	NA	NA	NA	NA
Thailand	4,464.0	4,751.0 (6.42%)	2.7	3 . 7
Vietnam	740.0	2,124.0	3.6	6.7

Source: Development Data Group, World Bank http://www.worldbank.org/data/countrydata/countrydata.html, accessed 2 January 2005.
Note: Figures in parenthesis denote percentage changes as compared to 1995.

* External expenditures include information technology products purchased by businesses, households, governments and education institutions from vendors or organizations outside the purchasing entity.

† Internal spending on information technology includes spending on internally customized software, capital depreciation, and the like.

Table 4.5 ***Technology and infrastructure data profile in years 1997 and 2002***

Indicators	World		East Asia and Pacific		South Asia		Europe and Central Asia	
	1997	2002	1997	2002	1997	2002	1997	2002
Total population (in billion)	5.79	6.17	1.7	1.84	1.28	1.47	0.473	0.472
Fixed lines & mobile telephones (per 1,000 people)	173	364	61.7	273	18	45	203	438
Personal computers (per 1,000 people)	54	101	7.5	26	2	7	28	73
Internet users (per 1,000 people)	25	131	4	44	1	14	10	87

Source: World Development Indicators Database, January 2005.

In terms of technology diffusion and take-up rates, Internet users clearly recorded exponential growth in all regions of the world. However, here also, the growth in the Asian region was the highest. Asian Internet users have also increased exponentially

cent for tele-density, 247 per cent for PC penetration and a whopping 1,000 per cent in the number of Internet users, albeit from a low base. However, within the Asian region, fixed and mobile phone penetration varied from 45 to 273 per 1,000 people in South and East Asia, respectively, in 2001. Over time, rates of growth in East Asia and the Pacific also exceeded those of South Asia.

The access to personal computers has also risen; although not so dramatically. Across the world, the numbers for all regions have doubled with the highest penetration level of 73 computers per 1,000 people recorded in Europe and Central Asia. In East Asia, computer access levels rose from 7.5 to 26 computers per 1,000 people between 1997 and 2002.

In terms of technology diffusion and take-up rates, Internet users clearly recorded exponential growth in all regions of the world. However, here also, the growth in the Asian region was the highest. Asian Internet users have also increased exponentially. In East Asia, the number of Internet users for every 1,000 people has grown from four in 1997 to 44 in 2002. The same story is repeated in South Asia, which had only one Internet user per 1,000 people in 1997 but recorded a jump to 14 users per 1,000 people in 2002.

Even though South Asia lags in terms of connectivity status relative to the other Asian sub-regions, it has been showing signs of rapidly catching up. In 2001, South Asia, with 43.7 million operative fixed lines and 8.5 million mobile subscribers, accounted for 4 per cent of the world's fixed lines and less than 1 per cent of cellular subscribers. Average fixed-line tele-density in the sub-region stood at 3.2 in that year and mobile tele-density was 0.63. However, during 1996 to 2001, the sub-region recorded compound annual growth rates of fixed lines and mobile subscribers of 20 and 78 per cent, respectively, as compared to the world average growth rates of only 7 and 48 per cent during the same period. Thus, relative to the other regions of the world, South Asia emerged as one of the fastest growing markets despite its low telephone penetration.

It is not just that the rate of growth during the 1990s has been higher than the world average. In fact, the pace of expansion of the telephone network in South Asia has accelerated over time from 7 per cent between 1976 and 1981 to 11 per cent between 1986 and 1991, and 20 per cent between 1996 and 2001. According to Minges and Simkhada[4], this acceleration in network growth rate is beginning to impact a long-established correlation between GDP per capita and fixed-line tele-density. The correlation would have predicted that South Asia's fixed tele-density would be 1.2 in 2001. Yet it was almost three times as high, at 3.2. They see this is as evidence that old assumptions about telecommunications development no longer apply.

Taking per capita annual investment in telecommunications as an indicator of trends in connectivity in the nine countries in this Report, we find that it has seen explosive increases over the 1990s in China, Malaysia and Thailand, and more moderate increases in Indonesia (Table 4.6) . However, in the case of Indonesia, Malaysia, Pakistan and Thailand, there appears to have been a decline in per capita investment by 2002, reflecting possibly the after effects of the financial crisis of 1998. The level of investment has also grown (even in nominal dollar terms) at a relatively slow pace in India and Sri Lanka.

It is to be expected that these wide variations in investment would influence the level of connec-

Table 4.6 ***Per capita annual telecommunication investment (US$)***

	1990	1995	2002
China	1.08	9.67	19.5
India	1.87	2.73	3.4
Indonesia	3.20	8.48	8.1
Malaysia	16.69	85.64	49.4
Mongolia	8.32	1.54	2.1
Pakistan	1.23	3.87	1.2
Sri Lanka	0.90	1.38	1.8
Thailand	7.02	23.68	21.15
Vietnam	NA	NA	NA

Table 4.7 ***Main telephone lines per 100 inhabitants***

	1995	2000	2002
China	3.30	11.18	16.69
India	1.29	3.20	3.98
Indonesia	1.69	3.23	3.65
Malaysia	16.57	19.92	19.58
Mongolia	3.50	4.95	5.18
Pakistan	1.67	2.16	2.33
Sri Lanka	1.18	4.14	4.43
Thailand	6.06	9.23	9.87
Vietnam	1.05	3.19	3.76

Source: International Telecommunications Union, Telecommunication Indicators Database, various issues.

tivity, which is crucial for the use of ICT for human development purposes. A simple measure used to assess the degree of such diffusion is, of course, tele-density or the number of telephones per 100 inhabitants in the country. In 2002, fixed-line density varied from 2.33 per 100 inhabitants (in Pakistan) to 19.58 (in Malaysia). In terms of tele-density rates (Tables 4.7 and 4.8) in 2001, Malaysia, China and Thailand are the top performers, both in telephone mainlines and mobile phones per 100 inhabitants. While levels of fixed-line penetration were much lower in the other countries, the rate of growth of tele-density was significant in all of them, except Pakistan. The lowest penetration rates are observed for Pakistan for both telephone mainlines and mobile phones, followed by Vietnam, with India and Indonesia coming next for telephone mainline penetration.

In most countries, the increase in overall tele-density is being driven by mobile phones. From being virtually non-existent in 1995 in all the countries covered in this study, excepting Malaysia and Thailand, mobile phones are now catching up with fixed lines. In developing countries, where even basic communication infrastructure is a problem, mobile telephony is proving to be a boon. Operators no longer have to invest heavily in hardware and, in countries that are geographically vast or where laying landlines is a difficult process, user rates of mobile telephony are on the increase.

However, of the nine countries, it is only in Indonesia, Malaysia, Mongolia and Thailand that mobile phone penetration exceeds that of mainline telephones. The reasons for this are likely to be quite different in these four countries, given that they stand at very different levels of economic development. It is likely that, in Malaysia, mobile telephone demand was driven by higher purchasing power whereas, in Mongolia, the absence of fixed-line infrastructure as reflected in its low mainline tele-density of a little more than 5 per 100 inhabitants, is the possible explanation for high mobile take-up rates. In Mongolia, all *aimags* or provinces (except for Huvsgul), are connected with microwave digital lines, with some *aimags* having satellite connections. As for the other countries, India follows Pakistan from the bottom, in terms of the mobile phone penetration rate. However, since 2002, mobile telephony has boomed in India, taking the mobile phone penetration rate to 2.4 at the end of March 2004.[†] So the picture has changed substantially.

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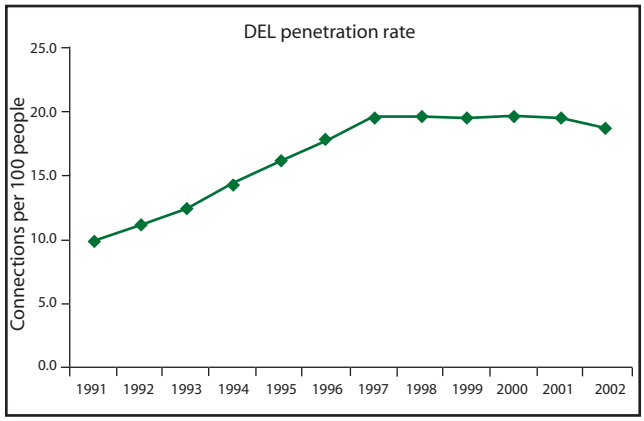
Table 4.8 ***Cellular mobile telephone subscribers per 100 inhabitants***

	1995	2000	2002
China	0.29	6.58	16.09
India	0.01	0.35	1.22
Indonesia	0.11	1.78	5.52
Malaysia	5.00	21.32	37.68
Mongolia	0.00	6.51	8.89
Pakistan	0.03	0.25	0.85
Sri Lanka	0.29	2.32	4.92
Thailand	2.26	5.04	26.04
Vietnam	0.03	0.99	2.34

Source: International Telecommunications Union, Telecommunication Indicators Database, various issues

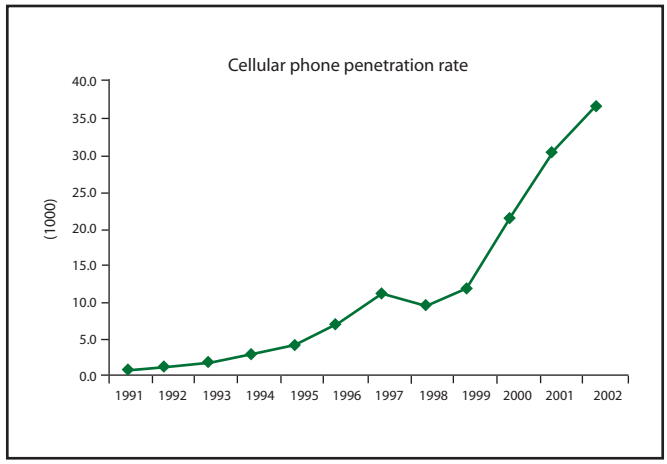
[†] Based on figures from the Department of Telecommunications of the Government of India, available at http://www.dotindia.com/networkstatus.htm, accessed on 21 May 2004.

Figure 4.1 ***Malaysia's direct exchange line (DEL) penetration rate***



Source: Malaysian Communications and Multimedia Commission
From John, K. J. *et. al.,* 2003, Chapter 3, Figure 2, pp 44

Figure 4.2 ***Malaysia mobile phone penetration rate***



From John, K. J. *et. al.,* 2003 Chapter 2, Figure 4, pp 48.

The rise in telephone density as a result of an increase in cellular telephone connections may not be fully indicative of the diffusion of telecommunications technology

In Pakistan too, the telecommunications infrastructure has improved vastly over the last decade, and especially since the adoption of the National IT Policy in 2000. Estimated Internet usage has risen from 130,000 in 2000 to over 4 million in 2003, mainly in the metropolitan areas,[5] although the number of cities in Pakistan with Internet access increased from 29 to over 1,000 between 2000 and 2003. Mobile phone usage has risen from 200,000 phones to 1.7 million in the three years between 2000 and 2003. Pricing is a key factor in this development. Internet access calls are not multi-metred or charged separately for telephone and Internet usage, mobile phones operate on the caller party pays (CPP) principle. Bandwidth prices for an E1 connection (2,048 kb/s) have been reduced from US$ 87,000 in 2000 to US $3,500 in 2003.

An interesting feature is that, whether in rich or poor countries, a sharp increase in mobile telephony has been accompanied by a deceleration in the rate of growth of fixed line penetration. In Malaysia, as Figures 4.1 and 4.2 show, the trend in the penetration rate for fixed lines has reached a plateau after 1997 even as the mobile phone penetration rate rose sharply.

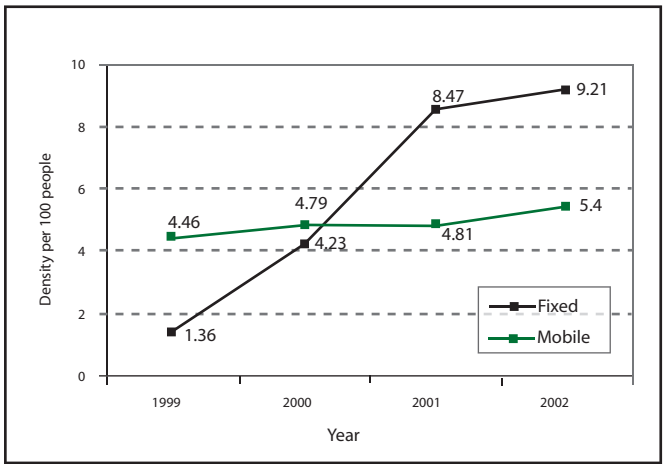
The same pattern is repeated in Mongolia where national telephone density per 100 people is 5.4 while mobile phone density is 9.21 per 100 people for the whole country (Figure 4.3). The mobile density in Ulaanbaatar reached 20 while in rural areas this number ranges from 0.35 to10.3. Most *aimags* have been connected recently with mobile communications and the number of users is rapidly growing.

In Sri Lanka too, the numbers of landline connections, pay phone booths and radio paging services have been on the decrease since the late 1990s. This has been attributed to the growing popularity of cellular phones, with cellular tele-density surpassing that for all other forms of communication. As a result, Sri Lanka's tele-density has changed significantly over the past 10 years both in different modes and as an aggregate (Figure 4.4).

Despite this, the presence of mobile telephones makes aggregate tele-density an unsatisfactory measure of the extent of diffusion. A very large proportion of cellular phone subscribers are those who subscribe to the service in addition to holding a regular landline. Hence, the rise in telephone density as a result of an increase in cellular telephone connections may not be fully indicative of the diffusion of telecommunications technology among those who were thus far marginalized from the network.

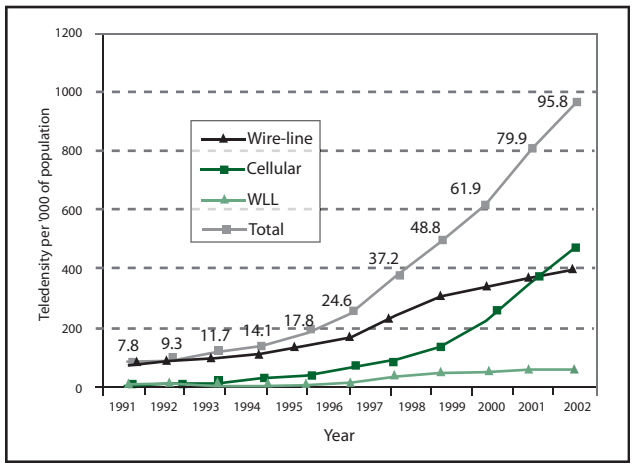
Further, there are other features of telephone distribution that point to the fact that tele-density is not an adequate index of diffusion. To start with, the aggregate figure conceals the low penetration of telecommunications capacity and a high degree of urban and regional concentration. As Table 4.9 shows, in the countries for which data is available, urban areas account for more than 50 per cent of fixed lines, with the urban share going up to 90 per cent in the case of Pakistan. Even

Figure 4.3 ***Mongolia's telephone and mobile density per 100 people***



Source: Davaatseren, 2003, Government Action Plan performance and future plans
From Enkhjargal, S. *et. al.,* 2003 Figure 2.1, pp 29

Figure 4.4 ***Tele-density growth of the past 10 years in Sri Lanka***



Source: Economic and Social Statistics of Sri Lanka, 2002, Annual Report 2002, Central Bank of Sri Lanka
From Wattegama *et. al.,* 2003, Figure 2.1

among urban areas, there is evidence of substantial regional concentration. The largest city alone accounted for well over half the lines in Mongolia and Thailand in 2001 and between a quarter to a third of the lines in Indonesia and Sri Lanka (Table 4.10). The ratios are far lower in large countries such as India and China, but this is more due to the presence of a larger number of metropolitan cities. But, even there, the metropolitan cities together account for a relatively high share of fixed lines.

Thus, to assess the extent of spread of connectivity, we need separate indicators of mass access such as the presence of public call offices (PCOs) in rural and urban areas, and direct exchange lines and village public telephones (VPTs) in rural areas. These indicators are by no means encouraging. For example, the number of public pay phones for every 100 inhabitants is not merely low in all countries, but has risen extremely slowly in most (Table 4.11).

Internet connectivity

Even if connectivity in the form of a communications link is established, there is no guarantee that this can be viably expanded to connect a country's population to the world through the Internet, if that were considered a advantageous route to take. There are few Internet users relative to the population at present and

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Table 4.9 ***Percentage of main lines in urban areas***

	1990	1995	2000	2002
China	22.3	80	65	63
India	90	—	79	73
Indonesia	—	—	—	—
Malaysia	—	—	—	—
Mongolia	—	32	59	69
Pakistan	91.64	—	—	90
Sri Lanka	—	67	73	23
Thailand	68	62	53	54
Vietnam	—	—	—	—

Table 4.10 ***Share of largest city in main telephone lines***

	1990	1995	2000	2001
China	—	4.6%	4.9%	4.9%
India	13.8%	12.0%	7.2%	6.3%
Indonesia	54.4%	—	36.2%	36.2%
Malaysia	11.2%	9.1%	—	—
Mongolia	44.5%	55.3%	60.4%	—
Pakistan	—	28.0%	—	—
Sri Lanka	68.3%	65.6%	23.7%	23.5%
Thailand	—	54.6%	48.4%	53.1%
Vietnam	—	36.4%	—	—

Source: International Telecommunications Union, Telecommunication Indicators Database, various issues

Table 4.11 ***Public pay phones per 100 Inhabitants***

	1995	2000	2002
China	0.07	0.27	0.77
India	0.03	0.09	0.19
Indonesia	0.06	0.17	0.19
Malaysia	0.49	0.67	0.48
Mongolia	0.00	0.02	0.03
Pakistan	0.01	0.03	0.07
Sri Lanka	0.04	0.04	0.04
Thailand	0.09	0.30	0.34
Vietnam	0.00	0.01	0.01

Source: International Telecommunications Union, Telecommunication Indicators Database, various issues

In terms of Internet penetration in Asia, the International Telecommunications Union estimated that in 2001, the Asia-Pacific region had over 160 million Internet users with a penetration rate of 460 users per 10,000 inhabitants

many developing countries lag in terms of the bandwidth (or the pipe) necessary for people to simultaneously access information flow through the Internet.

In terms of Internet penetration in Asia, the International Telecommunications Union (ITU) estimated that in 2001, the Asia-Pacific had over 160 million Internet users with a penetration rate of 460 users per 10,000 inhabitants. Amongst the nine Asian countries being studied here, China leads with a little over 59 million users, followed by India with a little under 17 million users (Table 4.12). However, with regard to the number of users per 100 inhabitants, it is Malaysia that emerges on top with a penetration rate of 31.96. The other eight countries are all well below this rate, with Thailand coming in second at around 7.76. The lowest penetration rates are observed in Pakistan and Sri Lanka, with a little over 1 user per 100 inhabitants.

Here again, access tends to be extremely concentrated. For example, in August 2000, when there were an estimated 1.6 million subscribers and 4.8 million users in India (0.37 per cent of the overall population), more than three-fourths (77 per cent) of these users were from New Delhi and the capitals of Indian states. Two cities – Delhi and Mumbai – alone accounted for more than one-third of all users. Maharashtra, with 453,000 users accounted for 28 per cent of the total. On the other hand, two of India's most populous states – Uttar Pradesh and Bihar – had only 20,000 and 8,000, respectively.[6] Clearly, the inadequate spread of connectivity, the perceived benefits of connectivity and the cost at which it is available are working against as rapid a spread of the Internet as was seen in the case of radio.

With respect to PC penetration, Malaysia leads the nine countries with 14.7 PCs per 100 inhabitants. All the others have single digit PC penetration rates. In fact, Pakistan, India and Vietnam are at the bottom, with the PC penetration rate below 1 per 100 inhabitants. Data on Internet

Table 4.12 ***Internet diffusion in selected Asian countries in 2002***

Country	Estimated PCs		Internet hosts		Number of ISPs	Number of Internet users		Number of Internet subscribers (in thousands)		International Internet bandwidth (M/bit/s)
	Estimated PCs total (in thousands)	Estimated PCs per 100 inhabitants	Hosts Total	Hosts per 100 inhabitants		Total (in thousands)	Per 100 inhabitants	Total	Broad band	
China	35,500	2.76	156,531	0.01	936	59,100	4.6	49,700	2260	9,380
India	7,500	0.72	78,595	0.01	90	16,580	1.5	3,640	82.4	1,670
Indonesia	2,519	1.19	61,279	0.03	60	4,500	3.7	600	31.3	573
Malaysia	3,600	14.68	86,285	0.35	6	7,841	31.96	2,633	19.3	1,320
Mongolia	69	2.84	127	0.01	NA	50	2.06	19.5	0.1	17
Pakistan	600	0.42	12,707	0.01	70	1,500	1.03	200	NA	410
Sri Lanka	250	1.32	2,335	0.01	29	200	1.06	70.1	NA	90
Thailand	2,461	3.98	100,132	0.16	18	4,800	7.76	1500	15	1011
Vietnam	800	0.98	529	—	4	1,500	1.85	350	1.1	143

Source: International Telecommunications Union, Telecommunication Indicators Database
NA: Data not available.

hosts per 100 inhabitants reveals a similar picture. Interestingly, as per available data, broadband subscriptions (which enormously increase the speed and volume of information transactions) as a share of total Internet users range between a low 0.1 per cent for Thailand to 2.5 per cent for Indonesia. This is well below the Asia-Pacific average of 19 per cent (the Republic of Korea leads the world with a massive broadband subscriber share of 93 per cent).

The threat of many digital divides

These inter- and intra-country variations in connectivity and access lend some support to the idea that ICT diffusion could well be accompanied by widening digital divides: stifling the effort to use the technology for enabling the realization of the MDGs. Those who have no or limited access to the technology or the skills and knowledge required to exploit it fall further back in terms of their ability to use the technology. The term 'digital divide' denotes the resulting widening disparity in the adoption of ICT by different sections of society.

Fundamentally, a digital divide is a reflection of existing broader socio-economic inequalities. However, experience worldwide suggests that, even while the effort to mitigate these structural constraints should continue, appropriate intervention can reduce the degree to which ICT penetration is shaped by them. In spite of commendable efforts by many Asian governments, ICT diffusion and use has followed existing socio-economic, gender and urban-rural divides. That is, the existence of structural constraints only increases the urgency of reinstating human development concerns at the core of initiatives to promote and harness ICT in Asia, so as to prevent the exclusion and marginalization of certain sections of the population in the developing world.[7]

It has been argued that the rapid pace of expansion of ICTs in the developing world implies that though there may be differences in the level of diffusion of the technology, the gap is closing. This suggests that the term "digital divide" came to prominence "more for its alliterative potential than for its inherent terminological exactitude".[8] What such arguments ignore is the fact that even when diffusion occurs there are substantial gaps between sections within developing countries, so that the global digital divide persists even if the line is not draw along national boundaries.

The Technology Achievement Index (TAI), first used by the UNDP in HDR 2001, measures "how well a country is creating and diffusing technology and building a human skill base, reflecting capacity to participate in the technological innovations of the network age".[9] The TAI focuses on four dimensions of technological capacity to compute the value of the index: creation of technology, diffusion of recent innovations, diffusion of old innovations and human skills.

In Asia, as per the TAI, Japan, Korea and Singapore are the only countries in the technological leader category (Table 4.13). The digital divide across countries is evident, with only one country (Malaysia) among the nine being studied here, being categorized as 'potential leader' with a TAI value of 0.396 and a rank of 30 among the 72 countries covered. China, India, Indonesia, Sri Lanka and Thailand come under the 'dynamic adopter category', while Pakistan is marginalized. Categorization was not possible in the cases of Mongolia and Viet Nam as satisfactory data were not available; this itself probably reflects even lower levels of technology adoption.

The different levels of diffusion of the technology to and within different countries has resulted in different stages of e-readiness, a term which the Harvard's Centre for International Development says can be understood as the potential of a community to participate in ICT developments. An oft-quoted index of e-readiness is the Network Readiness Index (NRI).[10]

The NRI framework for 2004 takes into account more than just ICT use in the economy: it also incorporates factors that contribute towards the use of ICTs for a nation's development. Originally, the NRI captured the degree to which a community is prepared to participate in the networked world, which was expanded in 2002 to include a community's potential to participate in the networked world in the future. Top-ranked countries are those with the most developed ICT networks and the greatest potential to exploit the capacity of their networks.

The NRI scores are a combination of indicators on network use and enabling factors reflecting important dimensions relevant for assessing the digital divide. Of a total of 104 countries covered, most Asian countries with the exception of

Inter- and intra-country variations in connectivity and access lend some support to the idea that ICT diffusion could well be accompanied by widening digital divides, stifling the effort to use the technology for enabling the realization of the MDGs

Table 4.13 ***Technology Achievement Index (TAI) for selected Asian countries in the year 2001***

Country	TAI value	**TAI rank** (out of 72 countries covered)	Category
Japan	0.698	4	Leader
Republic of Korea	0.666	5	Leader
Singapore	0.585	10	Leader
Malaysia	0.396	30	Potential leader
India	0.201	63	Dynamic adopter
China	0.299	45	Dynamic adopter
Thailand	0.337	40	Dynamic adopter
Indonesia	0.211	60	Dynamic adopter
Sri Lanka	0.203	62	Dynamic adopter
Pakistan	0.167	65	Marginalized
Mongolia	NA	Satisfactory data not available	Others
Vietnam	NA	Satisfactory data not available	Others

Source: UNDP Human Development Report, 2001: *Making New Technologies Work for Human Development*. Available at http://hdr.undp.org/reports/global/2001/en/pdf/chaptertwo.pdf
NA: Data not available.

Enormous digital divides also exist across regions of the world with respect to both PC and Internet penetration, even as the share of Internet users to total population has more than doubled over the short four-year period 1998-2002 in all regions of the world

Singapore, Hong Kong, Japan and Taiwan do not rank among the first 20 countries. Many are ranked 30 or lower, with Bangladesh being the least network-ready at rank 100. Of the nine countries covered by this Report, Malaysia at 27 is ranked the highest. At the other end of the scale, Sri Lanka (71) and Vietnam (68) are the least network-ready countries (Table 4.14). Mongolia does not feature in this ranking due to data limitations.

Table 4.14 ***Networked Readiness Index (NRI) 2004 of selected Asian countries***

Country	Score	**NRI rank** (out of 104 countries)
Malaysia	0.69	27
Thailand	0.27	36
India	0.23	39
China	0.17	41
Indonesia	-0.13	51
Pakistan	-0.38	63
Vietnam	-0.46	68
Sri Lanka	-0.49	71
Mongolia	NA	NA

Source: World Economic Forum (2005) *The Global Information Technology Report 2004–2005*, available at http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2004_2005/Networked_Readiness_Index_Rankings.pdf, Accessed on 30 March 2005.

Factors influencing the digital divide

The extent and likelihood of a widening of the digital divide can be assessed by examining indicators such as penetration, cost, socio-economic features, use of locally relevant content, and the policy regime. These factors influence the ability to derive economic and social benefits from information-intensive activities.[9]

Penetration

With regard to PC penetration, the digital divide is clear across the nine Asian countries (Table 4.12). Although countries in Asia have taken giant leaps in terms of Internet penetration in the past decade, the digital divide across countries is evident (Tables 4.7, 4.15 and 4.16).

Putting this in a global context, enormous digital divides also exist across regions of the world with respect to both PC and Internet penetration (Table 4.16). Data in Table 4.15 show that the share of Internet users to total population has more than doubled over the short four-year period 1998-2002 in all regions of the world. However, the US and high income Organization for Economic Co-operation and Development (OECD) countries continue to be way ahead of the other regions. Both East Asia and the Pacific, and South Asia are far behind. As compared to the world averages of 5.5 per cent and 13.1 per

Table 4.15 ***Digital divide in Internet use across regions of the world in years 1998 and 2002***

Region	Internet users as a percentage of population	
	1998	2002
East Asia and the Pacific	0.9	4.4
South Asia	0.5	1.4
United States	30.8	55.1
Middle East and North Africa	0.5	3.7
Europe and Central Asia	1.7	8.7
Latin America and the Caribbean	1.4	9.2
Sub-Saharan Africa	0.2	1.6
World	5.5	13.1

Source: World Bank, World Development Indicators Database, accessed 5 January 2005

Table 4.16 ***Differences in regional diffusion of ICTs in the year 2002 [Cost (US$)]***

	PC (per 100 inhabitants)	Internet users (per 100 inhabitants)
Global	9.91	10.22
Africa	1.30	1.23
Americas (North and South)	28.95	25.76
Asia	4.45	5.85
Europe	21.40	21.64
Oceania	42.42	36.98

Source: International Telecommunications Union Database, accessed January 2005.

cent in 1998 and 2002, respectively, the share of Internet users in East Asia and the Pacific was only 0.9 per cent and 4.4 per cent. South Asian percentages were even lower, at 0.5 and 1.4. Thus, the digital divide in terms of Internet penetration clearly persists across regions. This is significant because the United States and high-income OECD countries constitute just 19 per cent of the world's population.

Cost

Cost considerations are a critical factor in the digital divide. The poor are already hampered by social factors such as low education and a lack of familiarity with technology. Adding the burden of high cost of access to ICT services only serves to deepen the digital divide. Unfortunately, users in countries which are in the early stages of ICT development encounter higher cost of access as companies have to factor in capital costs as well as a lower user base. Data on Internet retail pricing reveal enormous usage cost differences across countries (Table 4.17).

While the average usage costs of Internet retail pricing are comparable between OECD and Asian countries at approximately US$ 30.00 and US$ 32.50 respectively, poorer Asian countries such as Cambodia, Laos and Vietnam have significantly higher than average costs. Particularly striking is the case of Cambodia, where the total cost of Internet usage per 20 hours stands at an exceptional high of US$ 45.40. At the other end of the spectrum, better-off countries like India, Malaysia and Thailand face costs for comparable services ranging between US$ 2 and US$ 5.5 (Table 4.17).

Within each country also, cost differences exacerbate the digital divide. According to the Mongolia country study associated with this Report, the price of Internet connections has been dropping overall. An hourly rate of US$ 0.60 in Internet cafés makes access more affordable for citizens who have no computer at home or in the office, in the urban area of Ulaanbaatar. Unfortunately, for users in rural *aimags*, dial-up

Table 4.17 ***Internet retail pricing 2003 (US$)***

Country	Total ISP Charge (20 hours per month, Aug 2003)
China	7.25
India	2.16
Singapore	15.38
Malaysia	3.68
Mongolia	11.71
Thailand	5.59
Indonesia	10.74
Pakistan	7.54
Philippines	17.05
Sri Lanka	5.23
Vietnam	10.42
Laos	26.50
Cambodia	45.40

Source: International Telecommunication Union, 2001 and 2005

Cost considerations are a critical factor in the digital divide. The poor are already hampered by social factors such as low education and a lack of familiarity with technology. Adding the burden of high cost of access to ICT services only serves to deepen the digital divide

connections are costly since phone calls cost US$ 0.20 per minute. In comparison, phone calls cost only US$ 0.06 per minute in Ulaanbaatar. Therefore, the only alternative in rural *aimags* are the Internet cafés at the local post and telecommunication offices, which charge rates of US$ 0.45 to 0.60 per minute.

Retail prices partly reflect the high investment costs associated with networking and Internet provision in developing countries. Thus, it cost the state government of Maharashtra, India, US$ 600,000 to wire up 70 contiguous villages in the districts of Kolhapur and Sangli. With 550,000 villages across India, the cost of wiring every single village in the country would work out at US$ 4.7 billion, which is indeed difficult to garner given other priorities.

Another area of concern is the cost of hardware. While tariff and excise duty reduction has helped bring down the cost of ICT equipment, it still is unaffordable from the point of view of providing IT to the masses

High investment costs obviously affect the extent and nature of digital provisioning. The Malaysian government has allocated US$ 290 million in its Eighth Malaysia Plan to bridge the digital divide among its citizens, underlining the role of the State in reducing such inequalities. However, Malaysia has also given some companies a Multimedia Super Corridor status which entitles them to financial incentives such as exemption from income tax for up to 10 years or an investment tax allowance with no duties on the import of multimedia equipment. While this provides incentives for companies to establish themselves on the Malaysian technopole, it can have the unintended effect of further privileging the larger business enterprises.

Hardware and software costs

Another area of concern is the cost of hardware. While tariff and excise duty reduction has helped bring down the cost of ICT equipment, it is still unaffordable from the point of view of providing IT to the masses. Similarly, it is widely accepted that costs of initial software and of upgrading can be substantial if ICT for development projects depend solely on proprietary software.

Thus ICT for development initiatives need to focus on reducing hardware and software costs. One such initiative in India aims to reduce hardware costs by simplifying the equipment as well as its usage. The Simputer was designed in 2001 as a simple, easy-to-use and inexpensive device with multilingual software, aimed at providing hardware access to a large number of poor users at low cost. Priced at less than US$ 200, it is currently being produced in small prototype batches and is being field-tested in selected ICT for development projects.

On the software side, the open source software movement is gathering momentum as a means to reduce costs by promoting more equitable and fair pricing. This has generated some interesting debates regarding 'open source' and 'free' software. Free software, or software for which the source code is available to programmers and users who can modify the software as required, substantially lowers software costs and maximizes diffusion.

The attraction of open source software lies in the fact that its use, by government and a large public, could encourage local software professionals to provide software support in the form of add-on applications that are written at a cost much smaller than that required to buy multi-featured packaged software. This would decentralize software production, challenging the large transnational producers of packaged and bundled software, who have been able to convert the software industry from a service industry to one of large-scale manufacturing, thus worsening digital divides.

Recently the government of the state of Madhya Pradesh in India publicly announced its decision to use the well-known open source Linux software in its official IT programme, which includes its e-governance (Gyandoot) and computer-enabled school education (Headstart) initiatives. This is in keeping with trends in other developing countries including China and many in Latin America such as Mexico, Brazil, Argentina and Peru.

Content

The information and communication revolution can also bypass the disadvantaged population groups if there is inadequate attention to developing locally relevant content. Issues of poverty, inequality and exclusion cannot be addressed if content does not address real life problems for these groups. For example, information on health that focuses on tackling lifestyle diseases such as obesity is of little use in a situation of poverty and starvation.

Similarly, the empowerment of women can hardly be promoted through websites where female subjects focus on beauty treatment or pornogra-

phy. Rural development issues are harder to address if the content does not use the local language and idiom.

Socio-economic factors and the digital divide

The digital divide is not limited to issues of penetration and costs of access to hardware and software. Increasingly recognized as more fundamental are factors such as social, economic, cultural and locational disparities, which lead to further cumulative inequalities. The interdependence among these factors deepens and widens the digital divide, impeding the effective use of ICT for human development. In Asia, gender gaps, urban-rural disparities, special disabilities faced by remote and indigenous populations, inter-generational gaps, all create sizeable obstacles to ICT absorption and use. For example, a study on Net-based advertising targeted at Indians living in India found there were 3.1 million Internet users in India as of 2000. These users were young (over 70 per cent below the age of 30 years), rich (over 60 per cent came from homes with a monthly income of INR 10,000 or more), and predominantly male (one in every three users was a woman).[11]

ICTs require specific skills; and that comes in the way of their adoption by the underprivileged groups and regions. For example, in less-developed countries, legal and administrative structures that have been considered important for providing equitable access to all sections of the population are yet to be institutionalized. Even when these structures are in place, difficulties in implementation can negate their effectiveness for human development, strengthening the position of economic and political elites vis-à-vis others. These elites have larger resources at their command to own or access the technology, can acquire the necessary skills easily due to their higher levels of secondary and tertiary education, and can establish links through ICT with other productive and social sectors for appropriating new facilities and opportunities.

Policy

Appropriate policy regimes can help redress the digital divide. Policies can influence content, access, competition, and availability and spread of infrastructure. Choices guiding ICT initiatives in Asia are often driven by economic and commercial interests. The gloss around the technology obscures social choices about how to computerize or communicate, and the ways in which different forms of computerization or communication advance different values.[12] ICT initiatives in Asia are also driven by governmental agendas such as political interest, social policy and military security, not always consistent with promoting human development.

The United Nations Commission on Science and Technology for Development Working Group[13] raised some crucial questions which need to be urgently addressed by political leaders and citizens of the developing world. Do the benefits of the increasingly widespread, albeit uneven, diffusion and application of ICTs outweigh the risks for developing countries? Are stakeholders in developing countries taking appropriate measures to minimize the risks of social and economic exclusion that could be associated with these revolutionary technologies? The UNCSTD report and other recent studies not only provide some interesting and useful insights into the problems of access and use of information technology by developing countries but also call for caution and careful planning and implementation of ICT-based programmes if the technology is to be harnessed for genuine development objectives and goals.

The attraction of open source software lies in the fact that its use by government and a large public could encourage local software professionals to provide software support in the form of add-on applications that are written at a cost much smaller than that required to buy multi-featured packaged software


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॥ जय माँ करणी ॥
rainbow
चलत फेरता
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STD·ISD·PCO

Photo: Amit Khullar

MDGs

Chapter 5

ICT and the MDGs: An index based on empirical regularities

There are differences among planners, policy makers, researchers and others about the role that ICT can play in realizing the MDGs. Many consider the technological opportunities that ICT offers as being important facilitators of the effort to attain the MDGs. The contrary view, however, is that ICT is of no great value and could even be detrimental to populations in the less-developed world, particularly the economically and socially underprivileged among them. These differences arise partly from the fact that the impact of ICTs in a country or a region depends on their specific components, the purpose of deployment and spatial spread, besides the economic, social and administrative environment in which diffusion occurs. It is useful, therefore, to identify, collate and consolidate evidence of a kind that permits an assessment of the impact of ICT on human development.

Towards that end, it is necessary not only to identify indicators of the status of ICT use, but also to analyse the nature of interdependencies between indicators of ICT development and those reflecting human development concerns of the kind captured by the MDGs. The present chapter attempts to do precisely this, using empirical evidence from the nine Asian countries that are the focus of this study. The country studies have been used to undertake an empirical study which:

- identifies ICT indicators that impinge on the key concerns underlying the human development approach, especially those components emphasized by the MDGs, and
- constructs composite indices for capturing the extent of ICT use for human development, especially for realizing the MDGs.

Through this process, the data relating to the nine Asian countries were used to construct a set of benchmark indices that could help determine and monitor the progress of different countries in using ICT for realizing the MDGs.

Recent initiatives and limitations of existing data sources

A number of regional and international organizations have undertaken similar studies to build a framework for monitoring and assessing the use of ICTs to achieve various socio-economic goals. For example, Orbicom's *Monitoring the Digital Divide* assesses the magnitude of the digital divide and, more specifically, the progress of different countries toward the 'infostate', by building thematic clusters of indicators related to info-density and info-use. The *Global Information Technology Report*, brought out by the Global Economic Forum, provides a framework to monitor progress using an index involving measurement of three components: the environment for ICT; the readiness of stakeholders; and the usage of ICT among stakeholders. The *Global Survey and Guide to ICT Planning in Education* is an important contribution to the task of assessing progress in ICT use in education. A study by the European Commission has built Statistical Indicators Benchmarking the Information Society (SIBIS) for a large number of OECD countries. It provides information related to access of households to ICTs for various purposes such as business, education and healthcare. The International Development Research Centre (IDRC) has also attempted to track ICT supply indicators as well as information on users and the nature of usage. Finally, the International Telecommunications Union's Report[1] seeks to identify "relevant indicators for measuring access of the world's populations

The impact of ICTs in a country or a region depends on their specific components, the purpose of deployment and spatial spread, besides the economic, social and administrative environment in which diffusion occurs. It is useful therefore to identify, collate and consolidate evidence of a kind that permits an assessment of the impact of ICT on human development

to ICTs – helping to measure the extent to which countries and communities worldwide have genuine access to the information society".[2]

The current exercise seeks to build on these initiatives and develop a set of indicators based on the experience of countries in the Asian region. An important effort is that of the United Nations ICT Task Force, established in March 2001, which attempts to combine an analysis of relevant ICT initiatives and the results of research studies relating to them in a coherent framework that offers guidelines for policy. Based on a largely qualitative overview of current applications of ICT in different countries, the Task Force came out with a set of indicators to chart progress which could help in setting targets for ICT development. It also developed a matrix that maps ICT use for human development across the eight MDGs. This provides a direction for the current exercise: that of identifying ICT goals relevant to the major MDG targets and then constructing a set of compatible ICT indicators.

A critical problem in measuring ICT spread and use from the point of view of realizing the MDGs is that of choosing appropriate indicators and assigning weights for composition

Following this trajectory, a list of indicators under each MDG has been worked out (Appendix II). However, it is not always possible to obtain information on these indicators for Asian countries, since any effort to deal with data deficiencies through cross-country surveys would be prohibitively expensive. This exercise, therefore, aims at making the best use of available evidence to arrive at a set of benchmark estimates of specific indicators.

A framework to identify indicators for the construction of a composite index

A critical problem in measuring ICT spread and use from the point of view of realizing the MDGs is that of choosing appropriate indicators and assigning weights for composition. Earlier studies on the subject were restricted to the industrialized countries. Since problems of diffusion of technology across sectors, regions and groups of the population are less serious for developed countries, concerns about the consequences of a digital divide were often ignored. The indicators selected were mostly related to the supply side, such as those pertaining to the availability of PCs, access to Internet facilities, density of telephones, use of electronic goods, and enrolment in or completion of technical education. These data are available in international publications and on websites. Similar indicators can easily be compiled for Asian countries, although there are problems of comparability of data in some cases.

However, in the case of developing countries, there is a strong case for going beyond supply-linked indicators and attempting to measure the spread of technologies and their role in promoting the development process. This would require information on user-specific indicators of ICT applications on the purpose of use, and on the agencies and legal framework used to promote the adoption of ICTs.

Unfortunately, existing data sources for Asian countries do not permit construction of such specific indicators suitable for cross-country comparison. Generation of fresh data would make difficult financial and administrative demands on national and international statistical systems. Also, these countries are so very diverse in terms of levels of economic and human development, degree of openness to world markets and socio-cultural specificities that it is difficult to generalize and arrive at a consensus on user-specific indicators. Further, a review of the literature and an analysis of interdependencies of ICT use and human development in developing countries may not be adequate to estimate its role in the future, particularly because ICT use is still in its infancy.

Identification of different dimensions of development and their constituent indicators

These difficulties necessitate the continued dependence on rather simple and straightforward indicators reflecting, primarily, the degree of availability of ICTs (see the list of supply side relating to the eight MDGs in Appendix II). They are combined with a few sector- or user-specific indicators that can be obtained from international documents or websites of UN agencies and the World Bank. These indicators are classified into four categories, focusing on four broad aspects:

- those capturing availability or supply
- those measuring "efficiency" (or cost of access) and speed
- those suggesting targeting of social sectors, and
- those reflecting targeting of vulnerable groups (Appendix III).

Availability-linked indicators

Availability-linked indicators have been placed in two sub-categories: skill-independent and

skill-dependent. The first includes popular ICT tools for which users do not require much skill or training such as telephone mainline connections, cellular subscriptions, television sets and radio receivers, all being presented per 1,000 of the population. Under the skill-dependent ICT category, where training and skills are required, the indicators identified are Internet users per 100 people, PCs per 100 people and per capita ICT expenditure.

Higher expenditures would imply greater use of ICT by larger sections of the population as they cover purchase of products, including telecommunication facilities and other equipment for offices, businesses, households, governments and educational institutions. Two separate categories have been kept on the supply side so as to increase the importance of availability-linked indicators in the overall aggregation scheme.

Indicators of efficiency and speed

The indicators that capture aspects of efficiency are Internet service provider charges, telephone usage charges for Internet access, cost of a peak-rate local call per three minutes from a fixed line, cost of a peak-rate call to the United States per three minutes, Internet speed and access, and extent of IT training and education. Information on these indicators is compiled from data obtained from the World Bank and the Global Competitiveness Report (GCR) 2001-02. The indicator of Internet service provider charge is the monthly dial-up access charge for 20 hours of use and that for telephone usage charge is the telephone call charge for 20 hours of access. Higher costs would imply lower efficiency and less access. Indicators of Internet speed and access, and IT training and education are positive indicators of efficiency as these assign higher values to countries where ICT facilities are relatively more efficient as manifest in greater speed of access and higher expenditures incurred in training of personnel.

Indicators measuring targeting of social sectors

These include Internet access in schools, computers in educational institutions per 1,000 students, government prioritization of ICT, and government online services availability. The importance given to universal literacy in the MDGs justifies inclusion of two educational indicators. Two government-linked indicators have been included, as the State continues to have a major role in promoting social development. Data on computers in educational institutions are obtained from the World Bank and all other indicators are compiled from the GCR, 2001-02. The latter simply show the 'rating' of each country, as assigned by GCR. These ratings, reflecting the performance of countries, are based on an opinion survey of 4,600 senior business leaders from 75 countries.

Indicators reflecting targeting of vulnerable groups

Five indicators have been identified to assess the contribution of ICTs to improving the status of socially deprived sections of the population: the percentage of women among professional and technical workers; public access to the Internet; government success in ICT promotion; competition in provision of Internet services; and efficacy of laws relating to ICT use.

Data on women professionals and technical workers have been taken from HDR 2003 and information on other indicators from GCR 2001-02. Public access to Internet facilities and greater competition among service providers is expected to lead to greater diffusion of the technology, a lowering of prices and an improvement in accessibility: all of which are seen as increasing the access of the economically worse off.

Also, greater competition is likely to generate greater employment in the informal sector, benefiting poor and vulnerable groups such as women. Government success in ICT promotion as also greater efficacy of the legal system for e-commerce, consumer protection, etc., would reflect the outreach of the technology. This, too, will benefit vulnerable sections that tend to be marginalized under a freely functioning market, without adequate protection of the State or legal institutions.

Rationale for selection of indicators

What is the extent to which the selected indicators can map the attainment of MDGs? For goals like eradication of poverty, the important question is whether income and employment effects of ICT have a bias in favour of the poor that could help them move above the poverty line.

Despite equivocal opinions, there is adequate empirical evidence to suggest that the overall impact of the availability of ICT has been positive

In the case of developing countries, there is a strong case for going beyond supply-linked indicators and attempting to measure the spread of technologies and their role in promoting the development process

for the poor. In any case, availability is a precondition for any kind of application, pro-poor or otherwise. This would justify inclusion of availability-linked and efficiency indicators of ICT development. Besides, a role for the State in providing public access to the Internet, in ensuring competition among service providers and a legal system promoting ICT development would help in better penetration of the technology and, thereby, in making a dent on poverty and inequality. It would be useful to construct other indicators for accessibility of the underprivileged or coverage of remote and backward areas, but this is not possible with existing official as well as non-official databases.

Availability-linked indicators have been placed in two sub-categories: skill-independent and skill-dependent

The role of ICT in improving education has been found to be positive and justifies the inclusion of availability-linked and efficiency indicators to capture aspects facilitating the realization of education-related MDGs. In addition, Internet access in schools and computer use in educational institutions have been considered extremely useful sectoral indicators in articulating progress of countries towards higher quality and universal primary education.

Statistics on access to and usage of ICT by women compared to men would be useful in understanding the gender divide in this area. While data are available in *The World's Women 2000*, with citations from Cyber Atlas and NUA, there are serious information gaps and problems of reliability due to sources of different quality in the Asian countries. There are also anomalies and inconsistencies in data collection procedures adopted by different countries that are significant, particularly for temporal comparisons.[3] One alternative is to use the percentage of women having a tertiary level of education (university, teachers' college or higher professional school), or enrolment of women in the field of science and engineering, but this would be a bit remote in capturing gender sensitivity in ICTs. It is, therefore, proposed to capture this dimension through the share of females among professionals and technical workers.

With regard to maternal and child health, access to basic amenities and other social sector objectives, indicators pertaining to government's role such as public access to the Internet, success of the State in Internet promotion, and efficacy of laws relating to ICT use, are useful as the State plays a key role in social development in Asian countries. These may be included to indirectly reflect the coverage of social sectors, as disaggregated data on the use of ICT in these sectors are not available. Besides, use can be made of availability-linked indicators, since the growth of ICT *per se* can help achieve these goals.

The ICT Task Force too recognizes that the selection of indicators will be guided by the availability of data at each point of time. In particular, it recognizes that the limited availability of hard empirical evidence would constrain the selection of indicators and influence their relative importance. It, therefore, argues in favour of a degree of flexibility in the methodology so that the indicators could be refined over time as data availability improves. In keeping with this perspective, the attempt here is limited to working out a few composite indices reflecting various dimensions of ICT development as also its overall progress. In addition, later in this Report, the Task Force's suggestion that the indexing effort should be complemented with an exercise in assembling anecdotal evidence and profiling success stories is adopted.

Component indices on different aspects of ICT development and an aggregate index

The methodology

In view of the growing popularity of composite indices and the possibility of using the country rankings in terms of various indices in previous studies, it is proposed not to use complex multivariate tools in the composition exercise. The methodology attempts to aggregate indicators in several stages, as has been done in working out the HDI. The method of assigning weights on the basis of a correlation matrix, such as Principal Component Analysis, is not considered appropriate here since the pattern of interdependencies is likely to change as the technology takes firmer roots in the region. As there is no other empirical basis to work out the relative importance of indicators, they are assigned equal weights.

The other significant problem is the elimination of the scale bias that characterizes each indicator. In computing the HDI for Global HDRs, UNDP adopts the 'Range Equalization (RE) method' where each indicator is divided by the range (after subtraction of the lowest value) to arrive at scale-free values that vary between 0 and 1.

In recent years, the methodology for computing HDIs has changed and it uses a fixed range computed on the basis of predetermined 'goalposts', reflecting the feasible upper and lower limits for the values. This enables temporal comparisons not only of the rank scores of the countries concerned but also of their human development indices. The disadvantage is that the three constituent indices pertaining to life expectancy, education and GDP have lost the feature of a fixed range of zero to unity. The highest value in each constituent index falls short of unity as the value for the top ranking country is below the goalpost. The explanation for the minimum value being higher than zero is similar. In view of the popularity of this method among practitioners and policy makers, as well as for reasons of comparability, it has been used in the present analysis as well.

However, fixing the range of the constituent indices through division by range discriminates against indicators that have greater disparity. Also, as the trends in inequality vary across different indicators, it would be inappropriate to force these to have a uniform and constant range over time. Indeed, with the introduction of the concept of goalposts to compute the range, the (scale-free) values of the indices no longer have a constant range of unity (thereby losing their unique property). However, maximum and minimum values have been specified based on recorded values over recent years and division by the range is expected to ensure that the difference in disparity in the constituent indicators does not get reflected in the HDI. There can also be disagreements in fixing goalposts for indicators like GDP per capita and life expectancy as the upper bound is based on the judgement of the researcher. On the other hand, the two bounds for literacy and gross enrolment are arithmetically pre-determined. While inequality in these two over time will decline as the maximum value is fixed, the same may not be the case with per capita income.[4] Unfortunately, the RE method treats the two types of indices identically. The popularity and acceptability of HDI among policy makers seems to have come in the way of these issues being investigated adequately in the literature.

It is proposed to use an alternate method that permits the coefficients of variation of different indicators to remain different, even after making them scale free and lets these differences be reflected in the composite index and ranking. All the indicators have been made scale free through division by their own means. The coefficients of variation of the original indicators, thus, become the standard deviations of the scale-free indicators, which are then carried into the component indices.

Another important point is temporal comparability of the indices. As the present exercise aims at making comparisons across countries only, the elimination of the scale effect has been ensured by dividing each indicator by either range or mean, computed for the chosen year. In case such comparisons are to be made over time, it would be necessary to fix the values of the divisors, as is now being done in computing the HDI for the HDRs. Indeed, for computing ICT composite indices for any future year, it would make sense to use the same means as in the base year in the denominator for each indicator. However, in case the base year is not considered representative of the early years of the 21st century, it should be possible to work out the mean of the first three years, say 2001, 2002 and 2003, and fix these as the denominators for eliminating the scale bias for all subsequent exercises.

Five component indices have been constructed, in the first stage by the RE method as well as by the Division by Mean (DM) method of indexing, to cover the following aspects: skill-independent ICT; skill-dependent ICT; efficiency and speed; social sector targeting; and vulnerable groups targeting.

Before composition, all the indicators need to be made unidirectional within each category. Indeed, the indicators reflecting the costs of access to the Internet, such as Internet service provider charges, telephone usage charges for the Internet, cost of a local call and cost of a call to the US, cannot be combined with those that represent Internet speed or IT training. It is necessary to take the reciprocal of these cost figures so that efficiency indicators are defined as: (i) Internet time available per US dollar; (ii) telephone time for Internet per US dollar; (iii) local telephone time (at peak period) available per US dollar; and (iv) US call time per US dollar. This is based on the understanding that the higher the access to ICT time per unit of money, the greater is the efficiency of the system. This problem does not exist for any other category of indicators. Finally, the composite aggregate index of development of ICT in the context of

The indicators that capture aspects of efficiency are Internet service provider charges, telephone usage charges for Internet access, cost of a peak-rate local call per three minutes from a fixed line, cost of a peak-rate call to the United States per three minutes, Internet speed and access, and extent of IT training and education

MDGs has been obtained by combining the five component indices.

Component indices obtained through RE method and the corresponding aggregate index

Following the RE method, the component index for a category is obtained by first making each indicator scale free, by subtracting its minimum value from each observation and then dividing it by its range. The average of these values across the indicators (within the category) for each country then becomes the value of its component index. Understandably, if a country has maximum values for all the indicators in a category, it will score an index value 1. Similarly, a country will obtain a composite score of 0 only when it has the minimum value in all the indicators. The larger the value of the group-specific or aggregate index, the higher is the role played by ICT towards the attainment of MDGs. An aggregate index for ICT development has been computed by using the same methodology as that for category-specific indices.

The indices of skill-independent and skill-dependent ICT availability measure the relative positions of countries in terms of the availability of different types of facilities. Malaysia occupies the top position in both skill-independent and skill-dependent ICT categories (Table 5.1). The value of the skill-dependent ICT index in this case is unity as it secures the highest value in all the indicators belonging to this category. Thailand and China that follow Malaysia are way behind, reflecting the differences across countries within the Asian region. The value of the skill-independent ICT index for Malaysia is also very high but its distance relative to the second and third position countries is less than in the previous case. In sum, the availability of ICT across the countries exhibits wide inter-country variation.

The efficiency and speed indices depict the ranking of the countries in providing access to high-speed ICT at low cost. Here, too, Malaysia occupies the highest position. However, its relative position vis-à-vis other countries is not as high as in the case of ICT availability due to the high costs of providing Internet facilities and of a call to the US, when compared with other countries (the two indicators belonging to this category). Sri Lanka, India and Pakistan report high values (fairly close to Malaysia), although these countries have very low levels of ICT availability.

The social-sector targeting index reflects the performance of the countries in promoting ICT in certain specific directions for the well-being of the people. The idea is to assess whether benefits of the technology have remained restricted to a few or have percolated down to larger sections of the population. China obtains the highest position here, followed by India and Malaysia. The high value obtained by China is largely due to the indicators pertaining to deployment of computers in the field of education and the government giving ICT a high priority.

Indicators measuring targeting of social sectors include Internet access in schools, computers in educational institutions per 1,000 students, government prioritization of ICT, and government online services availability

Table 5.1 ***Component indices showing different aspects of ICT development and the aggregate index as obtained by RE method for nine Asian countries***

	Indices pertaining to different aspects of ICT development						
Country	Skill-independent ICT index	Skill-dependent ICT index	Efficiency and speed index	Social sector targeting index	Vulnerable group targeting index	Aggregate index	Rank
China	0.57	0.12	0.46	0.87	0.39	**0.48**	**2**
India	0.04	0.01	0.62	0.65	0.76	**0.42**	**4**
Indonesia	0.17	0.04	0.38	0.14	0.40	**0.22**	**7**
Malaysia	0.87	1.00	0.67	0.59	0.68	**0.76**	**1**
Mongolia	0.14	0.06	0.31	0.09	0.37	**0.19**	**8**
Pakistan	0.03	0.00	0.57	0.36	0.48	**0.29**	**5**
Sri Lanka	0.18	0.04	0.62	0.10	0.33	**0.25**	**6**
Thailand	0.49	0.21	0.50	0.57	0.59	**0.47**	**3**
Vietnam	0.18	0.04	0.29	0.06	0.24	**0.16**	**9**

The vulnerable-group targeting index measures the efficacy of the system in reaching the benefits of ICT to women and ordinary citizens through legal and governmental support. India is placed in the top position, followed by Malaysia; and this is due to high values reported on public access to the Internet, government's success in ICT promotion, competition among Internet service providers and a developed legal system governing ICT use.

The aggregate index is a summary measure of the five component indices. It may be taken to reflect the overall progress a country has made in promoting ICT for human development. Malaysia records the highest value, followed by China and Thailand. India comes fourth and this is due to its scoring high values in categories other than availability of ICT. Pakistan, Sri Lanka and Indonesia are placed at mid-level, indicating a modest role for ICT in promoting socio-economic development. Mongolia and Vietnam have a long way to go, particularly in terms of targeting specific social groups or vulnerable groups of the population.

Component indices obtained through the DM method and the corresponding aggregate index

In applying the DM method, the indicators in each category are divided by their respective means. The values obtained are added up for each country to obtain the component index for the category. An identical procedure is adopted for computing the aggregate index of ICT development, based on the category-specific component indices.

The leading position of Malaysia in ICT development emerges in all categories of indicators, except the social-sector targeting index where China takes the initiative (Table 5.2). The position of Malaysia is particularly impressive in availability of skill-dependent ICT for which the value works out to about 25 times that of the average for India and Pakistan, the two countries occupying the lowest positions. In skill-independent ICT again, Malaysia has a very high value (followed by China), exhibiting a huge gap relative to India and Pakistan.

In the case of ICT efficiency, indices for India and Pakistan are impressive, and almost similar to Malaysia and China. Sri Lanka, which secures modest values in availability-linked indicators, goes to the top for efficiency. This index does not show much variation across countries as costs are becoming similar around the world, impacted by globalization. In targeting social sectors, China secures the highest value, basically because of the substantial use of ICT in educational institutions and the high priority assigned to the technology by the government. It is only in this category that we see Malaysia sinking very low, going below the average of the series, while India and Thailand attain significantly higher positions. In targeting vulnerable sections of the population, India and Malaysia seem to be doing well. In both countries, the State plays an important role in prioritizing ICT as also in creating a competitive environment among

Five indicators have been identified to assess the contribution of ICTs to improving the status of socially deprived sections of the population: the percentage of women among professional and technical workers; public access to the Internet; government success in ICT promotion; competition in provision of Internet services; and efficacy of laws relating to ICT use

Table 5.2 ***Component indices showing different aspects of ICT development and the aggregate index as obtained by DM method for nine Asian countries***

	Indices pertaining to different aspects of ICT development						
Country	**Skill-independent ICT index**	**Skill-dependent ICT index**	**Efficiency and speed index**	**Social sector targeting index**	**Vulnerable group targeting index**	**Aggregate index**	**Rank**
China	6.18	2.20	6.40	10.14	4.81	**1.37**	**2**
India	1.64	0.71	6.58	4.36	5.59	**0.79**	**5**
Indonesia	2.65	1.12	5.06	2.75	4.79	**0.71**	**7**
Malaysia	10.12	15.24	6.86	3.84	5.61	**2.17**	**1**
Mongolia	2.91	1.42	4.90	2.50	4.82	**0.72**	**6**
Pakistan	1.50	0.51	6.24	3.14	4.88	**0.67**	**8**
Sri Lanka	2.83	1.12	8.12	2.47	4.67	**0.80**	**4**
Thailand	5.63	3.62	5.11	4.31	5.36	**1.12**	**3**
Vietnam	2.53	1.06	4.71	2.49	4.48	**0.66**	**9**

service providers. Again, inter-country disparities are not alarming because of the nature of the indicators.

Understandably, Malaysia has the highest value in the aggregate index, followed by China and Thailand, the countries that have been part of a rapid, globally-linked development process during the past two decades. India and Sri Lanka come next. They are at about the same level but the latter gets past the former by reporting significantly higher values in availability- and efficiency-linked indicators. Immediately following them are Mongolia and Indonesia. These report medium level values in all the five categories of ICT development. Pakistan and Vietnam are at a lower level in the final aggregate index. The two reflect opposite development patterns, with the former showing high values in efficiency and targeting while the latter has a significant edge in availability.

The ICT Task Force too recognizes that the selection of indicators will be guided by the availability of data at each point of time. In particular, it recognizes that the limited availability of hard empirical evidence would constrain the selection of indicators and influence their relative importance

Comparison of the alternate sets of indices

A quick comparison of the rankings obtained from the two composite aggregate indices (by RE and DM methods, respectively) suggests that the results are not very different. The top three positions are occupied by Malaysia, China, and Thailand and the bottom position by Vietnam as per both methods. There are a few marginal changes in the ranking of the middle order countries. It could be argued that since the proposed DM method gives results similar to the RE method, the credentials of this alternative needs to be noted in the literature of aggregative indices. The objective of using the two different methods in this exercise, however, is quite different. It is to identify and focus on the differences that have emerged from the two methods and to analyse the reasons for these differences in the context of the dynamics of ICT development.

The first major difference is that despite the ranks of the countries being similar, the gaps in the values of the indices are quite different. For example, the difference between China, Thailand and India, obtained by the RE method, may be seen as insignificant. This, however, is not the case with the results by the DM method. Of particular importance here is the gap between India and the other two countries, which is due to the low values of the former for two composite indices of ICT availability. It is important that the alternate DM approach succeeds in retaining the significant variation in these two indices (Table 5.2), and that these are reflected in the aggregate index which brings down the figure for India. The RE method implicitly reduces their importance by treating them at par with other (component) indices that do not exhibit significant inter-country variation. Similarly, Mongolia and Vietnam score very low values in the aggregate index by the RE method, which is not the case with the alternate DM method. This again is because the availability indicators, for which these two countries record reasonably high values, receive low weightage in the logic of aggregation applied in the computation of the HDI.

One major difference is in the ranking of Pakistan vis-à-vis Sri Lanka in the aggregate index by the two methods. The higher scores of the latter on availability are reflected in the aggregate index by the DM method, with a relatively higher weight giving it a higher rank. In the RE method, the importance of the availability indices (with high disparities) are implicitly reduced, which is responsible for a reversal in ranking. Division by mean eliminates the scale bias but not disparity. Sri Lanka has higher scores than Pakistan in a large number of indicators, and by a huge margin in absolute as well as relative terms.

The difference in ranking occurs even in category-specific component indices. Sri Lanka and China get top positions in terms of efficiency and targeting of social sectors respectively by the DM method, leaving Malaysia behind (which is placed at number one in both as per the RE method). Most of the indicators in the two categories have low variation. All the countries have similar values except for telephone charge for Internet services and computers installed in educational institutions. Both indicators are important within their respective categories and are responsible for much of the variation across countries. Importantly, Sri Lanka's advantage lies in charging low prices for Internet services while China's is in promoting computer education in schools. The DM method, by implicitly giving higher weightage to these indicators, has placed the two countries above all the others in these categories. Similarly, Malaysia is able to get past India in terms of the vulnerable-group targeting index (the latter having the top position by RE method) as it has a larger percentage of female professionals among workers and the method implicitly gives

a higher weightage to the indicator because of its higher disparity.

It is not the purpose of this statistical exercise to establish the superiority of one method over the other, as their suitability would depend on the objectives of the exercise and empirical regularities observed in the region under investigation. This discussion makes it clear that a change in the methodology of composition can and does bring about significant changes in the values of component indices, and can alter even the ranking of countries. Issues of value judgement, implicit in the methodology, cannot be dismissed.

It has been demonstrated that the RE method inherently gives lower weightages to indicators pertaining to availability and a few other aspects of ICT development that are observed to have high disparity. These disparities are the result of the process of development, mediated largely through the market, with limited control being exercised by the government. In the earlier sections, it has been argued that ICT is still in the initial stages of development and, consequently, increase in its availability itself could prompt socio-economic development. Several economic, social and cultural factors are currently inhibiting the process of growth and an increase in the availability of ICT will help increase the exposure of policy makers, administrators and lay people to the global information system. Further, this would lead to the establishment of better communication networks even within the countries and facilitate decision-making by public and private agencies. The supply of ICT is strongly linked with economic affordability, bringing in high disparity. Also, economic factors affecting affordability will be important in future years as well for the development of ICT. In view of all this, giving importance to availability indicators does not seem misjudged.

National governments in the Asian region have tried to give a direction to the development of ICT by intervening in the market, controlling prices, introducing it in social sectors, fixing priorities, strengthening the legal structure for ensuring access to all, etc. Importantly, the cross-country differences in the concerned indicators are not very high as may be inferred from the low coefficients of variation of the indicators (Appendix III) belonging to third, fourth and fifth categories. Irrespective of socio-political structures, each country has taken measures to push the diffusion of the technology. There are specific measures adopted by individual governments to direct ICT towards the MDG objectives but it is impossible to generate cross-sectionally comparable data on this. Also, the success of such measures has been limited and uneven across countries, due to the overwhelming role of markets. This is reflected in the sectorally and spatially unbalanced growth of ICT, evident from the high disparity of the indicators of availability, belonging to the first and second category.

Therefore, maintaining the variation of the indicators (by making the standard deviation of the original indicator the coefficient of the scale-free indicator) and then giving equal weightage to their variations in the aggregation scheme appears appropriate. Studies have shown that indicators that play a significant role in the development dynamics of less-developed countries exhibit high disparity in space.[5] Undoubtedly, this kind of regularity observed in certain contexts cannot claim universality. However, given the pattern of development noted through correlation analysis and a review of the literature relating to the Asian region, the retention of the variation in availability indicators in the process of composition can be justified. This implies giving higher weightage to availability indicators, the rationale for which has been discussed while analysing the development dynamics in the region.

In brief

To assess the levels of ICT applications for human development aimed at realizing the MDGs, indicators were identified to capture five dimensions or broad categories of ICT development. Component indices were worked out for each of the categories by aggregating the constituent indicators after eliminating the scale bias. This was done with both the RE method used by UNDP in computing HDI and the DM method. An aggregate index was then computed based on the category-specific component indices by each method. These indices present the relative position of the nine countries in terms of development of ICT for attainment of MDGs.

Malaysia has the highest value in most of the category-specific component indices as well as the composite aggregate index, because of its

The indices of skill-independent and skill-dependent ICT availability measure the relative positions of countries in terms of the availability of different types of facilities. Malaysia occupies the top position in both skill-independent and skill-dependent ICT categories

high values on availability indicators for both skill-independent and skill-dependent ICT. China and Thailand follow in most of the individual indicators as well as component indices. However, in social sector targeting, China goes past Malaysia to the top position by both methods, due to its emphasis on the use of ICT in education. Thailand is at par with these two but gets a lower aggregate value due to deficiencies in availability indices. At the lower end are Mongolia and Vietnam, though they are fairly high in terms of availability indicators – way ahead of India or Pakistan. The latter two countries, however, have an advantage in efficiency and in targeting social sectors and vulnerable groups. The third South Asian country, Sri Lanka, has fairly high values for availability and occupies the top position in terms of ICT efficiency by one method. Indonesia has middle level values in almost all the indicators and figures in category-specific as well as composite aggregate indices.

An important point emerging from the analysis is that, in assessing the progress of ICTs for achieving any set of socio-economic goals, there would have to be an emphasis on availability indicators. In addition, several efficiency-linked and user-specific indicators should be included in the analysis. For that, information must be gathered covering aspects of affordability, access and utilization of ICT. These should bring in the demand side more strongly and reflect the spread of technology not only across economic and social classes but also regions, sectors and gender categories. Indicators, for example, may be built to articulate what percentage of households in certain social, economic, rural and vulnerable groups, such as tribals and other disadvantaged sections, are able to make use of ICT for applications relevant to them. Alternatively, one can try to build up 'surrogate end points' such as better information flows and better management of education, health and public delivery systems using ICT, for assessing progress towards achieving the MDGs.

Photo: UNDP Indonesia

MDGs

Chapter 6

National ICT policies for human development

While the index to measure the impact of ICT on development needs refinement, the attempt to derive such an index does point in one direction. There are wide variations across the Asian region in the development of ICT and its use for realizing the MDGs, which are not necessarily related to the development of a country as measured by per capita income. This is a pointer to the possible role of appropriate policies aimed at reducing the shortfall in performance relative to the potential.

Concern with developing an appropriate policy framework for harnessing ICT for development in developing countries is relatively recent. However, an examination of ICT policies indicates that by the late 1990s all the Asian countries in this study had put in place a policy framework seeking to accelerate the pace of ICT development. This chapter seeks to examine the extent to which these frameworks are sensitive to human development concerns and the ways in which they implicitly seek to realize the MDGs by promoting ICT use.

It needs to be noted that ICTs are neither a stand-alone solution to development problems nor can they replace traditional development initiatives and investments. However, the evidence suggests that as Asian nations progressed, so did their understanding of using ICTs for human development. The zeal to devise an appropriate policy framework was, therefore, also accompanied by a tendency to place human development concerns at the heart of each nation's ICT regulatory framework. Policies tend to be more than just focused on ICT promotion through provision of tax breaks and subsidies; they take into account all the constituents of a nation from the underprivileged to its business community, and are informed by a range of human development concerns. In particular, government policy tends to emphasize initiatives that can bridge the digital divide and reach the power of ICT to as large a proportion of the population as possible.

National policy framework

In Thailand, for example, even the very first National IT Policy statement dated 1996 and titled "IT 2000", incorporated human development concerns. The policy emphasized a three-pronged development agenda, involving investment in:

- an equitable information infrastructure to ensure empowerment and enhance life quality
- people by building a literate populace and an adequate information technology manpower base, and
- good governance.

The importance attributed to these aspects of IT policy was reflected in the country's Constitution as well (Box 6.1).

Over time, the policy framework has been refined and developed. To achieve the above goals, Thailand's "IT 2010" document identified five flagship themes:

- *e-Society*, or a focus on the use of IT for quality-of-life improvement, knowledge-based development and digital divide reduction
- *e-Education*, to develop and strengthen human capital at all levels so as to move the country towards becoming a knowledge-based society, which involves objectives such as life-long learning, computer literacy, human resource development, virtual education, etc.

There are wide variations across the Asian region in the development and use of ICT for realizing the MDGs, which are not necessarily related to a country's development as measured by per capita income

Box 6.1 ***ICT for human development is embedded in Thailand's Constitution***

There are two major sections in Thailand's current Constitution which outline the foundations of ICT in the national development context. These are:

i) Chapter III – Rights and Liberties of the Thai People, Section 40
"Transmission frequencies for radio or television broadcasting and radio telecommunication are national communication resources for public interest. There shall be an independent regulatory body having the duty to distribute the frequencies under paragraph one and supervise radio or television broadcasting and telecommunication businesses as provided by law. In carrying out the act under paragraph two, regard shall be had to utmost public benefit at national and local levels in education, culture, State security, and other public interests including fair and free competition."

ii) Chapter V – Directive Principles of Fundamental State Policies, Section 78
"The State shall decentralise powers to localities for the purpose of independence and self-determination of local affairs, develop local economics, public utilities and facilities systems and information infrastructure in the locality thoroughly and equally throughout the country as well as develop into a large-sized local government organisation a province ready for such purpose, having regard to the will of the people in that province."

Section 40 is related to the development in the telecommunications arena whereas Section 78 recognizes State responsibility to provide an equitable information infrastructure and becomes a guiding principle for the drafting of the National Information Technology Policy.

Souce: http://www.ect.go.th/english/laws/constitutioneng.html

ICTs are neither a stand-alone solution to development problems nor can they replace traditional development initiatives and investments. However, the evidence suggests that as Asian nations progressed, so did their understanding of using ICTs for human development

- *e-Government*, or the utilization of IT in the public sector, at central, provincial and local government levels, so as to ensure good governance
- *e-Commerce*, aimed at exploiting the economic potential of the Internet, and
- *e-Industry*, or the utilization and development of IT within the manufacturing and IT-related industries.

During the same period, other countries too have been in the process of formulating an appropriate policy framework. In Malaysia, the National IT Agenda (NITA), launched in December 1996 by the National IT Council (NITC), acknowledges the potential for accelerating and transforming development processes through ICTs, information and knowledge. NITA is a framework for development in the Information Age that encompasses comprehensive human development, envisions the mobilization of the entire nation, views ICTs as a strategic development tool, and seeks to leverage tri-sectoral partnerships as well as top-down and bottom-up approaches in implementation. NITA focuses on three development areas: people, infostructure (hard and soft infrastructure) and applications, and content. The intent is to provide equity and access to all Malaysians so that they can create value and thereby transform Malaysian society.

The release in 1997 of a document titled "Nusantara 21" marked the first major national initiative to develop ICT in Indonesia. Conceptually speaking, Nusantara 21 was a grand design for an information infrastructure that covers the entire archipelago of Indonesia. To support, accommodate and coordinate the various needs of Nusantara 21's stakeholders, the Government of Indonesia issued Presidential Decree No. 30 in 1997 that established a coordinating team from 16 technical departments and agencies of the government. The team was called Tim Koordinasi Telematika Indonesia (TKTI: Coordinating Team for ICT Development in Indonesia) and was chaired at that time by the Coordinating Minister for Production and Distribution.

Under the TKTI, a National IT Framework (NITF) document was prepared by the National Development Planning Agency (BAPPENAS) in February 2001 and submitted to TKTI. The NITF document prioritizes five strategic objectives in ICT development:

- e-government for good governance
- e-commerce to support a sustainable economy

- creation of an IT-based community
- utilization of IT for education, and
- promotion of e-democracy.

In India, a National Task Force on IT and Software Development was set up in the Prime Minister's office in May 1998. The Task Force made significant recommendations in three human development-related areas, among others. These were: IT in government; IT spread and IT awareness; and citizen-IT interface. With regard to IT in government, the Task Force recommended complete computerization ("up to viable limits") of government in five years. The objective of such computerization was to reach service delivery as close to the citizen as possible, with minimal intermediation and at affordable cost. The argument was that unless computerization progressed significantly in government, it could not spread adequately outside. To that end, it recommended that 2 per cent of the budget in every government department should be earmarked for the introduction and use of information technology, including training.

In the area of IT spread and awareness, the Task Force, besides recommending reaching computers and the Internet to every school and college within five years, called upon the government to launch a range of value-added network services. The committee argued: "While providing delivery of services, use of a variety of technologies and solutions could be explored. These could include home-based computers, ATMs, electronic kiosks, telephones, smart cards, etc. Such networks could substantially promote government's efforts to provide a 'one-stop non-stop' interface with the public".[1]

The Task Force also felt that, for at least about two decades, it will not be possible to provide either telephones or Internet or other information services universally i.e. to more than 90 per cent of households, since many would not be able to afford private subscriptions. It, therefore, recommended that these should be made available on a public access basis, just as long distance services are available through STD/ISD booths. Since there were more than 600,000 of these booths in 2003, with a significant proportion located in villages, it suggested that as many as possible should be converted into Public Tele Info Centres.

Finally, the committee called for the use of the Freedom of Information Act to make available all official databases online to intensify democracy and increase transparency.

More recently, as a follow-up to the work of the committee, the government set up a Working Group on Information Technology for Masses, on 10 May 2000. The working group was mandated to:

- review various schemes and major initiatives taken by various government agencies for taking IT to the masses
- identify potential areas and applications for deployment of IT for the masses
- recommend development schemes/programmes for citizen participation for taking IT to the masses, and
- prepare a comprehensive plan for taking IT to the masses.

The Working Group examined four areas – infrastructure and services, electronic governance, education, and mass campaign for IT awareness – and came up with a range of detailed recommendations in keeping with the thinking outlined earlier. Thus, it is clear that at least at the level of policy formulation and statement, a range of human development concerns do enter into the policy framework of the Government of India. Further, there is a substantial degree of recognition of the constraints to ensuring the reach of ICT to the extent needed for it to be a major instrument of development, so that policy does take account of the need for reducing costs and mobilizing resources. However the thrust is indeed quite recent and it remains to be seen whether policy will actually be translated into practice.

Government policy tends to emphasize initiatives that can bridge the digital divide and reach the power of information and communication technology to as large a proportion of the population as possible

The ICT legal framework and national ICT vision of Vietnam has been elaborated in Directive 58-CT/TW, dated 17 October 2000, of the Communist Party of Vietnam on accelerating the use and development of IT for the cause of industrialization and modernization. In this Directive, the Vietnamese Government has recognized that IT is one of the most important enabling forces for development. It sees it as one among many means to improve the people's quality of life and also create possibilities for a quantum jump in the areas of industrialization and modernization.

Not surprisingly, the government wants to ensure that, by 2010, the national information network is developed to reach nationwide coverage. It will support large traffic, high speed

and quality service at a cheap price so that it can raise the proportion of Internet users to levels reflected by the global average. The targets are cautious. Decision No. 95/2002/QD-TTG of the Prime Minister, dated 17 July 2002, approves the Master Plan for Information Technology use and development in Vietnam in 2005. It targets that, by 2005, average IT penetration and effectiveness all over the country will be of medium level as compared with that of other countries in the region. It also envisages that the level of IT use in activities of the Party and State management agencies, political and social organizations, flagship economic branches of the national economy in the central government, and in Hanoi and Ho Chi Minh cities will be similar to that in the advanced countries in the region.

The Mongolian Government is paying similar attention to ICT development as an accelerator for economic and human development. The main blueprint for the ICT sector is the "ICT Vision-2010" document which seeks to develop a "knowledge-based society to improve the quality of lives of the citizens" by ensuring that, "regardless of where citizens live", opportunities "for their equal and active participation in social life, for improving quality of life and to freely communicate with each other and the world community" exist.

There is recognition of the constraints to ICT becoming a major instrument of development. Policy makers do take account of the need for reducing costs and mobilizing resources

Needless to say, the direct emphasis on human development concerns in policy tends to vary. In Pakistan, the IT Policy and Action Plan itself makes only two specific references to human development goals:

- Section 3.4.2.3 on IT Education makes participation by rural and poor segments of society in IT education a strategic priority for both social and economic development, and
- Section 3.4.12.2.4.2 on IT in the Economy recognizes the need to develop new ways to use information technology to help solve the most pressing problems of human and economic development – education, health, poverty alleviation, rural development, and care for the environment.

However, towards these ends, the IT Action Plan makes several implicit commitments, both strategic and financial, that have human development implications:

- Section 4.6.1 on Universal Internet Access commits the government to spreading Internet access to remote locations and Pakistan Telecommunication Company Limited (PTCL) to making the UIN (Universal Internet Number) into a local call (from remote locations) to the nearest PoP of one or more Internet Service Providers (ISPs). This will enable equitable access. In parallel, a drastic reduction in leased line charges is expected to enable ISPs to go to smaller locations, and
- The IT Action Plan Projects Portfolio of the National IT Policy and Action Plan has a project (item 15) called "Community Internet Centres in Rural Areas" with an allocation of Rs 70 million over three years (at the 2002 exchange rate of US$ 1 = Rs 58, this is the equivalent of US$ 1.2 million). In addition, there is a project for the "Deployment of Internet Kiosks at Post Offices and Public Places" with an allocation of Rs 150 million (US$ 2.59 million). Finally, there are two e-government projects with total allocations of Rs 675 million (US$ 11.64 million).

In urban areas, where infrastructure is adequate, government policies have already helped expand real access by lowering the cost of Internet access over fixed-line telephones. This has been done with the establishment of the "131" universal access prefix for all ISPs. Through this facility, Internet users need only pay the charges for a single local call to access their ISP, regardless of the duration of the call. This service, available only in 29 cities in 2000, was extended to over 805 cities, towns and villages across Pakistan in March 2003.[2] This represents remarkable progress towards a universal service regime in the country, although it would be premature to suggest that Internet access or usage is universal. Key obstacles are low bandwidth in non-metropolitan areas and unreliable ancillary services (electricity, maintenance and repair services) and lack of demand for the resulting services.

What the Pakistan experience suggests is that, rhetoric aside, the basic thrust of policy aimed at using ICT for development in most Asian developing countries is the same as those captured in the objectives and the first three themes specified in Thailand's policy. The three objectives are those of ensuring an equitable information infrastructure, building capacity for exploiting that infrastructure, and investing in good governance.

A prerequisite for ensuring an equitable information infrastructure is investment: public as well as complementary private investment. However, the infrastructure thus created may not in itself be equally accessible. So an ICT policy sensitive to human development concerns must emphasize universal service provision in the telecom area. State initiatives to realize this are particularly important in countries with sharp social and economic divides and in those where geography makes universal provision difficult. For example, in China, which has put a strong emphasis on information technology within the context of its 10th Five-year Development Plan (2001-2005) and targets widespread usage of computers and the Internet, the statement on "Telecommunication Regulations and Rules of People's Republic of China" stipulates that telecom service providers/operators must fulfil the obligation of "universal service". The aim is to ensure that all citizens, living anywhere in the country, are able to access telephone and other basic communication services at an affordable price.

To that end, the policy in China recognizes the need for special expenditures for bridging the digital divide among regions. In fact, success in bridging the digital divide is impossible without special expenditure from national budgets. Hence, the government has not only invested heavily in the creation of telecommunications infrastructure, but also in universal telecommunication access in rural and remote areas. In particular, plans have been made to accelerate the construction and improvement of an information infrastructure that can meet the socio-economic needs of western regions of the country. Moreover, special efforts have been made by the government to cultivate a number of promising IT industries in the western regions.

Even in Pakistan which still scores low in terms of the ICT for Development Index, policy calls for massive governmental investment in IT and the Internet. It recognizes the increase in governmental efficiency and transparency that would be introduced by the application of ICTs to the ways in which government conducts its work. The policy also requires the government to allocate a minimum of 2 per cent of the budget for IT services, although it is unclear whether that allocation is to be made at the national budget level, or at secondary and tertiary levels throughout the country.[†] This is not to say that there is no role for private enterprise in Internet provision. Rather, the policy identifies "three general principles that should be adopted if the Internet is to grow in Pakistan":

- existing regulatory structures should not be forced on it
- competition in Internet growth should be encouraged, and
- unnecessary regulations should be avoided.

Even if an adequate infrastructure is built, its use depends on awareness and capability. Therefore, the promotion of the Internet as a medium of communication across the spectrum of business and government is a second key element of most national IT policies and action plans. The government's role is considered crucial in generating mass awareness of the Internet and IT, and in building the capability for ICT use. The emphasis on awareness in the Government of India's policy framework had been discussed earlier. Such awareness is visible elsewhere too.

In Pakistan, for example, the IT policy, in demanding the infusion of Internet, email and other ICTs into government operations and functions, also recognizes the need to universalize awareness and knowledge about the presence of these technologies, and their ready availability. It calls for massive awareness campaigns, frequent references to IT by government leaders, special events to promote IT, and the establishment of working groups to create awareness at every government department in the country.

The policy also recognizes that awareness *per se* can be rendered useless without creating an environment in which the Internet as a consumer-driven service can flourish. The policy calls on PTCL to play a facilitative, non-intrusive role in the development of a competitive and free environment for the provision of Internet services, both at the back-end (backbone services providers) and at the front end (Internet Service Providers and content providers).

A prerequisite for ensuring an equitable information infrastructure is investment: both public investment as well as complementary private investment. However, the infrastructure thus created may not in itself be equally accessible

[†] Section 3.4.12.1.4.2: A minimum of 2 per cent of the budget shall be allocated for IT services and provincial as well as federal IT departments will allocate a substantial sum annually for developing IT infrastructure and conducting training at all levels in the government.

Reducing cost

Cost considerations are an important factor in reducing the digital divide. Hence, governments in Asia are taking a proactive stand on reducing ICT costs. However, this often involves policies that imply a trade-off with universal provision.

Telecommunications reform aimed at encouraging competition has been a major policy thrust in many countries in the region. China largely relies on a unique reform programme titled "Competition Without Privatization". As a fundamental and strategic industry, telecommunication operations have been monopolized by the Ministry of Posts and Telecommunications of China for more than four decades. Therefore, the Chinese Government did not simply follow the trend towards a private, liberalized telecommunications order but carefully managed the introduction of market forces, and balanced development goals with its need for control. As a result, while the telecommunication operators remain State-owned, the basic telecommunication market advanced from a monopoly to a duopoly, and is now being extended to pluralistic competition.

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The reform of telecommunication operations began with some decentralization of decision-making and profit, via the contractual responsibility system in 1985. Further structural reforms – separating postal and telecommunication operations from each other and from governmental supervisory functions – were implemented during the period 1988-91. In the 1990s, the Chinese Government adopted a series of reform measures that, in less than three years, accomplished the tasks of separating enterprises from government and post from telecommunications, reorganizing industry sectors, dismantling monopoly and introducing competition in all service sectors, including basic and value-added telecommunications and information services. In 1994, China Unicom was formed, and allowed to build and operate nation-wide cellular networks. To promote fair competition in paging services, the paging sector of China Telecom was split in 1998 to form Guoxin Paging Ltd.

In a deepening of this trend, a new round of reform was launched in 1998. The basic idea was to create a fair market by breaking up China Telecom and simultaneously strengthen Unicom through market restructuring. China Telecom Hong Kong, China Mobile Group, Jitong, and China Net Communication were formed. Competition among State-owned institutions has thus increased.

In other contexts, the introduction of competition has involved the induction of the private sector. In India, telecom reform aimed at encouraging competition has involved:

- opening up the basic services sector to private operators. The National Telecom Policy of 1994 threw open the basic services sector by allowing for bidding for licences to operate in circumscribed telecom circles consisting of the metros and regions coterminus with the State. The ostensible objective was to supplement the efforts of the public sector to ensure telephone provision on demand and a telephone in every village at affordable prices
- permitting the entry of private and public sector companies into the mobile telephony area, using both GSM and CDMA technology
- corporatizing the public sector telecommunications network by creating separate corporations to cater to the principal metros and to the rest of the country, and converting the Department of Telecommunications into a policy-making entity
- creating a statutory Telecom Regulatory Authority of India (TRAI) to recommend policies to increase competition, fix tariffs and mediate between different service providers regarding interconnection, etc., and
- opening up National and International Long Distance Telephony to private operators.

In terms of the availability and cost of telecom services, the competition introduced by these measures has had significant consequences. However, there is concern in some circles on two counts. First, with increased competition and the presence of many players, it is argued, the objective of universal service provision would take a back seat. Second, it is argued, that the duplication of the expensive network by competing providers in different circles would result in tariff benefits of competition being distributed differentially. It is likely, it is contended with some supporting evidence, that low intensity and rural users would face an increase in tariffs over time, whereas high intensity users in high-density urban areas would benefit from a reduction in tariffs. If these outcomes are real-

ized, the implications for access and therefore for exploiting the human development benefits of the technology are no doubt partially adverse.

These trade-offs occur even when the government recognizes the need to use ICT policy for human development purposes. In India, the revised 1999 Telecom Policy calls for a balance between 'universal service to all uncovered areas' and 'high level services capable of meeting the needs of the country's economy'. It set the following targets:

- ensure a situation of telephone provision on demand by 2002, and sustain it thereafter so as to achieve a telephone density of 7 by 2005 and 15 by 2010
- encourage the spread of telecommunication to rural areas by making it more affordable, by making rural telecom provision mandatory for all fixed service providers and by providing reliable transmission media in all rural areas so as to increase rural teledensity from 0.4 to 4 by 2010
- achieve telecom coverage of all rural villages and provide reliable media to all exchanges
- provide Internet access to all district headquarters by 2000, and
- provide high-speed data and multimedia capability (using technologies such as ISDN) to all towns with a population greater than 200,000 by 2002.

e-Governance

Crucial to all policy frameworks is an effort to exploit ICT capabilities for better governance. The concern of governments at national, state/provincial and local levels to incorporate ICT into their development agenda is visible in the large number of 'e-governance' projects that have been initiated in Asian countries. These projects constitute by far the most numerous, among the largest and the most noticed of ICT for development projects in the region.

Pakistan's IT policy sees a role for government, not just in facilitating Internet expansion but in exploiting its potential by increasingly adopting e-governance features. The stated vision of the e-government programme is the improvement in the efficiency and transparency of the public sector and the enhancement of its service delivery mechanism. The National IT Policy recognized the need for a thorough adoption of information technology by government at the functional level. In October 2002, Pakistan's e-government portal (http://www.pakistan.gov.pk) was launched with an interface to 35 government divisions and all existing federal ministries.

However, the anticipated widespread use of technology in the business of government has not yet transpired. The legal framework necessary to implement internal government documentation and communication through electronic media does not exist. While enormous strides have been made in providing government employees with training and capacity-building opportunities, they have been skewed in favour of specialist training in computer sciences disciplines. In any case, the goal is not the provision of training or infrastructure to government officials but to re-engineer the manner and form of governmental action. Meanwhile, funds for e-government are being used mostly on information management systems and the development of content. Estimating the return on this investment would be premature, and purely speculative. However, the magnitude of investment, and the overarching desirability of the goals of e-government serve to enhance the importance of deploying e-government in an effective and meaningful manner.

Unfortunately, unequal access to Internet services (as explained above), inherent inequalities based on content (the e-government portal is entirely in English), and the limited "on-the-ground" service delivery function of the federal government (the portal is limited to the federal government, whereas social service delivery is in the provincial and local government domain) are all factors that may actually tend to exacerbate the digital divide in Pakistan, instead of correcting it.

Not surprisingly, while IT policy in Pakistan calls for the establishment of e-government that would utilize IT and the Internet for a more efficient service delivery mechanism, the policy recognizes that this represents an enormous challenge. It, therefore, does state that e-government may take between five and seven years before it can be deployed with any expectation of seeing its benefits.

In China too, the government strives to harness the digital opportunities offered by ICT and

Cost considerations are an important factor in reducing the digital divide. Hence, governments in Asia are taking a proactive stand on reducing ICT costs. However, often, this involves policies that imply a trade-off with universal provision of services

eliminate the threat of the digital divide to social and economic development. The 'Government Online' and 'Enterprise Online' programmes, initiated in the mid-1990s, aim to facilitate information access for all citizens. The aim of the programme was that 30, 60, and 80 per cent of all levels of government would be online by 1998, 1999, and 2000, respectively; and that 100 large conglomerates, 10,000 mid-size firms and 1,000,000 small firms would be wired by 2000. This e-government programme not only expected to allow people to promptly obtain information on government policies, regulations, laws and enterprise services, but was also a crucial initiative to bridge the domestic digital divide between the information "haves" and "have nots" nationwide.

The Sri Lankan government's 'e-Sri Lanka' vision also emphasizes using IT for good governance. It specifies the following objectives in this area:

- to build a nationwide ICT infrastructure by networking all primary and secondary cities, and extend connectivity to even the remotest parts of the island through terrestrial as well as space-based communication technologies
- to use ICT to improve the delivery of public services, knowledge and education to people; create empowered civil servants with information and communication tools; facilitate coordination across government agencies; improve competition and transparency in public procurement; and reduce transaction costs to businesses
- to implement an e-government solution to reinforce peace and to help integrate marginalized regions and communities within an equitable resource distribution framework, and
- to develop innovative applications of ICT for social development with the assistance of an active NGO community (e.g. applications for credit cooperative societies to facilitate the use of ICT to mobilize its members, extend micro-credit and generate employment in rural Sri Lanka).

In Indonesia, there are 22 e-Government Pilot Projects with an estimated cost of more than US$ 60 million that were identified by Booz-Allan-Hamilton's project to facilitate the deployment of Government Online. In early June 2003, a Presidential Instruction (No 3/2003) was issued on policy and strategy for developing e-government. This document instructed all government offices to take necessary action within their function and authorities to develop e-government. Three important documents were provided as attachments to the Presidential Instruction:

- National Policy and Strategy for Developing e-Government
- Architectural Framework of e-Government, and
- Framework for Implementing National Policy and Strategy for Developing e-Government.

This Presidential Instruction is viewed as an important commitment by the Government of Indonesia to play a leading role in maximizing the utilization of ICT.

In India, the e-governance area is the one in which some of the most innovative experiments in using ICT for development fall. Some well-known instances of such projects like the computerization of the Mandal Revenue Offices (MROs) in the state of Andhra Pradesh, and Bhoomi in Karnataka have been already discussed in Chapter 3. This is an area which has attracted large government outlays and is expected to receive even more attention in the immediate future.

Thus, the experiences of the countries chosen for special study as the basis of this Report suggest that, at a macro-level, ICT policy is indeed sensitive to human development concerns and seeks to use the technology in partnership with NGOs, donors and the private sector. What needs to be examined, therefore, is the degree to which this economy-wide commitment is being translated into specific projects that advance specific MDGs. This is the focus of the chapters that follow.

What needs to be examined is the degree to which economy-wide commitment is being translated into specific projects that advance specific MDGs

Photo: Amit Khullar

MDGs

Chapter 7

ICTs and eradication of poverty and hunger

All new technologies that restructure production and raise productivity can, all things being equal, reduce the incidence of poverty. Inasmuch as productivity increases help raise per capita incomes, they can help combat hunger and contribute to the alleviation of income poverty. Information technology, it is argued, can go even further.

In a fundamental sense, information access and spread is crucial to the diffusion of technology; and community effort can play a major role in the process. Consider, for example, the Green Revolution which is an indisputable success story in South Asia as far as agricultural productivity and aggregate economic growth are concerned. It involved the spread of a productivity-enhancing technological package, which has had a long-term, continuing positive impact on rural incomes. Information access and spread was crucial to the Green Revolution. It involved a process of provision of information and material support to rural farmers. The information that they were not otherwise privy to was a crucial component. What the community development programme accomplished, in fact, was the creation of an effective system of communication that helped disseminate the benefits of this technology to a large group of farmers. The Green Revolution is thus an example from which generic ICT lessons can be drawn.

Given the role of information in technology diffusion, the ability to use ICT to purvey information across geographical space, at a relatively low cost, enhances its role as an enabling instrument in the realization of the MDGs relating to hunger and poverty. In fact, through both direct and indirect means, ICTs offer great promise to address existing human deprivations worldwide.

ICT's direct contribution to poverty reduction, for example, can come either through the employment-generating effects of the diffusion of these technologies into poor rural and urban areas or through its effects on enhancing returns from economic activities undertaken by poorer households (Table 7.1). Its indirect contributions can come through facilitating and reducing the costs of delivery of information and services that promote wage- and self-employment, raise productivity and improve the quality of delivery of employment-generating and poverty-alleviating projects being implemented by the government.

Both 'old' and 'new' ICTs have been used for these purposes[1] with some success.[2] The impact of ICTs on poverty differs greatly, depending on which technology is used. Radio and telephony are rather cheap; their use requires few skills while in terms of content and language, they enjoy great flexibility. Evidence suggests that access through radio to relevant and timely information can make a difference to the livelihoods of people living in poverty.

In fact, until recently, radio was one of the most popular ICT tools for rural development. It has a high penetration rate, can effectively reach different target groups, and is relatively inexpensive. Radio has been used for provision of education, health and agricultural extension services. Although radio penetration has dropped at the expense of expansion of television over the past decade, it retains its attractiveness; and has found new audiences, both in the urban and rural areas.

Given the role of information in technology diffusion, the ability to use ICT to purvey information across geographical space at relatively low cost, enhances its role as an enabling instrument in the realization of the MDGs relating to hunger and poverty

Table 7.1 ***Summary of ICT uses for eradication of poverty and hunger***

Indicators	ICT contribution – local content
• Proportion of population below US$ 1 a day	• Employment opportunities – use of ICTs as methods of receiving local content on employment opportunities
• Poverty gap ratio *(incidence x depth of poverty)*	• Market prices – use of ICTs as methods to receive and transmit information on local market/agricultural prices
• Share of poorest quintile in national consumption	• Microcredit and other credit information – increase the access to information on credit opportunities for creating enterprises. • Enhance the livelihoods of poor people and communities by enabling them to benefit from the expression of their own knowledge and expertise through the use of ICTs and other media. • Access to new, overseas markets (selling local art) • Increasing fair trade opportunities by connecting local producers with fair trade networks • Strengthening small businesses and entrepreneurs – providing the tools for creating and printing flyers; managing accounts
• Prevalence of underweight in children (under five years of age)	• Support for local farmers, herders – co-management of land resources through making local maps; GIS available in telecentres
• Proportion of population below minimum level of dietary energy consumption	• Disaster relief at the local level – famines in remote regions or very localized disasters: finding about these kinds of crises sooner; using ICTs to help with redistribution of supplies to affected areas (Red Cross has done some great work already on using ICTs to speed up the delivery of relief services for major disasters) • Access by farmers and fishermen to local information on markets and prices via radio, telephony, Internet, etc • Enhance access by local healthcare workers to suitable and relevant international information, adapting this information to their circumstances as necessary.

Source: "The Role of ICT in Enhancing the Achievement of Millennium Development Goals" Draft prepared by UNDP for the consideration of the UN ICT Task Force. 21 February 2003

Technological change, especially the arrival of mobile telephony, has strengthened the role of telephones substantially. One often cited example of successful ICT use in poverty reduction is the Grameen Bank's Village Pay Phone initiative

The other conventional ICT instrument used to support development projects has been the telephone. Technological change, especially the arrival of mobile telephony, has strengthened the role of this instrument substantially. One often-cited example of successful ICT use in poverty reduction is the Grameen Bank's Village Pay Phone initiative.[3] Grameen Bank is a village-based micro-finance organization in Bangladesh. The lives of members of the Grameen Bank, who now also form the backbone of Grameen Telecom, changed when they were provided access to cellular telephones. Women members in villages were offered loans to buy cellular phones at taka 18,100 a piece (US$ 385). They were then able to rent the sets out to other villagers on a commercial basis. By providing gainful employment as well as ensuring connectivity that can be exploited to various ends, the Grameen Bank's Village Pay Phone initiative proved that ICTs can help provide goods and services that directly benefit the poor.[4]

Our concern here is primarily with the impact of fast developing modern ICTs, including the Internet, on the MDG-realization effort. Unfortunately, empirical evidence in this area is still limited, though there are a large number

SPECIAL CONTRIBUTION

ICT and global poverty

Muhammad Yunus, Founder and Managing Director, Grameen Bank, Bangladesh

The new millennium has brought with it unprecedented possibilities for each human being to discover his or her own potential, and a chance to change his or her life. This is true, irrespective of where in the world she lives, due in large part to the rapid development in ICT. ICT is setting the stage for a distanceless world. It is already contributing to the expansion of economies at a rapid speed. Although ICT offers exciting possibilities for fighting poverty, this potential will remain unexplored if we leave it to market forces alone. The benefits of these swift developments will primarily enable the rich countries to become richer, and big businesses to get bigger. They, in turn, will guide the ICT industry in the direction that will help them achieve their goals.

This need not be so. There are resourceful people and organizations in the world with a strong commitment to end poverty. They can throw their weight behind directing the ICT industry towards developing an ICT infrastructure, products, devices and systems which would best fit the needs of the poor. ICT business leaders, product and system designers, and researchers can be involved in contributing their time and talent to address issues faced by the poor. ICT can be used creatively to enable new and cost-effective ways for poor men, women and young people to participate in the global economy.

IT can play a role in bringing an end to poverty in the following ways:

- integrating the poor into the process of globalization by expanding their markets through e-commerce, eliminating middle-men in their businesses, and creating international job opportunities through outsourcing
- delivering education, knowledge and skill training, and
- delivering health services on demand.

Within the Grameen family, we are designing companies, some of which are IT companies, with exclusively the poor in mind. Grameen Phone has been created in collaboration with Telenor of Norway and Marubeni of Japan to provide mobile telephone services in Bangladesh. It is taking its services into rural areas of Bangladesh through Grameen Bank borrowers. A Grameen borrower receives a handset with Grameen Bank financing; and becomes the telephone-lady of the village, selling telephone services to the villagers, in places where even fixed lines did not exist before. In the process, she makes an income, on average, higher than twice the per capita income in the country. By July 2003, Grameen had provided more than 29,000 poor people with mobile phones for income generation in villages across Bangladesh. Grameen Phone itself has become one of the largest mobile phone operators in South Asia, having reached 1 million subscribers in just seven years of operation.

Another company we set up, Grameen Communications, is providing Internet service to rural areas – to bring education, knowledge and business opportunities to the poor. Grameen Energy is bringing solar power to the villages to provide energy for mobile phones, and light for shops and homes. Grameen Software has been set up to introduce international-level IT opportunities in Bangladesh for the benefit of the poor. Shares in all these companies will, one day, be owned by the poor, once they are established as financially attractive, profitable ventures.

Whether the poor can afford IT or not depends not on the amount of investment needed by the poor nor on how complex the IT is but on the appropriateness of the institutional environment around the poor. Microcredit can provide such an appropriate institutional environment. IT and microcredit both empower individuals, which makes them mutually reinforcing. Mobile phone operators in the villages of Bangladesh have been able to afford mobile phones because of microcredit. The same principle will apply to other IT services, applications and products.

I have been advocating for the creation of an 'international centre for information technology to end global poverty', to create an appropriate information technology infrastructure and design suitable applications for delivering services to the poor. The funding to create such a centre could come from a consortium of donors and contributors who support the core programme of the centre. It can build strategic partnerships with leading IT companies and their staff, research and academic institutions, social activist groups, microcredit institutions, development agencies, and health and education institutions and professionals. Creating this centre will be an important step towards achieving the MDG of halving world poverty by 2015.

of experiments under way.[5] Examples of uses of the technology in poverty alleviation include:

- those that help small- and medium-scale farmers increase their revenues and improve their farming practices by making it possible for them to access information on agricultural know-how and market developments[6]
- those that improve the marketing of products produced by small-scale artisans in rural areas through various e-commerce initiatives[7], and
- those that offer additional non-economic benefits such as improved law enforcement and more rapid and effective communication during disasters.[8]

Such projects cater to demands for information that have a significant economic content, e.g., real-time information on prices, weather, and pests; advice on agricultural technology (agricultural extension), water use, soil management, livestock management, and livestock diseases; and the availability and conditions of bank credit, microcredit, and governmental grants and subsidies.

ICTs empower farmers, rationalize supply chains and improve productivity. ICTs also facilitate research and development, and information-sharing on agricultural farm extension technologies and approaches

ICTs and agricultural development

Agriculture, like the production and exchange of commodities, will also be transformed by ICTs. Increasingly, ICTs spur the development of innovative programmes and research in the agricultural sector. Farmers worldwide are using ICTs to obtain market information, to bypass intermediaries and to obtain better prices for their produce.[9] Timely access to market information via communications networks also helps farmers make judicious decisions about what crops to plant and where to sell their produce and buy inputs.[10]

Additionally, ICTs empower farmers, rationalize supply chains and improve productivity. ICTs also facilitate research and development, and information-sharing on agricultural farm extension technologies and approaches (such as the development of effective seed technologies), particularly those that can work to enhance food security and subsistence.

An even more upbeat assessment of the role of ICT in agriculture runs as follows: "ICTs will allow farmers to have more accurate information on the factors that are needed to increase crop yield. 'Precision farming', or farm management using ICTs, will become the norm rather than the exception. We can also expect better crops and livestock as a result of agricultural biotechnology".[11]

A project launched by ITC Ltd in India is a case in point. ITC Ltd has set up a network of Internet-connected kiosks, known as *e-Choupals*, to serve the soybean, cotton, tobacco, and shrimp farmers in its procurement network. Through the e-Choupal (a high-tech version of the traditional *choupal*, meaning a village gathering place in Hindi, where farmers get updated weather reports, information on local and international produce prices, etc), farmers are not only allowed to sell their produce directly to ITC, but also to buy agricultural inputs and consumer goods for daily household use. One element of e-Choupal's success is its reliance on local expertise, since kiosks are typically managed by respected farmers and located in or near their houses.

In addition, both ITC Ltd and the farmers enjoy lower costs and higher revenues. ITC Ltd saves money by eliminating two layers of middlemen and buying its produce directly from farmers; the farmers, knowing current prices, can negotiate a better deal in selling their crops. Farmers are also able to increase the quality and quantity of their harvests, thanks to the information the kiosks provide. This "win-win" business model helps ensure the e-Choupal network's sustainability, while making it highly scalable. ITC Ltd has thus developed an internationally competitive agricultural business by empowering the independent small farmer in a country where 200 million people are engaged in farming or related activities.

China is another country to have exploited the benefits of the technology in this area. The website of the China Technology and Science Service for the Countryside, operated by the Ministry of Science and Technology of China, delivers comprehensive technological and related information to 900 million peasants in more than 800,000 administrative villages in China. The website is operated by a broadcast network that includes television and uses the functions of a computer terminal. It started operations on 6 June 2001, and has since post-

ed 18,000 scientific and technological articles, and more than 100,000 words have been updated every day. Another similar project in the agricultural sector is the Beijing FarmKnow project, which began in 1998. During the project's first phase, over 60 farms in the rural areas around Beijing were equipped with computers and Internet access, and farmers were trained to use them. Currently, Beijing FarmKnow reaches over 100,000 farmers through its website. Farmers can access information on crop planting, disease control, pest identification and control, seed prices, and market prices as well as consult with agricultural specialists by email. There are many such examples elsewhere in Asia. One such in Malaysia, which is comprehensive in scope, is discussed in Box 7.1.

There are many other instances of the contributions ICT can make to raising the magnitude and reducing the vulnerability of returns earned by small producers from their economic activities. These include provision of information that warns fisher-folk of storms at sea or facilitates the prevention or treatment of crop or animal disease.

In India, Embalam is a two-street village 22 km west of Pondicherry, where 130 out of 210 families struggle below the poverty line. The village elders have allowed the M S Swaminathan Research Foundation (MSSRF) access to one side of the temple, to house two solar-powered computers that are used to give villagers a wealth of data, varying from the price of rice to weather conditions for fishermen and medical information for the sick. Embalam is one of four villages in which the MSSRF is implementing the "information village" project. The project aims to use "science and technology to tackle poverty, with a $120,000 grant from the Canadian government. The foundation provides villages with free technology and information in exchange for the villages' promise to house the computers and staff their operation." Through the project "farmers have gained a better grip on their local markets as prices are more transparent. They get the right seeds when they want them; and they have catalogued over 350 different types of herbs that can grow in their area. Fishermen get information from satellite images on where the fish shoals are likely off the Pondicherry coast, and (from a United States Navy website) on wave heights and wind directions in the Bay of Bengal".[12]

Pakistan's ThreadNet Hunza is another example of the use of ICT in generating economic activities and sustainable incomes. Established in 1995, the Karakoram Area Development Organization (KADO) is funded by the Aga Khan Development Network (AKDN) and the Swiss Agency for Development Corporation (SDC). Its objective is to work closely with the communities inhabiting the Karakoram area in the northern mountainous region of Pakistan. KADO has programmes that employ ICTs, such as the e-commerce initiative called ThreadNet Hunza (http://www.threadnethunza.com). ThreadNet Hunza offers the products of local handicrafts, such as carpets and household accessories, for sale over the Internet. With technology support from KADO's staff, the website has established a

On the employment front, India's experience is used to argue that the growing market for IT services and Business Process Outsourcing offers poor countries a new development opportunity

Box 7.1 ***Malaysia's TaniNet***

TaniNet is essentially an information service toolset. It was started in September 1999 in Malaysia as a project under the Demonstrator Application Grant Scheme (DAGS). Among its main objectives is to introduce the Malaysian rural farming community to agricultural biotechnology through an interactive, Internet-based service in English and Malay.

Services offered include: online information and services on agriculture and biotechnology; information on the local application of new technology; a forum for discussions among the rural farming communities through a managed bulletin board and chat room; easily available information on agricultural biotechnology; online access to expert advice and troubleshooting related to agricultural problems; and education for the community through access to important and useful information and services.

Even though there is specific reference to the benefit of this scheme for the poor, the developers of this application have discovered that the use of indigenous content and local language further increase the popularity of the website among local residents or communities.

Source: http://www.taninet.com.my and John *et. al.* 2003.

small and loyal clientele in Europe and the US (figures on the sales from the site were unavailable, although KADO claims that the website is self-sufficient and provides significant premiums to villagers on their products).

In some cases, as in Vietnam, villages have created websites to market local produce. A good example is Bat Trang, a pottery village. The villagers here have created a website (www.battrang-ceramics.org) about their products with the hope of increasing the volume of goods sold abroad. Yet another example is the Hoi An town in Danang city. This is one of the most popular tourist places in Vietnam. Residents of Hoi An have created their own website to introduce and promote their products such as silks and other souvenirs for foreigners and tourists.

ICTs and employment

On the employment front, India's experience is used to argue that the growing market for IT services and Business Process Outsourcing (BPO) offers poor countries a new development opportunity. As UNCTAD 2003 puts it, "Outsourcing to offshore vendors or 'offsourcing' is expected to continue growing in the near future," because "competitive advantages and economic pressures encourage companies located in the United States and Europe to look for partners in developing countries to deliver quality business services".[13] The pressure to outsource non-core operations and concentrate on core business functions has always been characteristic of large companies. Initially, this resulted in the hiving-off of certain operations to be undertaken by specialized, local firms in the developed countries themselves. The change now is that, with the increasing availability of cheap and better or larger network technology, communications infrastructure and bandwidth, many of these services can be managed and provided from remote locations.

So long as a cheap workforce with the requisite language abilities and skills can be found or created, this is an opportunity waiting to be exploited by developing countries, according to many. The evidence too seems to support this argument. As the UNCTAD 2003 report argues, "many companies in certain developing countries (mainly India) have flourished by providing, in particular, software application development and management services to clients worldwide".[14] It is true that India has certain specific, historically determined advantages, such as English language abilities that serve it well in the principal outsourcing market, the US; a large pool of educated and in many cases professionally trained manpower; and, above all, an autonomously evolved software services industry base. However, even in countries without these advantages, other capabilities can, if combined with national government and international support, be used to win them a slot in the BPO-IT enabled Services (ITeS) space. This is not necessarily true in the case of IT services which requires more advanced skills, but would definitely be true in the BPO-ITeS segments.

It is indeed true that any growth in employment and income can ultimately have some effect on domestic demand and, possibly, poverty. However, the human development effects of outsourcing are limited because such employment is still extremely small, predominantly urban and restricted to the English-educated middle class.

ICTs can also play a role in ensuring better employment opportunities in developing countries via improved labour market facilitation and direct employment. Using electronic job marketplaces, employers and employees can match labour skills and availability to satisfy demands. For example, TARAhaat, a portal designed to serve villages in rural India, provides job opportunity information on local websites in local dialects (Box 7.2). In addition, the establishment of local telecentres in countries such as Pakistan and India has created direct employment for thousands of local women and men.

Another country to have harnessed ICTs for improved labour market facilitation and direct payment is Mongolia. ICTs directly create employment opportunities for the unemployed and poor in IT industries. Newly established mobile phone stations, for example, have created many job places. They operate on CDMA, AMPS and GSM technologies and increase communication capacity to 200,000 users.

Ulaanbaatar, in the last decade, has established more than 100 Internet cafés and created at least 200-300 jobs. Some self-employed citizens, through their own initiative, have sought to fill a gap in the market by installing telephones in public places for local calls. The price for a one-minute call is 100 tugrugs for residential phones and 200 tugrugs for cellular phones. This is a clear demonstration of the self-employed harnessing ICTs to make a living.

Microfinance ventures, even when successful from the point of view of providing credit to the poor and ensuring high recovery rates, are characterized by high transaction costs and therefore extremely high interest rates. The Swayam Krishi Sangam (SKS) smart cards project is one example of using ICT to reduce transactions costs and reduce the cost of credit provided by self-help groups

Box 7.2 ***India's TARAhaat***

TARAhaat, named after the all-purpose *haat* (meaning a village bazaar), comprises a commercially viable model to bring relevant information, products and services via the Internet to the unserved rural market of India, from which an estimated 50 per cent of the national income is derived. It combines a mother portal, TARAhaat.com, supported by franchised networks of village cyber cafés and delivery systems to provide a full range of services.

In the absence of efficient infrastructure for transport and communication, information is hard to come by and market options are not clearly or widely known. There is no instrument more effective than the Internet for bringing both jobs and information to the rural economy: bringing the buyer and seller together and creating an efficient marketplace.

The look and feel of TARAhaat is carefully designed to attract and retain users of all kinds: farmers, traders, housewives, senior citizens, and children. The primary interface is both graphic (using specially designed pictures and icons that are attractive, colourful and animated) and voice-based to ensure that everyone, regardless of their level of literacy, can quickly learn to take advantage of the system.

The impact of TARAhaat is being felt at several different levels: family, agriculture and youth. For the family, this venture provides a window to the world, enabling it to connect locally to international information, and health, matrimonial, and mailing services. The farmer benefits through weather forecasting, procurement services, and sales negotiations. The younger generation benefits through career counselling, entertainment, and educational and career opportunities.

Source : ICT case study presented at the International Conference on Achieving Connectivity for the Rural Poor in India, Baramati, India, 31 May-3 June 2001, Retrieved on 9 March 2005 from http://www1.worldbank.org/prem/poverty/voices/globcoal/baramati/casestudies.htm

The use of ICTs offers increased opportunities to improve the living conditions of the poor through better government services, enhanced environmental monitoring and more efficient education and health care services

ICTs are widely utilized in the country for job search, employment and education. In 1998, with the assistance of the TACIS programme, a labour market information system was established by the government implementing agency – the Central Employment Office. This was upgraded in 2002. Household income and expenditure survey data in Mongolia show that one-third of the very poor are unemployed, a rate over three times that of the non-poor. All district employment offices are connected to the network. They gather information from entities and training organizations on vacant job places and training programmes, register unemployed people, send the unemployed for relevant training, and work as job intermediaries. In 2002, over 16,900 people or 54.8 per cent of the unemployed were sent to skills and short-term training programmes through local employment offices.[15]

ICTs and access to credit

It is widely accepted that access to credit is crucial to continued poverty alleviation. Lack of credit can prevent the growth of productive activities, affecting poverty alleviation. In the absence of credit, the poor can be forced into a state of indebtedness that prevents them from realizing the full benefits of their economic activities. This leads to bondage and extremely low wages, very often pushing children from poor households into underpaid child labour. It is also accepted that microfinance ventures organized through self-help groups are a useful complement to State-provided credit, especially in a large country like India.

The problem, however, is that microfinance ventures, even when successful from the point of view of reaching credit to the poor and ensuring high recovery rates, are characterized by high transaction costs and therefore extremely high interest rates. The Swayam Krishi Sangam (SKS) smart cards project is one example of using ICT to reduce transactions costs and reduce the cost of credit provided by self-help groups (Box 7.3).

ICTs and the improvement of government services for the poor

Social deprivation of various kinds can be alleviated through provision of information related to health, government projects and

Box 7.3 ***India's Swayam Krishi Sangam (SKS) smart cards***

Located in Medak District in Andhra Pradesh in India, Swayam Krishi Sangam (SKS) is a microfinance project catering to the needs of landless labourers and marginal farmers in this drought-prone area with a high incidence of poverty. Forced to borrow during emergencies at high rates of interest, many of the poor fall into a debt trap and end up "mortgaging" children into bonded labour.

Committed to targeting the poorest, SKS encourages membership of women from households having annual incomes less than INR 20,000 (approximately US$ 450). SKS has a variety of loan products and provides general and seasonal loans at an interest rate of 20 per cent, consumption loans from group funds at zero interest rates and emergency loans, also at zero interest rates.

SKS currently operates one branch in Narayankhed (Medak district), serving 998 poor women in 60 village Sangams (collectives). It reports a 100 per cent repayment rate on loans, most of which are in the range of US$ 50 in the first year of membership and US$ 100 in the second year. These have reportedly been used primarily for land and livestock related enterprises, and activities such as vegetable vending and running tea shops. SKS field staff is recruited locally; almost all from the poor – Dalit, tribal and other backward castes. A majority of the staff are women with, at best, only a 10th-grade education. SKS maintains that the loans have made a tremendous impact on members' lives, raising their incomes, reducing seasonal out-migration and preventing bondage of children as child labourers.

Poverty maps are important tools in guiding spending for governments. ICTs such as GIS allow for poverty mapping, which combines geographically-referenced surveys and census data to generate poverty and inequality profiles at low levels of aggregation

government personnel, and activities of non-government organizations.

ICTs have also been used by governments to help extend and improve their services to the poor. For example, the Indonesian government has initiated a number of projects for reducing government bureaucracy and inefficiency, thus providing faster, reliable and cheaper services to the public at large, while ensuring transparency and accountability within the government. These projects have helped improve government services by reducing processing time and costs for the public, as well as providing faster and accurate reporting for internal use. Some successful projects include the Department of Finance's services for tax and duty collection, or regional government services for issuance of licenses and permits (Box 7.4).

The use of ICTs offers increased opportunities to improve the living conditions of the poor through better government services, enhanced environmental monitoring, and more efficient education and healthcare services. Governments are using ICTs to improve the quality and efficiency of public services delivery systems. To this end, ICTs help governments strengthen

Box 7.4 ***Indonesian government's online projects***

Projects initiated by the Indonesian government for the purpose of reducing government bureaucracy and improving inefficiency, include:

- Electronic Data Interchange (EDI) to reduce export and import document-processing time from several days to only 30 minutes.
- Payment of income tax online (*MP3-Monitoring Pelaporan Pembayaran Pajak*): The programme was completed in 2003, and succeeded in collecting 13,000 billions rupiah of income tax within two months. Earlier, this would have taken six months.
- Computerization of regional government services: Government services in the districts of Takalar and Kutai Timur are considered the most advanced among regional government ICT-based services development. For example, Kutai Timur (www.KutaiTimur.go.id) has deployed a programme called One Roof Management Information System (*SIMTAP*) that currently offers 23 services online, with more in the development phase. Most of the services are related to issuing business licenses, permits and registrations. Some licenses and permits can now be obtained within a few minutes.

Box 7.5 ***India's Gyandoot: a model network***

The 'Gyandoot' community network, aimed at creating a cost-effective, replicable, economically self-reliant model for taking the benefits of IT to the rural population, is an intranet using Wireless in Local Loop (WLL) technology. It is set up in five blocks with 21 kiosks, each catering to about 15-20 villages in the tribal Dhar district of Madhya Pradesh in India. Its success lies largely in targeting information by assessing the interests of the people.

The key services it offers are: information on rates for agriculture produce, land record rights, government programmes and employment opportunities; provision of access to documentation such as caste certificates, applications for jobs, local weather reports and e-newspapers; provision of services such as computer training, online public grievance redressal, health services, email, rural e-auction, and matrimonial services.

The scheme also requires the establishment of intranet/Internet kiosks that are run on a commercial basis, with the operator obtaining a share of the minimal fee charged as revenue for undertaking the investment. In many places, the village panchayat paid for the kiosk (*soochanalaya*) and equipment, which was operated by a *soochak* who was an educated unemployed youth from the village, trained for the purpose. To quote Sood[1]: "The Gyandoot Project in Dhar has developed an important e-governance protocol, in the form of the *shikayat*, or complaint. For a fee of INR 10, rural citizens may select from a predetermined menu of 30 different kinds of complaints, which together cover a wide range of citizen-consumer to government interactions in rural areas. These include for example: the absence of a school teacher; the death of cattle that may require a government veterinarian's inspection; the malfunction of a public hand-pump that must be repaired; and so forth."

Between January 2000 and June 2001, 68,500 villagers have used various services. The most commonly used services were grievance redressal (41 per cent), market rates (25 per cent), and land records (20 per cent). Interestingly, one out of every six users of the network was illiterate with no knowledge of reading or writing. It is a disappointment that only 13 per cent of the users are women, which can be attributed to the low status of and lack of women-specific and family-oriented services. With this experience, similar initiatives, with better refinement are underway.

Source: Samiullah, Y. and Rao, S., 2002

ICT diffusion alone cannot deliver results, but must be supported by a range of conventional development advances. For example, the impact of improved ICT access on farm earnings through increased knowledge of market prices will be redundant if there are no roads to carry crops to markets

internal information flows, accountability and transparency, and procurement of goods and services. Effective use of ICTs by governments can raise the quality standards for information technology suppliers. The success of the Gyandoot community network in India demonstrates the importance of identifying and catering to the needs of the users (Box 7.5).

In Vietnam, there is a general trend in the ministries toward improving the skill levels of ICT use and focusing on the development of databases to support activities such as economic, agricultural and water resource management. A plan to introduce Telecommunications Posts Cultural Point for Communes (TPCPC) was drawn up in 1998, based on the co-operation of various government agencies such as Ministry of Agriculture and Developing Rural Areas, Ministry of Culture and Information, Association of Vietnamese Farmers and Vietnam Posts and Telecommunications Corporation.

Nearly 75 per cent of the Vietnamese population lives in rural or remote areas. The aim of the TPCPC plan is to provide 100 per cent of the communes in Vietnam with the ability to access basic telecommunications and postal services. The total of 5,714 post and culture centres nationwide provide basic knowledge and up-to-date information to farmers, especially in remote and mountainous areas. Eighty-five per cent of communes receive newspapers daily and 92.5 per cent have access to the telephone network.

The Vietnamese Government also focused on using the Internet to supply necessary information to farmers in rural areas. For example, the pilot project "Internet for all" connected 30 post and cultural centres in 30 communes of 10

provinces. There is also a growing number of ministries going online with preliminary websites in place or under development. Also underway is a discussion on a potential project for automating customs.

ICTs and poverty mapping

Poverty maps are defined by the Asian Development Bank (ADB) to be spatial descriptions of the distribution of poverty in any given country. As such, they are important tools in guiding expenditure for governments. ICTs such as GIS allow for poverty mapping, which combines geographically-referenced surveys and census data to generate poverty and inequality profiles at low levels of aggregation. Additionally, poverty maps based on highly disaggregated data serve benchmarking as well as monitoring and evaluation purposes.[16] In other words, ICTs help facilitate consultative inputs, poverty monitoring, mapping and assessments to evaluate impact and enhance support to the poor within the context of a country's poverty reduction strategy, as seen in Malaysia. Often, however, such interventions in areas such as health, education and infrastructure, being the responsibility of different agencies, are not coordinated. In order to integrate such cross-institutional data, a Meta Data Standard needs to be established.

Malaysia's database on the poor, the SINAR system, utilized the Poverty Level Index (PLI) to register poor households. SINAR was developed as a system to centralize the coordination of information on the urban poor, which is useful to various agencies and private institutions. This enables services to be provided to individual poor families while helping to avoid duplication and abuse. By March 2002, SINAR had been used to record information on 13,049 household heads and 2,845 members of poor families in Kuala Lumpur.[17] Another such example is the multi-county initiative from the Food and Agricultural Organization (FAO) titled Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) (Box 7.6).

Supportive measures

As can be deduced from the discussions above, ICTs can have an important development impact as they are able to overcome the barriers of social, economic and geographic isolation, increase access to information and education, and enable the poor to participate extensively in the decisions that affect their lives (Table 7.2).

Needless to say, ICT diffusion alone cannot deliver results. It must be supported by a range of conventional development advances

Box 7.6 ***Information and action for food security***

A major step towards eliminating hunger is to generate accurate and timely information on chronic food insecurity, its nature and causes. Most countries have national information systems on food security, but they vary widely in their coverage, analytical techniques, and in the quality and reliability of their information.

To support these efforts, FAO has promoted an initiative titled Food Insecurity and Vulnerability Information and Mapping System (FIVIMS) that operates at both national and global levels. At the national level, its aims include raising awareness of food security issues, improving data quality and promoting better use of the information to drive action. At the international level, an inter-agency working group with a secretariat at FAO, Rome, helps to define common standards, methods and tools for information management and presentation. It also mobilizes resources and provides support to national FIVIMS programmes.

A number of FIVIMS activities are under way in countries in Asia and the Pacific, including Bangladesh, Cambodia, India, the Philippines, Sri Lanka, Thailand and Papua New Guinea. In Asian countries, which host the largest number of undernourished people worldwide, FAO, backed by the Japan Trust Fund, has been supporting start-up activities via the Asia FIVIMS project. The aim is to improve information on food insecurity and vulnerability so that countries can take the necessary actions in favour of the goals of the World Food Summit – to reduce the number of undernourished people and achieve food security for all.

Source: FAO communication

Table 7.2 ***Poverty and types of ICT intervention***

Correlates of poverty	What ICTs can do	Category of poor that benefits	Advantage of ICTs
Lack of sufficient health, water and sanitation	Information improves delivery of health services and transfers knowledge on improvement of water and sanitation	Potentially all can benefit, particularly the poor in rural and suburban areas	ICTs can influence the improvement of basic infrastructure and services
Lack of skills or education	Distance education or learning-assisted ICTs	Potentially all can benefit, but the poorest segment is likely to be excluded. Some lower income individuals might be able to take advantage	ICTs can complement traditional teaching resources
Lack of employment or income earning opportunities	Employment in ICT professions (e.g., mobile phone operators, IT industry work)	May benefit the poor with low income but not necessarily the poor	ICTs can help in disseminating information on employment opportunities
Lack of information and social capital	Market information on agriculture, labour market conditions and other income earning opportunities	May benefit the poor with low income but not necessarily the poor	ICTs can be used integrated with traditional media, e.g., radio, broadcasting, Internet information
Poor quality of governance	More efficient and transparent government	Potentially all can benefit, including the poor	ICTs can be used in conjunction with traditional practices
Lack of voice and participation	Email access to decision-makers, ICTs allow active participation of people in policy formulation and decision-making	Potentially all can benefit, including the poor	ICTs can complement traditional newspapers and other media

Source: Adapted from Digital Divide: Determinants and Policies with Special Reference to Asia, ADB, October 2002.

Technological interventions alone cannot bridge the digital divide and reduce poverty. More important than technology is the content made available to the user

Needless to say, ICT diffusion alone cannot deliver results. It must be supported by a range of conventional development advances. For example, the impact of improved ICT access on farm earnings through increased knowledge of market prices will be redundant if there are no roads to carry crops to markets. This issue should be of particular concern to policy makers in the government services sector, as increased ICT use in government can only be successful as part of a larger development effort.[18]

Further, technological interventions alone cannot bridge the digital divide and reduce poverty. More important than technology is the content made available to the user. Even more important is the programmatic support that would

run parallel to the provision of hardware, software and content.[19]

It has been found that a successful ICT concept must encompass relevant information about local and indigenous situations, which enhances lifestyles and sustains livelihoods of the local poor communities concerned. It must also have suitable information and communications technology as a tool to deliver the information effectively to the targeted local poor communities.

In addition, content provided through ICT should not be limited to knowledge from outside sources but extended to draw on knowledge from the local community, especially the poor. Further, it would be useful if ICT content exploits the potential of the existing traditional or folk media that are available among different communities. By linking ICT content to the existing content and symbols from the traditional media, the problem of interventions being viewed as "foreign" to the respective community can be partially resolved.

To be relevant, applications must be available in local languages and, to the extent possible, be visually oriented and use voice interfaces

Thailand is a case in point. With the role of ICTs increasing in importance as the country shifts to community empowerment as its key poverty reduction strategy, its experiences have shown that content development is the most crucial factor. Currently, the information, both on- and off-line, is still agency-based, not people-centred. At this stage, an information/knowledge management system that is people-centred and user-friendly is probably more important than hardware and network connectivity for a middle-income society such as Thailand.

Illiteracy and knowledge only of local languages are, as expected, major obstacles to the use of ICT. To be relevant, applications must be available in local languages and, to the extent possible, be visually oriented and use voice interfaces.[20]

Given the low literacy rate as well as the very limited familiarity with English, much of the available content is not accessible by rural populations. Since 2000 some viable solutions to this problem have emerged, such as Inpage software. However, the standardization and deployment of solutions and content will take time. Nevertheless, it is encouraging to note that various initiatives to develop content in local languages have been launched in countries such as China, Pakistan and India. For instance, China's various websites specializing in agricultural development and poverty reduction are in their national language – Mandarin.

Therefore, the following principles governing the use of ICTs in future poverty alleviation undertakings suggest themselves[21]:

- Efforts should be made to develop viable ICT poverty alleviation programmes. These programmes should be coordinated across agencies in the best spirit of networking, to ensure proper focus in resource use and synergy in development efforts. The small, spontaneous but fragmented initiatives among private agencies and NGOs to bridge the digital divide should not only be encouraged and facilitated but be mainstreamed and coordinated by creating an 'ICT for poverty alleviation small grants fund' that can be micro-managed by regional agencies.
- Educational applications of ICT should be fully supported for their economic potential.
- Technological interventions should be supplemented by strong content provision. It should run parallel with a development programme, thus providing mutual reinforcement between ICT utilization and impacts.
- The use of poverty maps should be fully exploited through the collection of highly disaggregated census and economic data.
- A regional approach to programme development should be adopted since ICT and poverty alleviation are not best dealt with using a single national strategy. Governments and government agencies within the same region (e.g., Southeast Asia) should initiate dialogues to determine standards, platforms and protocols for information and knowledge exchange and re-use. A regional approach to knowledge networking should be adopted.

These and other practices can make ICTs powerful tools for poverty reduction by enhancing the capabilities of the poor in education, marketing, management and planning, as well as providing links to a variety of resources such as agricultural information.

Photo: Amit Khullar

MDGs

Chapter 8

The role and use of ICTs in education

We cannot predict what forms systems of education will take in the future; what their environmental characteristics, content structure or mode of delivery would be. However, what we can safely predict is that ICTs will play a major role in such systems, since this is a trend that is already visible across the world, including in Asia. Needless to say, changes in the nature of educational systems are visible too. Assumptions of teacher-centred education and whole-class instruction are being challenged. It is no longer strange to think of communication between teachers and students using emails, online lectures or even video conferencing. And as part of those changes, ICTs are already creating new possibilities for "reaching the unreached" and also for making lifelong education feasible for all. These trends would only gather momentum and could imply a revolution, provided determined efforts are made to promote appropriate use of ICTs as innovative new delivery mechanisms for system-wide provision of education.[1]

Government policies too now reflect the realization of the importance of integrating ICT use and promotion into their education policies. The creation of educational networks offers substantial economies of scale and scope, when attempting to improve the quality of education and seeking to standardize quality across the system. Hence, governments are investing in infrastructure facilities that link schools and educational institutions. Most significantly, in countries with vast land areas that make assured access to education difficult, ICT is proving a boon since it reduces costs and renders distance learning much more viable than it was earlier.

Potential benefits

The opportunities and benefits associated with the use of ICTs in education are manifold. The capacity of ICTs to reach students in any place and at any time is bringing about revolutionary changes in the traditional educational paradigm† by eliminating the premise that learning time equals classroom time.[2] By providing flexible and interactive learning styles and anywhere anytime access, ICTs benefit learners by giving them the material they need when and where they want it. ICTs allow them to interact without temporal and spatial constraints with both teachers and learner groups.

By providing flexible and interactive learning styles and anywhere anytime access, ICTs benefit learners by giving them the material they need when and where they want it. ICTs allow them to interact without temporal and spatial constraints with both teachers and learner groups

The teachers benefit by taking advantage of the interactive systems that help them understand a learner's needs and performance more accurately, make more effective assessments and develop improved systems of certification. ICT-based systems enhance educational quality for learners by increasing motivation, facilitating acquisition of basic skills, promoting inquiry and exploration, and preparing individuals for the technology-driven world.

On the teaching side, ICTs enhance quality because they can be used as tools for training and support for teachers regardless of their geographical

† The traditional paradigm is built on three basic principles:
1. Learners must congregate in a building where the teaching/learning process must take place.
2. There must be a predetermined path, divided into grades, that leads to a diploma and students must follow this path regardless of their interest, needs or abilities.
3. There must be a hierarchic structure where the instructor is the provider of knowledge and the students are the recipients.

SPECIAL CONTRIBUTION

The Virtual University: a key component of the Pakistan Education and Research Network

Atta-ur-Rahman, Chairman, Higher Education Commission, Pakistan

Explosive growth in IT in the current decade has opened up vast new opportunities for development for countries such as Pakistan. The four broad IT areas on which the Government of Pakistan has focused are:

- IT education
- IT infrastructure
- government enabling policies to promote IT related investments, and
- providing services to the citizen.

The Government has given the highest priority to IT education. A multidimensional strategy was adopted to overcome the deficiency in human resources in the field of information technology. This involved the initiation of new government-sponsored short-, medium- and long-term training programmes, setting up of seven IT universities, and strengthening of existing computer science departments at public sector institutions. A nation-wide programme has been launched to train the trainers in various areas of IT. To improve the quality of IT education in schools, a training programme for 25,000 school teachers has been completed.

Some seven new universities are being set up, including two in the private sector. In order to save funds and time, we decided to use existing campuses, wherever they existed, and convert them into IT universities/institutes. This is an important cornerstone of our policy since construction would have taken us years of effort and seriously delayed our IT initiatives.

An exciting educational initiative has been the establishment of the Virtual University, started with the assistance of UNDP on 26 March 2002. This distance-learning university will allow us to train tens of thousands of IT professionals in different parts of the country, as high quality TV programmes are telecast across the nation.

Viewed as a single entity, Pakistan has highly qualified individuals who are scattered in various institutions and organizations without forming a critical mass at any single place. Similarly, the wider Pakistan diaspora includes many notable academics. Virtual University

The digital revolution has created a dilemma for the less educated. On one hand, it creates new and better jobs but, on the other hand, it raises the bar on high-demand skills, which they don't possess. There is a distinct need for utilizing technology to serve those on the "downside of privilege"

dispersion. In fact, research has shown that the introduction of ICTs for educational purposes has positive effects on teaching practices. Other benefits for educational providers include efficient management of learning resources at lower costs (Table 8.1). These result from the sharing of resources and learning environments, opening up of classrooms as well as the promotion of collaborative learning and a general move towards greater learner autonomy.[3]

The use of ICTs brings new challenges as well. The digital revolution has created a dilemma for the less educated. On the one hand, it creates new and better jobs but, on the other, it raises the bar on high-demand skills which they do not possess. There is a distinct need for utilizing technology to serve those on the "downside of privilege".[4]

Further, the teaching paradigm has to change if benefits from even the right ICT infrastructure are to be derived. Since computers, being only tools, themselves bring very little to the learning process, policy makers must help teachers effectively integrate computers and Internet technologies into their schools.[5] ICTs alone do not have special properties or powers that would revolutionize education. The principal agents in the teaching and learning process are teachers and their pupils, and if both parties commit to the use of what is undeniably a pow-

utilizes the services of these talented individuals to design and develop its courses, which are then delivered, free to air, on television. A strong student-teacher interaction is provided over the Internet using a comprehensive Learning Management System which provides course content, discussion boards, assignments, etc. as well as their own email accounts for students. To maintain a formal educational environment, students are encouraged to attend classes at any of the many "virtual campuses" all over the country. These campuses provide the necessary equipment for viewing lectures as well as networked computer laboratories that are required by students for their studies. The local networks connect to the main servers of Virtual University over the Internet, which has become available even in the remotest regions of the country.

Although still in its infancy, Virtual University has made considerable progress. Over 2,000 students are enrolled in its first degree programme – a four-year BS in Computer Science or Information Technology. The courses have been well received by the academic community in general, and several conventional universities have incorporated them formally or informally into their own programmes. The fact that Virtual University provides a uniform educational environment to its students, regardless of their physical location, has become a huge equalizer with significant implications for uniform development across the country. Quality higher education is no longer the domain of the urban elite, and the affordability of the programmes puts them within reach of even the lower income groups.

Realizing the importance of providing affordable quality higher education to its people, the Government of Pakistan formally chartered Virtual University in September 2002. Keeping in mind the effectiveness of the new mode of education and the changing world scenario in IT, the charter empowers Virtual University to offer courses in a wide spectrum of disciplines. The University has recently introduced a series of BS programmes in liberal arts thereby providing an opportunity to a much wider audience.

Virtual University has also been granted a license to operate two independent television channels dedicated to education. These channels will be available on free-to-air digital satellite telecasts across the region and are scheduled to go on air towards the end of 2003. The advent of these channels will go a long way towards enhancing the outreach of Virtual University and it is anticipated that, with the introduction of new courses in English and other regional languages, enrolment from overseas will also increase. As enrolment grows, the Virtual University of Pakistan will be poised to become a significant contributor towards the socio-economic well-being of the nation.

The new flexible and interactive learning environment ushers in new ways of learning. ICTs break through traditional constraints of space and time, making for an ideal educational tool in reaching out to learners across remote areas

erful tool, then improved learning is likely to occur.[6]

Finally, while ICTs do offer many beneficial opportunities for education, they are no substitute for formal schooling. The role of technology is to support primary education not replace it, though the technology may play a part in meeting the needs of children or adults who cannot go to a conventional school or class. Access to ICTs ensures enhancement of traditional or formal education systems, enabling them to adapt to the different learning and training needs of societies. Computer simulation, telematics, video-audio, computer conferencing and virtual learning, along with educational television and radio, have the potential to reach larger audiences than possible through the traditional classroom.[7] In principle, ICTs can increase the effectiveness of the process of education by providing cheaper and more interactive tools. They can enhance the teaching aspect of education and improve educational administration (the planning, monitoring and evaluation of education). Value addition to education represents the greatest advantage in the use of ICTs (Figure 8.1).

Policies, investments and initiatives

In order to successfully use ICTs for education within a country, it is essential to pursue certain long- and short-term objectives for development

Table 8.1 ***Opportunities and benefits associated with the use of ICTs in education***

Opportunities	Benefits
Access to high quality learning material at remote sites	Learning material developed anywhere can be made accessible to learners anywhere
Open connectivity between learners	Free flow of information within and across learner groups
Interactive learning transcends limitations of simple access to information	Networked ICTs allow interaction between learners, with teachers, and the development of quasi intelligent learning programmes
Flexible learning activity convenient for the learner	Removal of time constraints on learning allows different rates of progression and access to non-traditional learners
Removal of spatial constraints on the learning environment	Reduced physical constraints on access to learning; travel and subsistence costs minimized; and distance is no longer a determinant of marginalization
Development of intermediary services to support learning	Use of networks of teachers and advisors to collate process and distribute ideas and materials to wider audiences
Management of learning can show rich data on learner's progress and performance	Interactive systems can generate formative data on learning progress and link to adaptive learning matched to learners' needs and actions
Assessment and certification can be administered using ICTs	Assessment and certification can be organized online with possibilities to reduce costs, improve security and standardize assessment tasks
Educational service providers can use ICTs to increase efficiency, improve service, and reduce costs	Financial, administrative and resource management systems can use ICT generated data at different levels of analysis to improve service delivery
Collaborative learning activities among learners	Students from different locations could learn and share resources together
Collaborative teaching activities among teachers	Teachers from different places and with varied perspectives could share experiences and jointly develop teaching resources

Source: Adapted from Lewin 2000

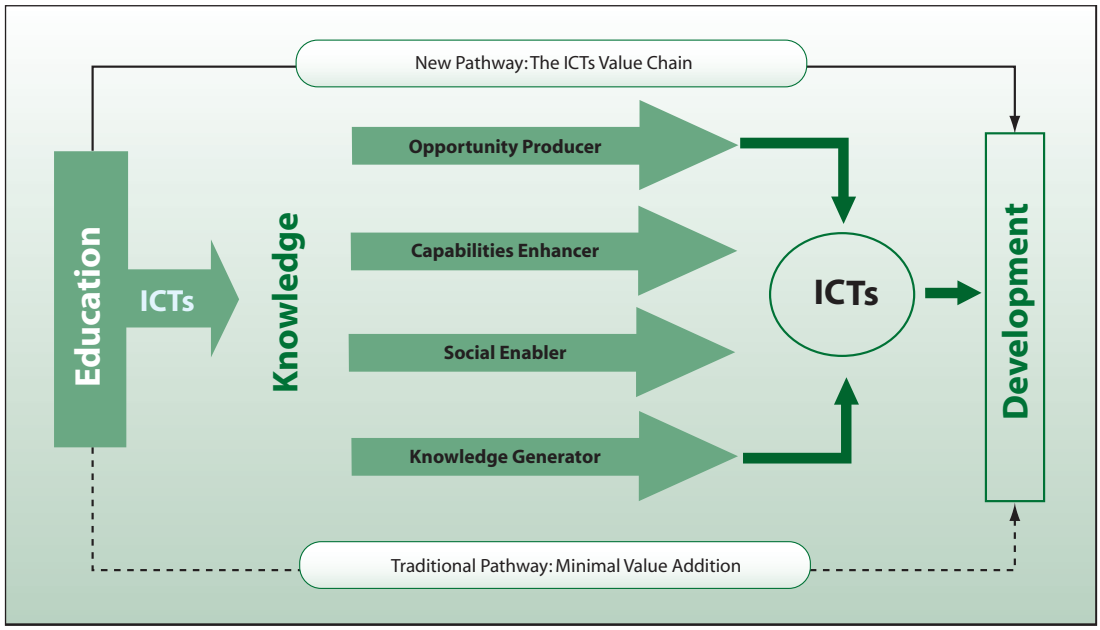
Using network technology, distance information platforms are being built across the fields of basic, higher and vocational education. Such online schools offer excellent teaching and systematic curriculum resources

of ICTs. Some of the more significant objectives can be summarized as follows:

- to build the physical infrastructure such as computer networks (local networks, intranets, Internet) and computer rooms in schools, to ensure connectivity, and to provide access to various databases and resources for teaching and learning activities, and for educational management
- to develop human resources for the ICT industry with ICT trained specialists at all levels of qualification and to create specialized ICT training programmes for promoting ICT applications in different fields
- to develop educational software that uses ICT as a tool to aid innovative thinking, problem-solving and processing skills, and
- to improve educational management by designing student, teacher and administrative databases.

In order to profit from the advantages that ICTs bring to education, several governments and NGO across Asia have initiated programmes to exploit the benefits of the technology. In India, the IT Action Plan adopted in July 1998 was an early initiative. In Mongolia, as a follow-up to its ICT Vision 2010, the Ministry of Science, Technology, Education and Culture (MOSTEC) released a set of

Figure 8.1 ***The value of ICT to education***



Source: Banuri *et. al.* 2003, Figure 1, pp 21

"Guidelines for dissemination of ICT in education of Mongolia by year 2010". The objective of the document was to establish a flexible system for the implementation of ICT training at all levels of education, according to international standards. ICTs in education mainly focus on development of the education management system and reform of educational content and technology. In Sri Lanka, the Ministry of Human Resources, Education and Cultural Affairs conducts several programmes, as part of the Sri Lankan educational system reform policy, promoting the use of ICT to streamline the school educational process at primary and secondary levels.

There are also a number of specific projects experimenting with the use of ICTs in education. For instance, in June 2003, the Government of India announced an ambitious programme titled 'Vidya Vahini', to create computer laboratories with facilities such as Internet access, an online library, academic services and web-casting across 60,000 schools run or financed by it. Drawn up by the Department of Information Technology, the project is being implemented by ERNET India and the software is being developed by the National Informatics Centre.

In India community projects are conducted across several states. In Madhya Pradesh, the government tackles computer illiteracy by providing computer-enabled education and development of basic computer skills for all students in primary and middle schools through the 7,000 Jan Shiksha Kendras (cluster resource centres) located in middle school premises across 48 districts. Another state that has joined the ranks in using ICT to enable community development is Andhra Pradesh. It set up 663 computer classrooms with over 8,000 computers for computer education in high schools, reaching over 300,000 students. Other initiatives of the Indian government include less ambitious but highly effective community-based projects (Box 8.1).

The Sri Lankan Government also runs an initiative connecting 92 education centres across provinces, regions and sectors to the Ministry of Education, developing computer training centres at 800 selected schools, and issuing CD-ROMs to meet the educational requirements of Sri Lankan secondary schools. In a decisive move, the Ministry has also introduced IT studies as an optional subject for the General Certificate of Education (GCE) (Advanced Level) examination from 2004.

Malaysia is another country that looked to propel itself into the knowledge economy with its Smart School concept, a learning institution that aims to foster self-assessed, self-paced and self-directed learning. The government, along with the private sector, set out to develop Smart School

In male-dominated societies, technology has proven a cost-effective alternative to all-female schools for educating women without disrupting cultural traditions. Television and radio broadcasts or Internet-based technologies enable girls to continue their studies from home or small learning centres

Box 8.1 ***India: An example of efforts to integrate ICT in education***

Among the many ICT-oriented projects initiated in India, community-based low-cost projects such as the Goa Computers for Schools Project emerged successful. It aims to improve the levels of computer access and literacy among students, as well as train teachers to use computers to teach effectively.

The project also allows after-hours use of computer facilities for email, information access and income generating schemes by adults in the community. Based on Linux, the software used in this unique project is moderately priced, can be freely distributed and legally copied. The project also proved to be of immense help to all secondary schools, ensuring that they obtain a laboratory of at least eight Internet-ready computers with the help of the government, industry and the community, relying on teamwork and networking among volunteers.

The Goa Computers for Schools Project is a case of sound policies that seek to combine local needs with local solutions to ensure sustainable and effective use of ICTs in the field of education.

Source: Chandrasekhar *et. al.* 2003

Provision can be made to reach children through distance education, as in many parts of the developing world formal schooling is currently likely to account for less than 1,000 days of a child's entire lifetime

Applications (involving teaching and learning materials and a smart school management system) and install the necessary technology infrastructure. ICT was to be used as the main teaching tool in four major subjects and the Internet was to eventually become a learning resource for students. However, the project faced many challenges and was downscaled at a later stage.

Although, most governments initiate sound ICT policies and even implement some successful projects, many fail due to lack of resources. Building the ICT infrastructure requires a huge amount of initial investment from governments. Yet, countries such as Vietnam have invested in a computer-based information network system for education called Educational Network (EduNet) and improved computer facilities at educational institutions. These investments will go towards providing an Internet connection and presence for all educational institutions, additional multimedia classrooms and high performance computing centres, educational databases for teachers and students, and facilities for distance education. Investment in the EduNet is expected to lead to improvements in the areas of content, teaching methodology and education management.

In China too heavy investments have mainly been made in building the physical ICT infrastructure required to support education. In 2001, there were 7,266 primary schools and 3,714 middle schools that were built with campus-wide networks, and the total number increased by 200 per cent by 2002. By the end of 2002, there were 5.84 million computers in primary and middle schools nationwide with about 3.5 students sharing one computer on average, as compared with a ratio of 100 to 21 in 1999. In Thailand, investments in the educational infrastructure have been made with a view to bridging the quality gap between urban and rural education (Box 8.2).

Pakistan too has made progress in developing the infrastructure through the Pakistan Education Network (PEN) initiative, at a cost US$ 5.18 million, to provide connectivity across universities, secondary and primary schools. PEN is is a major ICT infrastructure project being administered by the Higher Education Commission – the federal government's regulatory agency for universities. The PEN initiative will utilize existing telecommunications infrastructure, the recently launched Paksat-II satellite, and specially designed and placed network "nodes" and servers, to ensure connectivity across 60 universities initially and, eventually, thousands of secondary and primary schools. It has a 155 MBps optical fibre backbone, and was launched in early 2003.

Use of ICTs in distance learning and non-formal education

The new flexible and interactive learning environment ushers in new ways of learning. In addition, ICTs break through traditional constraints of space and time, making for an ideal educational tool in reaching out to learners across remote areas.

Provision can be made to reach children through distance education, as in many parts of

Box 8.2 ***Thailand's SchoolNet***

SchoolNet Thailand was initiated by the National Electronics and Computer Technology Centre (NECTEC) in 1995. The project's prime objectives are to provide Internet access to schools throughout Thailand, to improve the overall standard of education in the country by reducing the gap in quality of education between schools in urban and rural areas. The project was successfully implemented with the help of the Telephone Organization of Thailand (TOT), the Communications Authority of Thailand (CAT) and the Ministry of Education.

Each of these agencies plays a vital role in the project. NECTEC is responsible for technical matters; TOT sponsors domestic communications and hosts the Network Operation Centres (NOCs) nationwide; and CAT supports the international Internet bandwidth. Finally, the Ministry of Education selects schools and coordinates, promotes and supports the use of Internet in these schools. SchoolNet successfully achieved the target of connecting 4,758 schools and its activities have evolved beyond network connection to incorporate complementary activities. They can be classified into five areas:

- It connects schools to the network, regardless of where they are located, by paying only the local telephone charge, and no Internet access fee. School members receive up to five dial-up accounts each for 80 hours per month. They also receive 8 MB of data storage on a central server to post school web pages and educational content.
- It provides technical support to schools, through a special distribution package called LINUX School Internet Server or LINUX SIS, which contains Web-based system administration software that is distributed to schools as freeware. In addition, a help desk is provided at the NECTEC SchoolNet office.
- The project provides teachers and students with Internet training and web page development courses. Moreover, training is also given on the use of digital library toolkits to teachers of schools that are excellent centres for specialized subjects, enabling them to put their courses or teaching materials in the digital library.
- Finally, SchoolNet encourages schools to participate in international collaborative projects, such as the Global Learning and Observations to Benefit the Environment Programme and ThinkQuest Projects.

Source: Thuvasethakul *et. al.* 2003

The question of equitable access is not just a question of who can use what is available on the Internet, but also of who can produce it. There are already great differences across countries in this respect

the developing world formal schooling is currently likely to account for less than 1,000 days of a child's entire lifetime. Fewer than half of primary school-age children are enrolled in school and more than two-thirds of those who do enroll fail to complete three years of schooling. While it will take a massive effort to change this situation, as an interim measure, ICTs can be employed in formal and informal settings to deliver essential knowledge and information.[8]

ICT-based distance education has been used to overcome time, space and geographic restrictions, allowing teachers and students to interact and share learning materials. Using network technology, distance information platforms are being built across the fields of basic, higher and vocational education. Such online schools offer excellent teaching and systematic curriculum resources. ICT enables better management of knowledge resources, ensuring that distance-learning students receive high quality education and access the best teaching resources.

This holds true especially for a huge country like China where millions live in remote areas, and the lack of qualified teachers impairs access to fundamental and advanced education. According to the Ministry of Education's programme, the China Modern Distance Learning Satellite Broadband Multimedia Transmission Platform went into operation in November 2000, to serve mainly the western and other remote regions. This project allows simultaneous transmission of video and multimedia channels at different rates. Moreover, the Internet access service provided on the platform enables a high-speed interconnection with CERNET, forming a satellite to land consolidated bi-directional education network. The operation of

this platform comprehensively improves the situation of one-way transmission available through the satellite TV network in China.

In addition, projects such as the 101 Distance Learning Centre (www.chinaedu.com) cater to 200 distance-learning middle schools in China with over 0.6 million registered students coming from 70,000 common middle schools. Remarkable achievements have been made in many big cities such as Beijing where there are more than 30 online secondary schools with 50,000 to 100,000 students.

Distance education has also proved enormously successful in countries like Indonesia, Thailand and India. Government ministries have been instrumental in taking distance education from concept to execution with rewarding results across these three countries. Indonesia's Southeast Asian Ministers of Education Organization (SEAMEO) established a regional open and distance learning centre to supplement or substitute conventional classroom instructions. Its projects include development of online courses for senior secondary school students, training institution personnel, field extension workers and university lecturers, production of web and CD-based multimedia learning programmes for online access, integration of IT in teaching mathematics and science and in the education and prevention of HIV/AIDS. India's outstanding success story in distance education was a one-of-a-kind project initiated by the Ministry of Human Resource Development using television to reach out to India's students. Well into its 20th year, the project has seen resounding success in equipping student communities in backward areas with the knowledge they require (Box 8.3).

Distance learning in both formal and non-formal environments has helped raise the quality of education and contributed to economic and social development in most countries where these initiatives have been undertaken

In Thailand, the Distance Learning Foundation (DLF) has been entrusted by the Ministry of Education to conduct live secondary curriculum broadcasts via satellite to schools. Since its inception, from broadcasting for a limited time to 99 schools, it is now available through the week, round-the-clock via UBC Channel to destination schools. The Foundation has broadcast to 3,000 secondary schools, or around 2 million students, and to 350,000 UBC members. The broadcast was also later expanded to cover neighbouring countries.

Teachers and students in distance education programmes can use telephones or fax machines if they have questions, and this service is provided free of cost with the help of both the public and private sectors. In 2002, DLF partnered with the Institute for Promotion of Teaching Science and Technology offering free-of-charge web-based information content to those with access to the Internet, through both 'live broadcast' and 'by demand'.

Pakistan can also be cited as another country that has put distance education to good use in tackling adult illiteracy in rural areas (Box 8.4). It also has several other distance learning initiatives in place, from training and capacity building for mid-career professionals in the areas of sustainable development and the environment to training employees in the social sector. Spearheaded mostly by NGOs, other initiatives also include electronic media projects for underprivileged pre-schoolers. Based on *Sesame Street*, produced by the US-based Children's Television Workshop, the project has taught children concepts such as numeracy, communication and language, critical thinking, environmental concerns/ecology, health and hygiene, character-building, self-development, and social awareness.

Other countries such as Sri Lanka, however, have been slower to adopt distance learning, and are only now taking steps towards harnessing its potential. The Open University of Sri Lanka was launched in 1997, and initially only distributed teaching materials to a selected group of internal students. After a while, institutions such as the University of Colombo, School of Computing and Singapore Informatics began to introduce web-based distance education services. Soon, a small but growing number of wired individuals started pursuing diplomas, and professional or degree programmes offered by overseas institutions via the Internet.[9]

ICT programmes have also been utilized in other ways. Countries such as Malaysia and India have embarked upon projects in the non-formal education sectors. For instance, in Malaysia, the Electronic Book pilot project studies how electronic book appliances, that store textbook content and link users to the Internet, can be used to improve teaching and learning. It was reported that the e-book improved user knowledge in computers and technology, and increased pupils' interest in reading and learning.

Among other projects that were launched, but did not succeed, is Project Shiksha in India. With

Box 8.3 ***India's Countrywide Classroom project***

In order to combat the traditional compartmentalized system of education in India which prevented acquisition of knowledge and learning, the University Grants Commission (UGC), which comes under the Ministry of Human Resource Development, Government of India, initiated a unique educational experiment, called the Countrywide Classroom in 1984.

Realizing that India's explosion of student population could not be adequately reached through merely classroom education, television was used as a means to supplement classroom teaching. The UGC used the Indian National Satellite (INSAT) system to telecast high quality educational material via Doordarshan, India's national public service television network. The project was primarily aimed at undergraduate students in small towns and rural backwaters.

Initially conceived as a one-hour programme, the Countrywide Classroom grew to 20 hours of programming per week. The project sought to use television's positive attributes such as animation, special effects and visual power to make an impact on its youthful target group. Content is developed by Educational Media Research Centres and Audio Visual Research Centres established by the UGC. Today, 17 autonomous media centres function in a decentralized mode, co-ordinated by the Consortium for Educational Communication. These media centres have produced over 6,000 educational programmes on science, applied science, engineering, medical science, social science and humanities among others.

The Countrywide Classroom reaches out to four million viewers a day for an average programme. The enormous reach is explained by the fact that TV viewing is a community activity in India. The central and state governments along with the UGC have ensured access to communities and, therefore, larger audiences by providing TV sets.

Today, although the project has gained recognition around the country, UGC may need to explore interactive packages, utilizing the potential of widespread cost-effective Internet services to complement the Countrywide Classroom in order to survive the age of convergence. Other shortcomings include lack of effective promotion to create awareness, limited transmissions, lack of videotapes which can increase reach, and lack of telecasts in other languages apart from English and Hindi.

Source: Govindaraju, P. & Banerjee, I. 1999.

ICTs have been successfully harnessed for education in countries such as Mongolia, to reach remote communities, and provide education to traditionally marginalized sections of society

the aim to accelerate computer literacy, comprehensive software training for teachers and students was initiated at government schools across India. Over 80,000 school teachers and 3.5 million students got the opportunity to strengthen their IT proficiency. However, since the project was spearheaded by Microsoft, all training was based on its platforms which increased dependence on proprietary software and made it expensive to replicate on a mass basis.

Distance learning in both formal and non-formal environments has helped raise the quality of education and contributed to economic and social development in most countries where these initiatives have been undertaken. It must also be noted that in some countries, more than others, the benefits have been manifold. In male-dominated societies, technology has proven a cost-effective alternative to all-female schools for educating women without disrupting cultural traditions.[10] Television and radio or Internet-based technologies enable girls to continue their studies from home or small learning centres. Functioning without gender or cultural allegiances, technology facilitates communication and through this expanded access to information enhances the reach and processes of education significantly.

The impact of ICTs on educational services is growing.[11] Initial attempts to introduce computer-based technologies into schools and higher education were hampered by cost, constraints on information processing, and lack of connectivity. However, in recent years, ICTs have been successfully harnessed for education in countries such as Mongolia, to reach

Box 8.4 ***Pakistan's Functional Education Project for Rural Areas***

The Functional Education Project for Rural Areas in Pakistan was initiated as an experimental programme to address the learning needs of the rural populace, where adult illiteracy is 62 per cent.[1] Based on extensive research and careful development of material, the Allama Iqbal Open University (AIOU) worked out a method of teaching and group study led by villagers to meet the needs of locals. The experimental stage ran from 1982 to 1985 and the AIOU has since institutionalized some of that work.

The main teaching methods and media include printed teaching material, illustrated flip charts, audio cassettes and group meetings led by group leaders. Field workers recruited and trained group leaders in the techniques of group study and supervised their work. At the end of each session, the group leader completed a feedback form that was used later for management and evaluation. The project reached about 1,500 learners and it was estimated that it could be extended to reach about 5,000 a year. It also met with some success in reaching people with little formal education, as 55 per cent of the learners were illiterate and 66 per cent had either not gone to school or were educated only up to the lower primary level. The evidence is consistent in showing that the project succeeded in establishing a viable and effective system for rural education. Its work has continued and has now become the responsibility of a university faculty of mass education at the AIOU.

Source: Adapted from: Edirisingha, P. 1999.

The provision of a localized, supportive environment that encourages teachers to see ICT as integral to the achievement of their existing goals will be an important national initiative

remote communities, and provide education to traditionally marginalized sections of society (Box 8.5). There has been a shift from the traditional to the open and virtual paradigm in education. Smart schools, online education and virtual universities have been incorporated by institutes applying a new set of strategies to deliver education, using synchronous and asynchronous digital networks.[12]

Although ICT plays a significant role in providing a more effective, relevant and flexible mode of learning to the underprivileged, its use calls for a completely new teaching paradigm. This shift in the teaching environment needs to be taken into consideration before deployment, along with other factors specific to each country. These factors span local infrastructure limitations, localized content availability, cost to install, maintain and scale up ICT-based educational programmes, familiarity and learning curves of the target audiences with respect to the technologies being used, socio-cultural aspects such as age, gender and literacy levels and penetration and perception of technologies, among others. In addition, choosing the appropriate ICTs will also demand a thorough understanding of the educational objectives at hand which, in turn, requires complete knowledge of the target audience's goals and aspirations.

However, the re-training of teachers and reshaping of the educational system remains the most challenging task as ICTs are increasingly used in education. ICTs provide active learning experiences and access to a wide range of media.[13] Therefore, teachers need to consciously redesign learning environments so that students can transfer their newly gained ICT skills to other applications that can be used in an ICT-rich environment.[14] Once teachers and students acquire ICT skills they can adopt a transferable learning style so that each further step in using ICT becomes easier. A change in the learning environment calls for a paradigm shift for teachers. This shift primarily occurs due to teachers moving from being passive instructors to becoming active constructors, putting the learners in charge of the learning process (Table 8.2).

There are four key reasons demanding a change in the role of the teacher.[15] Firstly, ICTs will render certain teaching resources obsolete. Secondly, ICTs will make some forms of assessment redundant. Thirdly, it will become crucial for teachers to encourage critical thinking skills, promote information literacy and nurture collaborative working practices. Finally, teachers will need to reappraise the methods by which they meet children's learning needs.

In order to effect these changes, teachers have to be empowered to use ICT.[16] Providing them with resources to integrate ICT would help them gain confidence in these technologies. However, training of teachers alone is unlikely

Box 8.5 ***Mongolia's Gobi Women's Project***

One of the simplest uses of ICTs is exemplified by the Gobi Women's Project in Mongolia. Funded by DANIDA at a cost of US$ 1.7 million and aided by UNESCO, the project provides non-formal distance education to some 15,000 nomadic women, broadcasting useful instruction on health, commercial skills, family planning, traditional crafts and environmental issues.

The project relies on a series of weekly radio programmes and booklets, covering everything from stitching a camel saddle to basic mathematics. Since nomads move a couple of times a year, a chain of "co-ordinating committees" composed of education specialists and professionals such as doctors, veterinarians and economists have been formed. They reach out from the capital Ulaanbaatar to the 62 *sums* (districts), linking teacher trainers to the corps of 620 visiting teachers, who meet monthly with about 30 students individually or in small groups.

The project has re-equipped four radio stations (one in the capital and three in the Gobi) to produce three weekly series reinforcing the books' lessons. While the Ulaanbaatar station takes the lead in introducing new subjects, the regional stations take a local look at the curriculum. Radio producers, teachers and communicators have been trained by the project. The project helped women become self-sufficient.

UNESCO plans to extend the project with another DANIDA-funding of US$ 1.5 million to enable parents to learn new skills and help their children study at home. It is expected to reach 37,000 families since the school drop-out rate is a problem because parents need the children to help with domestic work. The project, in its next phase, therefore aims to offer "family-based education".

to be effective in the development of ICT skills and knowledge, and enhanced use of ICT in schools.[17] A more holistic approach comprises appropriate training (appropriate in terms of skills, knowledge, relevance to educational goals and priorities, and delivery), ready access to ICT resources and ongoing support to encourage progress beyond formal training. The provision of a localized, supportive environment that encourages teachers to see ICT as integral to the achievement of their existing goals will be an important national initiative.

A good example of the holistic approach is the project for improving teacher quality in China. The Ministry of Education, along with UNDP and DFID, is using distance education to raise the educational equity for 20,000 teachers in the poorer Western provinces. Pakistan too has developed training projects that would equip 10,000 primary and secondary school teachers with ICT skills. Although these training programmes have been initiated to effect a change in the learning environment, it is too early to ascertain the impact of these initiatives.

Another major challenge that developing countries face today is the lack of models specific to local contexts for use of ICT in education. Claudio de Moura Castro, Chief Education Adviser of the Inter-American Development Bank, points out that though

The pressing problems for educational planners is how to quickly reach the majority of the poor, uneducated rural populace, and find out how to fund, implement and maintain the educational part of ICT networks

Table 8.2 ***Paradigm shift in teacher's role***

From	To
Objectivist learning theory	Constructivist learning theory
Teacher-driven	Student-driven
Teacher as expert, information giver	Teacher as facilitator, coach, guide
Teacher as knowledge transmitter	Learner as knowledge constructor
Teacher in control	Learner in control
Focus on whole classroom teaching	Focus on individual and group learning

Source: Lee 2001

rich countries have used technology to make education even better, if developing countries were to follow the same path, they would be choosing alternatives that, in addition to being very expensive, require high-quality teachers who are not and cannot be made available.[18] These experiments are, therefore, doomed to remain enclaves, catering to the elite but incapable of being scaled up to reach the number of people who are in dire need of better instruction.

Instead, then, developing countries need to focus on those technologies that compensate for factors that are lacking, namely, well-trained teachers and the resources to pay for expensive equipment. The task at hand is to concentrate on technological alternatives that, at low cost, bring to students the imagination and creativity of a few excellent teachers.

Though there have been commendable efforts by many countries in leveraging ICTs for education, the true potential of ICT application has not been realized. Both civil society and the public sector have focused almost exclusively on ICT education. The lack of creativity in using ICTs as a means to better education, and focusing on ICTs only as a component, deprives the education sector of an important instrument. The goal of achieving universal primary education has yet to be advanced using ICTs, with the exception of some experimental innovations in the private sector.

The need for linking ICT and education efforts to education policies and reforms that embrace the use of new technologies holistically cannot be stressed enough

Developing countries face three main challenges in expanding primary education:[19]

- *Limited resources*: compared to rich countries, developing countries spend much less per student and as a proportion of GNP at all levels of education.
- *Inequity*: when spending on education is low, the benefits of the education system are disbursed unevenly so that rich people often capture a much larger share and the poor benefit marginally.
- *Inefficiency*: inefficient spending means that a high share of recurrent spending goes for teacher salaries, leaving little for learning materials. In addition, low-quality teaching means that students do not learn as much as they could.

Another major constraint is the lack of content for ICT delivery. The development of instructional content-ware remains a neglected area, affecting investments in hardware and resulting in heavy economic and educational losses. One possible reason is that equipping schools with infrastructure is easier than developing corresponding instructional material,[20] since many countries have yet to discover how to produce suitable yet cost-effective content for delivery. Educational materials could typically include content in the form of text, special "books of readings", study or learner guides, assignments, assessments pads and tutors' guides. These resources, along with appropriate learner support systems, would complete the education or training environment.[21]

In this context, questions of equity and quality become significant. The pressing problems for educational planners is how to quickly reach the majority of the poor, uneducated rural populace, and find out how to fund, implement and maintain the educational part of ICT networks. The question of equitable access is not just of who can use what is available on the Internet, but also of who can produce it. There are already great differences across countries in this respect. Similarly, there are great differences between public and private corporate players in their capacity to become "net-based education providers". Equity can be looked at from two angles:

- equitable access of students as consumers, where the poorer peoples and nations are put at a disadvantage, and
- equitable provision of content, where the poor are even worse off.

Finally, the need for linking ICT and education efforts to education policies and reforms that embrace the use of new technologies holistically cannot be stressed enough.[22] Though Internet connectivity represents innovative public sector leadership and ministries of education around the world have made a commitment to computerize schools, few have developed coherent strategies to fully integrate the use of computers as pedagogical tools in the classroom. Today, countries have seen levels of computer literacy grow but they remain far from utilizing the full potential of ICTs in education. Real learning gains have yet to be made and will only come when countries succeed in integrating computers and the Internet into the broader educational curriculum.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MDGs

Chapter 9

ICT, gender equality and empowerment in Asia

It is now widely recognized that systemic or structural and conjunctural factors have combined to generate and perpetuate substantial gender disparities in the course of economic development the world over. Needless to say, Asia is no exception. Recognizing the equal right of women and men to development, and the debilitating effects on overall growth and human development that gender disparities have been found to have, the UN's Millennium Declaration provided for special goals and targets in the area, which calls for mainstreaming the gender problem into economic development. This chapter is concerned with delineating some of the principal challenges raised by the gender situation in the Asia-Pacific region and examining how ICTs are being and can be harnessed to further this agenda.

Assessing the status of women

The fundamental problem from a gender-sensitized, human development point of view is evidence that economic growth need not necessarily generate improvements in the socio-economic status of women. There is indeed national and international indication of a positive relationship, in the long run, between material progress and the socio-economic condition of women. However, this outcome does not reflect an automatic, monotonic relationship. The outcome is influenced, among other things, by women's struggles for equality and justice and by the demand for labour resulting from economic expansion. Increased demand for women workers leads to greater recognition of women's work because it is paid, resulting in pressures to provide better conditions of work, enlarge the opportunities for women's participation and improve the overall freedom and status enjoyed by women.

A range of indicators has been used to assess the extent to which this process has unfolded.[1] To start with there are variables defining the basic conditions of life and survival, such as access to food and nutrition, water, shelter and basic consumables (including amenities such as electricity and sanitation). Second, there are variables defining capabilities, such as access to education and health services. Third, there are variables defining the nature of economic participation, such as the pattern of employment, division of time between paid and unpaid work, control over assets and control over own labour power. Finally, there are variables defining the extent of social inclusion and freedom, such as the degree of control in household decision-making, freedom from violence, social involvement and autonomy of movement outside the household, and political participation. Almost all of these features are covered by the goals and targets set by the UN's Millennium Declaration.

It should be obvious that each of these can influence the degree of access to and the capacity to use the benefits of ICT. Therefore, inasmuch as there is a gender divide that adversely affects the status of women, it also contributes to a digital divide since women's access to and capacity to use the benefits of the technology are restricted. In the South Asian region, Internet users constitute less than 1 per cent of the population. And most women Internet users belong to the predominantly urban, educated elite. According to one analysis: "Barriers of illiteracy, preoccupation with survival, constraints of time, inegalitarian and oppressive socio-cultural norms and practices, high costs and predominantly urban character of facilities, and bandwidth limitations are some of the key factors impacting women's access to ICTs in the region.

In as much as there is a gender divide that adversely affects the status of women, it also contributes to a digital divide, since women's access to and capacity to use the benefits of the technology is restricted

Obstacles to access – a necessary condition for women's appropriation of ICTs – prevent the engendering of the design, content and use of ICTs."[2]

We can think of two ways in which ICT use can empower women and improve their status:

- directly, through the agency of the affected women themselves, who exploit the benefits of the technology to improve their status, and
- indirectly, by those who are exploiting the technology to improve the delivery of services to women, to increase awareness about the status of women and to advance their advocacy activities.

The latter could consist either of women's groups or those not specifically targeting women, but whose activities have a positive fallout for women who, as a group, are specially disadvantaged. Given the gender divide, it is the latter that is likely to be more important in the early stages of the effort.

ICT can be used to empower and improve the status of women: directly, through the women themselves, who exploit the benefits of the technology to improve their status; indirectly, by those who are exploiting the technology to improve the delivery of services to women

At an individual level, ICTs offer possibilities for women to participate in e-commerce, distance education and e-government, thereby overcoming socio-cultural barriers to women's economic advancement that have been especially significant in many Asian cultures. At the level of women's groups, information technology allows information processes to be accomplished much more efficiently, and thus can be used to raise the productivity of information workers, including the operations of advocacy groups and NGOs that work to improve the lot of women.[3]

The use of ICT in women's education

Educating women and giving them equal rights is important because it increases their productivity, raises their output and reduces poverty. It also promotes gender equality within households and removes constraints on women's decision-making, thus reducing fertility rates and improving maternal health. Educated women do a better job of caring for children due to an increase in awareness about the health and nutrition of their children. Equal access to education is an important step towards greater gender equality, but it is not the only one. However, even as gender disparities in education diminish, other differences persist everywhere in legal rights, labour market opportunities, and the ability to participate in public life and decision-making.

ICTs can do a lot to improve women's opportunities in receiving education and training. Distance education based on ICTs, especially through radio and television programmes which contain various forms of educational and training content, will promote sharing of education resources and offer women wider access to professional training, secondary education, on-the-job education, etc. Programmes targeted at women could not only educate and develop skills, but also provide insights into women's issues, and create awareness among women regarding their rights, problems, solutions and choices. This would help equip women to identify and break down barriers that restrict and discriminate against them.

The first barrier to overcome is the lack of knowledge to access the benefits of ICT. In some instances more 'primitive' means are used to solve the problem. The Siyath Foundation in Sri Lanka provides information to women at the grassroots level by downloading information from the Internet, translating it into their mother tongue and distributing it throughout Sri Lanka by fax or post. Regular discussions are held among the women at the village level about the downloaded information at 'Gami Hamuwa' meetings.[4] However, Sri Lankan women's groups are increasingly using ICT tools for education and training purposes. The Centre for Women's Research (CENWOR) has launched a Women's Electronic Information Network, which consists of electronic mailing lists and a website, and online training for women.

In Pakistan, the Sustainable Development Networking Programme (SDNP), as part of its Internet Skills Training Programme for Women, conducts workshops at SDNP centres that teach basic Internet access and use. These were introductory in nature and could offer large numbers of participants some hands-on experience. They were usually targeted at specific groups. For instance, SDNP in Quetta focused one workshop on housewives and working women in May 2001, attracting about 50 participants with access to computers at home. The province is highly gender segregated and the presence of a female SDNP staff member enabled contact to be established. The aim was to assist women in

Box 9.1 ***"A Million Homes On The Internet" project in Shanghai***

To enhance women's capabilities, the Shanghai Women's Federation is implementing a project named 'A Million Homes On The Internet' with the assistance of the municipal government and Shanghai Telecom. With this project, the Federation hopes that a million women between the ages of 35 and 60 years would receive education and training in ICT knowledge and skills in three years starting 2003. They can then utilize the facilities offered by ICT, such as computers and set-top boxes, all by themselves, and improve their quality of life. The Federation also hopes to set up a distance education centre for women in more than 30 per cent of the counties and towns in Shanghai, so as to provide women with easier access to education.

Source: Wang *et. al.* 2003

overcoming their fear of technology, to provide basic training on email and Web use, and to enable them to oversee family use of the Internet. The office reported enormous interest in Quetta city and Baluchistan, with one session attracting over 250 people, and there was much interest expressed by the participants in obtaining more advanced skills. Other centres at which a large number of such sessions have been held are Peshawar, Islamabad, Karachi and Lahore. In many remote areas, this was women's first exposure to the Internet.

Once the access barrier is broken, the opportunities are immense. A community development project on ICTs for women's empowerment through education is being conducted by the Annisa Foundation, in collaboration with the UNESCO office in Jakarta, Indonesia. The project is being implemented in two villages: Batu Kumbung and Gegerung in West Lombok in West Nusa Tenggara. The Foundation assists eight groups in literacy programmes including three groups of female farm labourers for the functional literacy programme; one group of children who are out of school; one group of male teenagers; one group of fathers; and two groups of mothers. The programmes teach writing and reading skills, and simple calculation. Other activities for women's empowerment conducted by the Foundation include the dissemination of knowledge related to their health and the environment, and the establishment of income-generating activities.

This project also cooperates with the Agency for Assessment and Application of Technology in the implementation of solar cells as the main energy source for computers and televisions in the classroom, reducing costs of provision substantially. The teaching is conducted through the media of television and radio. Each village has one multi-functional hall for conducting the programme. A set of computers for database and administrative purposes and another of television and radio sets for teaching purposes are installed in the hall. Face-to-face class activities are conducted three times a week and also for evaluation and assessment purposes. The major impact of this project for women is that they could acquire the skills to take up productive activities such as making snacks, growing vegetables and other home-based activities that allowed them to earn extra income, while attending to their family responsibilities that are ingrained in the socio-cultural condition. In other countries, especially China (Box 9.1), such efforts are being undertaken on a much larger scale.

Very often educational programmes impart skills that raise productivity and increase returns from employment. Since 1985, Indonesia has been developing a programme called *Kelompencapir*. *Kelompencapir* is short for *Kelompok* (group), *pendengar* (listeners), *pembaca* (readers) and *pemirsa* (watcher). So, the programme involves radio listeners, newspaper readers and TV audience groups, who together discuss the information delivered to them, arrive at a decision and take collective action, mainly regarding rural life and development. It is a programme aimed at disseminating knowledge on new varieties of crops, new methods of growing crops, or new technologies in the villages. The villagers from different villages compete in transforming that knowledge into actual practice. The participants in this programme have an almost equal gender distribution. Such simple models could be further improved to become more innovative by using the full spectrum of ICTs.

In India, the National Institute of Agricultural Extension Management (MANAGE) has set up village information kiosks in 11villages in the Ranga

Programmes targeted at women could not only educate and develop skills, but also provide insights into women's issues and create awareness among women regarding their rights, and choices. This would help equip women to identify and break down barriers that restrict and discriminate against them

Reddy district of Andhra Pradesh state. The kiosks are housed on the premises of Mutually Aided Cooperative Thrift and Credit Societies (MACTCS), a collective of savings and credit groups of women, federated at the sub-district (*mandal*) level. The 11 village kiosks cater not only to the concerned villages, but to women from 25 to 30 surrounding villages, who are group members of these societies. This project is an agriculture extension initiative, which seeks to ensure quick dissemination of technological information from the agricultural research system to farmers in the field and then relay their feedback back to the system managers. Staff of the MACTCS are trained by MANAGE to run the kiosks. The maintenance and operation of MACTCS finances is a major service offered by the kiosks. Villagers also use the Internet to check their eligibility for housing loans, crop loans and other schemes, and as a source of information about market prices in the state.

ICTs can primarily allow women to juggle family responsibilities and work commitments by teleworking, which opens up a plethora of productive employment opportunities for women previously constrained by the need to stay at home due to socio-cultural reasons

Elsewhere in Andhra Pradesh, a project titled 'Sustainable Dry-land Agriculture by Mahila Sanghams' has been initiated by the state government, under the UNDP-GoI Food Security Programme. A major objective of the project is to utilize appropriate methodologies to meet the information needs of women farmers. These include information on agronomic practices and farming methods, access to and use of new technologies, market news and agricultural commodity prices, weather and rainfall patterns, recommended crops for the season, and information on meetings and workshops on relevant issues. A database of relevant information is maintained and updated at a central hub, which can be accessed through a network of computers at information centres located in the office of the Mandal Agricultural Offices. These centres will be equipped with computers and modems for dial-up Internet access, and would provide services to the entire community. In addition to information related to dry-land agriculture, the information centres would also maintain a gender-disaggregated village database with basic demographic information, landholding patterns and income profiles. The centres would provide a platform for distance learning through centrally developed interactive learning packages on specific technologies. They will also provide simple services such as filling in and printing out applications for various government schemes in the required formats, at a small charge.

Such projects have been launched elsewhere in Asia as well. In order to improve and enhance current science and technology-based products and services, and their delivery through the application of ICTs, the office of the Ministry of Research and Technology in Indonesia developed a delivery system of information products called Warintek (Warung Informasi Teknologi or Technology Information Kiosk). Warintek has been introduced in rural communities in Indonesia since 2000. It consists of technology information kiosks that provide access to the Internet and CD-ROMs of appropriate technologies for rural communities. All information on appropriate technologies in the CD-ROMs is presented in Bahasa Indonesia. Warintek charges a small sum for access to the Internet and provides free access to the CD-ROMs. Both male and female farmers are invited to Warintek kiosks to be trained on how to use and access the information needed. In West Sumatra and Palembang, women participants, including farmers, are very active in the use of Warintek kiosks to search for information related to their businesses. About 10 to 20 people utilize the kiosks each day of whom half are women. In Medan, North Sumatra and the Papua Provinces, district governments have allocated 50 to 60 per cent of the Warintek training slots to women.

Education is one of the areas where ICTs have been shown to have the most impact. The strategic application of technologies and ICT-enabled skill development could be used to broaden the availability of quality educational materials and resources. ICTs could also support teacher training, learning and capacity development. In addition, ICTs could help deliver educational and literacy programmes specially targeted at poor girls and women, using appropriate technologies in both formal and non-formal educational settings such as public access centres. Lastly, they could be used to influence public opinion on gender equality through information and communication programmes, using a range of ICTs.

The use of ICTs to generate employment opportunities

For women, the access to productive employment opportunities is the key to the reduction of poverty and the redress of inequities in the distribution of incomes in favour of men. However, only a part of women's work can make

this contribution since it is known that a significant part of women's work – in the processing of primary produce for self-consumption, basic domestic handicraft production, and in services such as cleaning and childcare – is unpaid. Since such work is typically not captured by employment data, there is also a tendency to overestimate the extent of unemployment among women as well as to underestimate the female labour participation rates.

However, a positive development is that ICTs can provide a number of new job opportunities for women or business opportunities of which women could avail themselves. ICTs can primarily allow women to juggle family responsibilities and work commitments by teleworking, which opens up a plethora of productive employment opportunities for women previously constrained by the need to stay at home due to socio-cultural reasons (Box 9.2).

In partnership with Nari Raksha Samiti (NRS), the Datamation Foundation in India started a computer literacy programme and established a computer-training centre in a slum locality in Delhi. Women who are underprivileged, abused or destitute but have had at least school-level education are trained there to acquire basic computer skills such as the use of software applications like Microsoft Word, Excel and PowerPoint. The training is expected to help increase employment opportunities for these women. The Datamation Foundation itself has hired nearly 150 of these women, which accounts for about 10 per cent of its work force. Datamation's goal is to create more than 3,000 full-time job opportunities for women in the next two to three years.

There are examples in India where ICTs are used for marketing purposes to strengthen the earning opportunities of poor women. One of the few e-commerce projects, geared to the marketing of commodities produced by rural women's cooperatives and NGOs focusing on women, is India Shop set up by the Foundation of Occupational Development (FOOD). The advantages are better prices and higher profit margins for these women, which result from bypassing

Through the use of ICTs, some rural women can gain a new communication platform to exchange opinions on political issues with their political leaders and to raise awareness about women's issues

Box 9.2 ***e-Homemakers in Malaysia***

'e-Homemakers' is a community project managed by homemakers in Malaysia. The project currently involves the management of a community portal, www.myhome4work.net, in three languages; the testing of a virtual office with teleworking staff who all work from home; the publication and distribution of a monthly e-newsletter to 5,000 members; and the organization of conferences to encourage the practice of working from home as well as to open women's minds to alternative work options. Two hundred disadvantaged women have also been trained in information technology, with the aim of preparing them to work from home as teleworkers. All e-homemakers communicate mostly through email, fax and telephone, while the portal's editors share files through Yahoo! Briefcase. Face-to-face meetings are conducted as and when necessary.

The project's founder, Mothers for Mothers, is a network of women working or wanting to work from home using ICTs. Although homemakers are classified as a 'digitally under-privileged group', Mothers for Mothers was the earliest women-centred organization in Malaysia to experiment with the use ICTs. In 1998, when the group was established, it was the only organization in the NGO circuit to use email and telephone services to organize conferences from Kuala Lumpur to Penang. Over 98 per cent of communication was done via email, at a time when email was new even to big companies. Mothers for Mothers also published a book on working from home in four languages. The research, writing, editing and proof-reading was entirely coordinated and completed via email from 1999 to 2000.

In 1999, core volunteers of the group constructed a website called mom4mom.com without external funding, by working closely with an IT company. It was the first local website to embark on e-commerce for women by having a simple message board where women could post their advertisements for home-based services and products, though financial constraints meant that payment could not be made online. Mom4mom.com was subsequently converted to myhome4work.net.

Source: e-Homemakers. Retrieved 1 September, 2003. http://www.myhome4work.net/en/index.php.

the middleman through such ventures. To support the venture, FOOD runs an e-marketers project at the same time, which trains computer operators at different locations to partner local cooperatives, deliver products, provide customer services, and promote the website. After the initial pilot period during which the e-marketers were provided free Internet access to carry out their work, they continue to receive DSL Internet connections from FOOD for a small fee, while some choose their own Internet service provider. e-Marketers are trained by FOOD for free, and receive a commission ranging from 2 to 5 per cent of sales by the women's cooperatives and NGOs. The commission helps the e-marketers to sustain the project and motivates them to further expand their client base. FOOD now collaborates with the Council for Advancement of People's Action and Rural Technology (CAPART) to expand this successful model to other parts of India.

The use of ICTs for women's social and political participation

ICTs can also facilitate women's participation in government and political affairs. Some rural women can gain a new communication platform to exchange their opinions on political issues with their political leaders and use ICTs to raise awareness about women's issues. Female political candidates can also win support from voters in this way, employing ICTs in the communication of their political messages to the voters.

In Malaysia, the use of ICTs among political groups is seen to be higher and more comprehensive as compared to non-political groups. A major factor for this could be access to better funding. Puteri UMNO (the young women's wing of UMNO, the dominant Malay-based party within the ruling coalition) and Wanita MCA (the women's wing of the major Chinese-based political component within the same coalition) have secretariats with several permanent staff linked through Local Area Networks (LANs). Most administrative work is computerized and electronic file sharing is common. Both organizations have Internet-enabled computers, websites (Wanita MCA's is located within the parent site), and use emails and faxes for communication between branches as well as between members. Of the two, Puteri is clearly more organized in terms of having a strategy to promote the use of ICTs among its members, as well as in using ICTs to advocate and achieve political purposes.

Presently, there are plans for the Puteri state headquarters to be on broadband, and for all UMNO offices to double-up as community IT centres that are open to the public. Members are being trained in information warfare and in 'Cyber War Conventions' that have been undertaken as an on-going, year-round activity on a national scale. Puteri's website is frequently updated, and hit rates and contributions indicate that it has a core group of regulars as well as quite a high number of irregular surfers. Underlying Puteri's plans, which are coordinated by an IT bureau, is the recognition that ICTs, in particular the Internet, are a crucial tool for educating and empowering women. This drive to ensure widespread awareness of women's individual rights, and the collective power so generated, can help towards realizing the MDG indicator of expanded women's representation in national politics, which stands at just over 10 per cent of total MPs in the national parliament. In contrast, Wanita MCA is adopting a more organic approach. It has no specific bureau in charge of ICT, whether for administrative or programme purposes, relying instead on direction from its research and operation units.

The use of ICTs by women's advocacy groups

Perhaps the most significant positive impact of ICTs on women's empowerment is the enhanced capacity of women's advocacy and support groups to exchange information, coordinate action, and increase the reach of advocacy campaigns

Perhaps the most significant positive impact of ICTs on women's empowerment is the enhanced capacity of women's advocacy and support groups to exchange information, coordinate action, and increase the reach of advocacy campaigns. Civil society and activist organizations routinely receive dozens of emails containing information on emerging areas of concern.

In New Delhi, India, the Datamation Foundation, in collaboration with the NRS, has launched an initiative titled 'Save the Girl Child Campaign'. It is aimed at using ICTs to generate and record complaints against members of the medical community indulging in selective sex determination tests and selective abortion of female foetuses. The campaign has set up a dedicated website on which more than 750 cases of selective sex-determination tests and consequent illegal abortion of the female foetuses have been recorded. Furthermore, through links with other organizations active in the field, such as Nanhi Kali, NRS and Nari Dakshta Samiti, attempts are

being made to increase the number of recorded cases, to mobilize public opinion against the activity and to monitor individual complaints effectively. This is an excellent example of advocacy groups using ICTs to further the reach of their campaigns, and to improve the efficacy of their campaigns by establishing networks with other groups with similar objectives.

Some women's groups in Thailand have started to use the Internet in their work. An example is the Development and Education Programme for Daughters and Communities Centre (DEPDC), whose website can be found at www.depdc.org. DEPDC became internationally famous when its founder and manager, Sompop Jantraka, was named an Asian Hero by *Time* magazine in April 2002. Its main objective is to prevent young women, from seven districts in the northern Thai province of Chiangrai, from entering the sex industry or the labour market at a young age. Since 1989, DEPDC has offered scholarships, shelter and various kinds of support to children and their communities. It has successfully prevented more than 1,000 girls from entering the sex industry. At present, the Centre is taking care of a large number of children, including hill-tribe children orphaned by AIDS. DEPDC markets and sells the girls' handicraft works on its website. The handicrafts, which include hand-made scarves and bags, generate profits that are channelled to the Centre's Vocational Skills Training Programme for the benefit of the girls.

Older forms of communications technologies such as the radio have a crucial role to play in a society with limited literacy. This is illustrated by the activities of the Kutch Mahila Vikas Sangathan (KMVS), an NGO working with rural women in 150 villages of the Kutch district in Gujarat, India. After its involvement in community development work for over a decade, KMVS launched a weekly, 30-minute, sponsored programme in the Kutchi language on All India Radio's Radio Bhuj in 2000. Titled *Kunjal Paanje Kutch Ji* (Sarus Crane of Our Kutch), the programme deals with a range of gender-related issues such as the participation of women in political processes, a girl's right to education, female foeticide, the harassment of brides for dowries and female suicides.

There are similar examples of innovative use of the Internet in Pakistan as well (Box 9.3). The project 'Portrayal of Women in the Media' was designed by UNDP in collaboration with Pakistan Television (PTV), Pakistan's only public telecast media channel. It aims to ensure a

Low levels of literacy and education of a majority of rural women results in insufficient computer skills to fully harness the potential of ICTs. Language barriers pose a formidable obstacle and there are substantial difficulties for non-English speakers in Asian countries to interact with the virtual global community

Box 9.3 ***Shirkat Gah and the World Wide Web for women***

Shirkat Gah (Urdu for "convening point for participation") is one of Pakistan's most respected women's rights groups, known for its efforts to empower women and advocate for a better legal and social framework. In recent years, the international recognition it has received, and the coalitions and networks it has helped build, have served the cause of Pakistani women through the Internet and email.

As a member of international forums and groups such as the GREAT (Gender Research and Training) Network in the United Kingdom, the web-based South Asia Citizens Web (http://www.mnet.fr/aiindex/) and Women Living Under Muslim Law (http://www.wluml.org/), Shirkat Gah has been able to leverage the immense reach of the Internet and email to help draw national and international attention to some of the most disturbing recorded cases of rape and violence against women. In particular, rape cases such as those of Zafran Bibi in 2001 and the Meerawala gang-rape in 2002, became international causes through the timely and effective use of mailing lists and international networks. In 1999, when the government of Nawaz Sharif initiated a misguided campaign to push for civil society accountability, and ended up harassing established organizations such as Shirkat Gah, the abuse did not go unnoticed.

Shirkat Gah's use of the Internet is also identified in a 1999-2000 study by the Society for International Development as one of the prominent examples of how "women all around the world have been able to use the Internet to support their networking, information and communication needs, and in the process of mobilizing support, they have created a series of networks that quickly and strategically link women's local concerns with the global movement."

Source: Harcourt 2000.

positive, balanced and diverse portrayal of women in electronic media through training and gender sensitization of TV media professionals. Under this programme, PTV facilitates specialized courses on gender sensitization and seeks to incorporate gender issues into regular training programmes. Gender committees have been established at all PTV centres and, in 1999, PTV management made a major policy decision to ban all displays of physical violence against women and children in their programming. Perhaps the most significant landmark in the history of PTV's gender policy was the launching of a daily 60-minute transmission for women, titled *Khwateen Time*. The project has now established its credibility by securing reasonable success in portraying a better image of women through the electronic media. Mind sets and attitudes cannot be changed overnight but at least the first step has been taken in that direction.[5]

There should be an allocation of financial resources in the national budget to support strategies to increase women's participation in the information economy, including funding for NGOs to strengthen opportunities for women's empowerment through ICTs

The Human Rights Commission of Pakistan has also been able to extend its outreach precisely because of email and the Internet. One initiative that was critical in making such interaction possible is the construction of email lists and list archives on specific issues by SDNP. Indeed, this is among the true success stories of Pakistan's ICT experience. It represents the most complete source of news and information about various social and human development issues in Pakistan available on the Internet.

The Gender and Sustainable Development List[†] (GSD-List) provides a daily news update on women's issues, both from mainstream and alternative media sources. The GSD-List has helped in the evolution of a vibrant community of women's activist organizations in the country by placing the power of electronic communication at their disposal. By understanding the convening power of the Internet, they have leveraged it to great effect in several cases of atrocities against women – bringing unprecedented attention to the state of women's empowerment in Pakistan.

According to CENWOR, which monitors the use of ICTs by women's groups in Sri Lanka, enhanced networking has been one of the most useful, practical and visible results of individual women and women's groups gaining more access to ICTs. Such networking has been used in recent years, for example, to quickly and effectively share information updates among all concerned women about significant court cases that raise issues related to women's rights, violence against women and women's access to resources. Also, ICTs and their networking capabilities allow women's groups to raise action alerts among women activists in Sri Lanka. An example was a government proposal to import labour for the country's free trade zones where the work force was predominantly rural women. The Internet has also enabled women's groups in Sri Lanka to become better connected with international women's groups and women activists from around the world.[6]

In Mongolia, the Women's Information and Research Centre (WIRC) is a well-recognized and dynamic NGO, which was established in 1995. WIRC facilitates the promotion of gender equality in Mongolian society and uses ICTs in a number of ways. Firstly, it uses ICTs in research and database processing, and analysis on broad-scale social, economic, political and cultural events with a gender-specific agenda. Next, it uses ICTs for information dissemination and networking in priority areas. Also, ICTs are used at the Documentation and Resource Centre facility, which has as its main aim the promotion of women's equal participation in public life in the information technology era.

At a regional level, UNICEF's Meena Communication Initiative has played an important role in focusing attention on the rights of the girl child in South Asia. Aimed at changing perceptions and behaviour that hamper the survival and development of female children, the campaign uses the cartoon character Meena, an assertive and courageous little girl, and a set of events derived from the research of actual conditions to challenge prevailing perceptions and practices. These 'adventures' are presented in a range of formats including animated films, videos, radio serials, comic books, posters, discussion guides, folk media, calendars and stickers. The Meena series has also emerged in ancillary education materials, including posters, comic books, flipcharts and educational packages.

[†] gsd-list@isb.sdnpk.org, archives at http://lists.isb.sdnpk.org/mailman/listinfo/gsd-list

Challenges in implementing ICT projects for empowering women

Cultural and social attitudes often discriminate against women's participation in the fields of science and technology; and they limit the opportunities for women to embrace the benefits of utilizing ICTs. Traditionally, women tend to be left out of e-learning and ICT-based activities in the home, as they are the last to use home computers, surf the Internet, or to have the luxury of time to access community telecentres. Rural and marginalized women tend to forego the chance to use ICTs such as mobile phones as they believe their husbands, brothers and other male members of the household should have first priority, due to deep-seated socio-cultural notions of male superiority and hierarchy. This situation imposes natural barriers for women to get adequate access to ICTs and to reap the benefits that ICTs offer. Furthermore, unexposed to the knowledge and use of computers, women develop a fear of technology, which is difficult to overcome, affecting their confidence in learning to use ICTs.

The majority of women, particularly in rural areas, have a low level of literacy and education. This results in insufficient computer skills to fully harness the potential of ICTs. Language barriers pose a formidable obstacle. There are substantial difficulties for non-English speakers in Asian countries to interact with the virtual global community because most of the information from outside of these countries is in English. This is further complicated by packaged software that embodies the experience and requirements of a foreign culture. The lack of cultural relevance is significant to women as they are, more often than men, deprived of formal educational training.[7]

Women in many Asian countries have limited time to themselves due to their responsibilities of caring for their families even while engaging in income-generating activities. This situation is especially true for women in rural areas. Thus, the opportunities for women to receive formal education and vocational skills training are scarce. Women, therefore, face the triple burden of having to earn an income, manage the household and provide childcare. This gives them little time to learn and use ICTs.

Next is the limitation of the lack of ICT equipment and poor infrastructure as not many women's groups have proper or adequate ICT equipment and facilities. The high cost of ICT hardware makes the acquisition of ICT equipment, especially PCs, largely unaffordable for women, more so for the disadvantaged who could greatly benefit from ICT usage for economic self-reliance. Women are often financially dependent upon men and have limited control over financial resources that could be used to purchase or gain access to ICTs.

In the statement of the Asia-Pacific Gender Forum for the World Summit on the Information Society, it was also recognized that "the potential of ICT as a tool for enhancing women's capacities in the area of health and education, as well as their access to basic social services and information, is well-recognized. However, in the marginalization of women from the lack of accessibility and affordability of ICT, women face a variety of barriers from low rates of basic literacy and information literacy to the lack of high-skilled ICT training. The English language dominance of ICT in software and in content further isolates women in this region from fully participating and benefiting from the information society".[8]

The Way Forward

Relatively few applications of the technology will be planned to achieve gender goals, but indirectly ICTs may have profound effects on gender roles, gender equality and the empowerment of women. It may well be that most countries will maintain the policies and build the institutions needed to utilize the technology to promote social and economic development, and that the improvement of the status of women will be part and parcel of the resulting modernization and development. It may, however, be the case that preexisting gender inequalities will be reflected in the differential abilities of men and women to appropriate the technologies, and that the information revolution will see a continuation or a worsening of gender inequality.[9]

The key actors in the ICT policy-making and implementation process are national governments, multilateral agencies including bodies in the United Nations system, donor agencies, civil society organizations and the private sector. Integrating gender considerations into national ICT policy and implementation can only be

A strategy for enhancing women's access has to be multi-pronged. It will entail a change in social structures, community and household norms, economic and technological models, and the creation of spaces for women's agency

achieved with strong and effective leadership from the State which puts in place consultative mechanisms that ensure that all key actors are actively involved in the process of policy formulation, implementation and review. Furthermore, the representation of women's organizations at all levels of ICT-related policy and decision-making processes should be ensured. Otherwise the making and implementation of ICT policies would be skewed towards the interests of the male population, which is unfortunately all too common in most Asian countries.

There should be an allocation of financial resources in the national budget to support strategies to increase women's participation in the information economy, including funding for NGOs to strengthen opportunities for women's empowerment through ICTs. In addition, ICT education should be integrated in school curricula and be based on gender equality, to realize girls' full participation in science and technology education. Similarly, relevant distance education and training programmes should be implemented using ICTs, especially for rural women and girls, who are most disadvantaged in gaining access to education. It is thus imperative that the State play a proactive role in improving the social and economic environment for females so that they can harness ICT technologies and reap the vast benefits that ICTs afford.

The representation of women's organizations at all levels of ICT-related policy and decision-making processes should be ensured. Otherwise the making and implementation of ICT policies would be skewed towards the interests of the male population

International agencies should assist national governments in these areas by providing a variety of supporting resources: technical expertise for design of policy tools, financial support and institutional capability-building. Specific activities include policy dialogue and advocacy, where organizations representing women's interests are deliberately included in consultations regarding all issues related to ICTs, and where women are specifically consulted regarding their needs and contributions in the process of ICT expansion. Institutional strengthening has to be ensured, so that the government, national regulatory bodies and other entities involved in the governance of the ICT sector have the capacity to analyse the impact of the sector on gender equality, and include this analysis in policy-making and planning processes.

The private sector is powerful and important in the ICT area; however its goals tend to emphasize profitability. The major challenge for private sector organizations in developing countries is to reorient their strategies to long-term market development, rather than short-term profitability. Private sector organizations should adopt proactive employment policies that encourage and facilitate the participation of women in a wide spectrum of ICT-related fields. Also, they should demonstrate their commitment to achieving the goals of gender equity in the ICT sector by providing and supporting training programmes specifically designed for girls and women. Lastly, they should promote the protection of women's human rights against online sexual exploitation and gender-based violence without compromising women's rights to information and communication.

Civil society organizations should participate fully in ICT policy-making consultative processes, promote indigenous local content that reflect local cultures and ways of life, and support women's online communities and networks, especially those that aim to address gender issues and promote linguistic diversity.

A strategy for enhancing women's access has to be multi-pronged. It will entail a change in social structures, community and household norms, economic and technological models, and the creation of spaces for women's agency. The lessons from micro-level initiatives indicate some directions for moving towards greater access for women. Crucial among these are capacity-building for women, sensitive design of projects, continuous adaptation of design and delivery based on women's needs, the exploration of technology menus that fit the convenience of women (such as the use of radio and multimedia).[10]


TeleDoc

Photo: Amit Khullar

MDGs

Chapter 10

ICTs and health

Improved healthcare is crucial to the realization of a number of MDGs such as those relating to reducing infant and under-five child mortality rates by two-thirds by 2015, combating the effects of infectious diseases, and halting the spread of HIV/AIDS. Technical interventions must focus on prevention through means such as immunization and the launch of public health campaigns as well as on treatment delivered through a strengthened basic healthcare system. ICTs can help these efforts by improving the effectiveness of health promotion and disease-prevention programmes as well as facilitating health-service delivery. ICTs are increasingly being used to facilitate two-way information exchange in healthcare between rural and urban areas, providing isolated communities with access to the latest health information and treatment, and informing officials of rural public health issues. If ICTs are strategically deployed and integrated with health interventions, they can enable resources to go much further through cost-effective and scalable solutions.

Many development practitioners believe that ICTs can play a critical role in improving healthcare in developing countries. Some of the key premises in this area are:

- ICTs represent an unprecedented opportunity to make new knowledge, services and opportunities available in underserved areas. Poor communities benefit by receiving critical health resources communicated across large distances, improved access to governmental and quasi-governmental resources and services, and superior medical advice, diagnosis or knowledge in their own locality
- ICTs can play a critical role as instruments for continuing education and lifelong learning that will enable doctors in developing countries to be informed about and trained in the use of advances in medical science and knowledge, and
- ICTs can be potentially used to increase the transparency and efficiency of governance, thus improving the availability and delivery of public health services.

ICTs have been used in many ways to enhance healthcare provision and delivery by:

- increasing access of rural caregivers to specialist support and remote diagnosis, and delivering healthcare services through teleconsultation to remote populations, leading to a decrease in the reallocation of medical specialists
- responding to disease epidemics through sharing lessons, treatment practices and guidelines with healthcare professionals, researchers and policy makers
- enabling governments, NGOs and health establishments to increase access to health information through various forms of ICTs, for example, radio or television programmes and the Internet
- collecting and analysing health information, measuring outcomes, and disseminating information to healthcare professionals, researchers, policy makers, citizens, and/or any other relevant parties
- facilitating intra-government coordination on healthcare, enhancing government planning, increasing health awareness and purveying disease prevention content across all actors and departments, particularly in the most crisis-affected countries
- enhancing the delivery of basic and in-service training for healthcare workers, and serving as a medium for continuing education or lifelong learning for healthcare professionals to keep abreast of the latest knowledge.

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Telemedicine

The most reported ICT application in health is telemedicine. The potential of ICTs to traverse time and distance allows humans to interact with each other in new ways. As such, ICTs are being used in many developing countries to facilitate remote consultation, diagnosis and treatment. Telemedicine helps to extend the scope and reach of clinical services, and allows for the capture and analysis of clinical data from multiple sources to assist in the formulation of improved treatment programmes. Instead of having to move the patient to the doctor or vice versa, it becomes possible to move only the relevant medical information. In rural communities, where access to specialized care is almost non-existent, patients can seek advice from distant specialists without leaving the community. One form of telemedicine is interactive videoconferencing. This permits two doctors and a patient at different sites to confer simultaneously. A camera in an examining room enables one doctor to present the patient to the other doctor, usually a consultant. Essentially, telemedicine can impact health by:

- reducing the need to transfer patients to a site of medical expertise
- decreasing the need for reallocation of medical specialists
- decreasing the number of patient days in the hospital
- lowering the costs of healthcare for patients
- enhancing diagnostic and therapeutic quality of care, and
- preventing deaths through increasing the levels of second opinion diagnosis between medical practitioners.

Where no doctors are available, remote healthcare provision via the Internet is better than having no healthcare at all. For example, the best medical students in Pakistan often leave upon graduation to work in Europe and the US. For those who remain, medical practice is no longer the lucrative career choice it once was, although top professionals in urban Pakistan command very high premiums for their services. For developing countries such as these, with an acute shortage of medical practitioners, telemedicine may be the most practical means to provide good healthcare services to the people (Box 10.1).

ICTs can play a critical role as instruments for continuing education to enable doctors in developing countries to be informed about advances in medical science and knowledge

In Thailand, the telemedicine project was initiated and implemented by the Ministry of Public

Box 10.1 ***TelMedPak.com: pioneering telemedicine in Pakistan***

Established in April 1998 in Pakistan, TelMedPak seeks to interconnect hospitals and local doctors. A prototype was set up in a private hospital in Taxila, a small town 20 km from Islamabad. This hospital was equipped with an Internet-enabled PC and a scanner. Store-and-forward teleconsultation was used. The patients' case reports requiring expert medical opinion were emailed to the specialist, who studied the case reports and replied to the hospital. Each patient's complete record was kept strictly confidential with a limited number of people having access to it. This project proved to be very successful.

TelMedPak also launched a pilot project in Gilgit. Case histories with images of x-rays and CT scans were sent through the Internet from Gilgit to Islamabad. A panel of consultants then gave their expert advice on the cases. Internet service providers helped to connect the district headquarters (DHQ) at Gilgit with the surgical unit of Holy Family Hospital, Rawalpindi, where apart from general surgeons, orthopaedics, neurosurgeons and other medical specialists were made available. All the practical modalities of telemedicine were tested. DHQ Gilgit, with only a few doctors, was able to offer patients health services similar to those in developed cities such as Islamabad. TelMedPak aims to establish satellite links and promote collaboration with international hospitals and schools.

TelMedPak.com also serves as a repository of medical information, articles and news alerts on emerging health issues, guidelines on preventative medicine and a directory of practitioners. The site is constantly updated and provides valuable information such as articles on the SARS epidemic. One attractive element of TelMedPak is a small Urdu language section on maternal and child healthcare (http://www.telmedpak.com/homes.asp?a=995).

Source: *Connecting Telemedically*, TelMedPak website http://www.telmedpak.com/doctorss.asp?a=3211

Health (MPH) to serve as a platform for medical consultation, enabling physicians in remote or under-served areas to consult specialists in the capital. Medical consultations include tele-radiology, tele-pathology and tele-cardiology. The project has been in operation since May 1998, linking the MPH and major university hospitals in Bangkok with about 20 district hospitals. Each station has a room-based videoconferencing system. The commercial ThaiCom I satellite provides the network backbone while provincial telephone lines serve as a support network. The tele-consultation application has store-and-forward and interactive videoconferencing features. One of the frequently used applications is tele-sonography where still or dynamic sonographic images are sent from remote areas to city specialists. The first phase was completed with reasonable success.

China too has many rural areas where healthcare is usually inadequate due to geographic isolation and low population density. Considerable healthcare discrepancies exist between rural and urban areas. Medical expertise is concentrated in capital cities, so people in rural areas often have to travel for specialized health treatment. The government, public institutions and the private sector have been promoting ICTs as a means of overcoming this problem.

In India, Apollo Telemedicine Enterprise Ltd, a sister organization of the Apollo Hospitals Group, was established in September 1999. It specializes in providing consultation services and second opinions to remote sites where access to quality healthcare is difficult. Apollo Telemedicine is reportedly the pioneer in launching the first rural telemedicine centre in the country, catering to a population of about 50,000 villagers. As many as 10 hospitals covering eight states have recently hooked up to the Indian Space Research Organization's (ISRO's) network, thus extending super-specialty medical consultations to remote areas such as locations in the Andaman and Nicobar Islands, Tripura, Leh, and Assam. Using Insat satellites and VSAT equipment, the patient's medical records, such as medical images and outputs from diagnostic devices, are sent to specialist doctors, who, after perusing them, provide advice on the course of treatment in a videoconference with a doctor or a paramedic at the patient's end. This is indeed a major advance, given the fact that less than 2 per cent of specialist doctors in India are practicing in rural areas where the majority of patients live. At present, links have been established between super-specialty hospitals and smaller hospitals in neighbourhood district towns.

The principal criticism of telemedicine applications is that they are expensive and cannot be scaled up to cover large populations. However, there are successful attempts to develop low-cost applications in this area as well. One example is the low-cost telemedicine kit developed by Neurosynaptic Communications, a company based in Bangalore, India, in collaboration with the TeNet group at the Indian Institute of Technology (IIT), Chennai. The equipment includes a remote diagnostic kit and a PC, which together provide basic healthcare infrastructure in rural areas at a cost of just INR 10,000 (around US$ 220). It can measure basic physiological parameters such as temperature, blood pressure, pulse rate and multi-channel ECG (electrocardiogram). It also has an electronic stethoscope. Doctors in secondary or tertiary healthcare centres and patients at remote locations can be connected to each other via the Internet and a videoconferencing link. The data from the kit is communicated to a computer through a wireless infrared link. The fully battery operated kit also has an integrated video/audio conferencing capability, and a central database can store all patient records and history. Measurements made using the kit can be sent to the doctor in a remote location over the Internet. Using the data, the doctor can make his/her diagnosis and provide the appropriate advice.

In Malaysia, the Ministry of Health (MoH) joined forces with the private sector to form Telehealth, with the aim of delivering high quality health content to the public using ICTs. The project's initiators believe that empowering people with medical knowledge will enable them to make informed decisions so as to care for their own health. This is the "wellness paradigm", which is envisaged by MoH to be the future of healthcare. The Telehealth website (www.telehealth.com.my) has four components, one of which is tele-consultation that provides a platform for specialists to make decisions without the need to physically examine the patients. To reach a wider section of the population, the content is in the national language, Bhasa Malaysia, and in English.

ICTs are being used in many developing countries to facilitate remote consultation, diagnosis and treatment. Telemedicine helps to extend the scope and reach of clinical services and allows for the capture and analysis of clinical data from multiple sources to assist in the formulation of improved treatment programmes

The portal also offers a wide range of articles on lifelong wellness including pregnancies and newborn babies. It also allows users to register with the site to facilitate collection of their profiles based on which they are provided with personalized content. Users can also request for information stored in the database to be automatically emailed to them. The portal offers chat facilities to allow users to interact with others, while newsgroups allow users to exchange ideas without having to be online all the time.

In Indonesia, the Videophone Telemedicine Project uses low-cost videophone equipment to enable local doctors to consult specialists at major hospitals over normal telephone lines. It was launched in May 1999 as a joint trial project between Medifa, an Indonesian non-profit organization that supports the training of young doctors, and the Japan International Cooperation Agency (JICA), advisers to the Indonesian Government on telecommunications policy. Based on the results, Medifa has expanded the network considerably. The aim was to find a practical and inexpensive way for local doctors in outlying regions to consult medical specialists and take part in medical education.

Doctors in regional clinics sometimes lack experience in certain fields and are hesitant in their diagnoses without the support of senior doctors at major hospitals. Both local doctors and patients want to be able to consult specialists "face-to-face" via videophones in difficult cases. There are several advantages: it is applicable in any area with a telephone network; it is easy to use as PCs are not required; and it is economical, costing only US$ 450 for equipment and telephone charges.

Information is vital in improving the health status of a population and preventing the spread of communicable diseases. ICTs can play a role in the management of such information, through database storage and retrieval of information

ICTs in healthcare education and training

The potential for use of ICTs to improve medical education is indeed immense. For example, in Sri Lanka, an experimental application is being used at Colombo University's Medical Faculty to train its undergraduates. It is a client-server solution that can run on an Apache web server, with PHP server-side scripting language, or on a Windows NT platform. Students can log on to the server through the LAN using a conventional web browser. Once connected, they can choose between two types of approaches: a pre-determined sequential walk through the lessons; or a pre-lesson question paper, and depending on the answers they provide, a tailor-made sequence of lessons. Each lesson comprises a combination of text, images and multi-media clips. While following the lessons, random pop-up questions are presented, and student responses are recorded into the database.

These questions keep students alert, and enable the lecturers to keep track of their progress and identify concepts that prove to be too difficult for a majority. The faculty has also started maintaining computer-based multiple-choice question banks for medical students. A student can use these question banks to test his or her knowledge before the exams. The tool also incorporates a search engine and a discussion forum. In addition, students in different medical schools in Sri Lanka have joined hands to create e-groups for information sharing. These e-groups provide not only technical information related to medical studies, but also allow for dissemination of advice from seniors to juniors.

Malaysia's Telehealth initiative also has a continuing medical education component that helps increase the knowledge and skills of healthcare providers. The country's Health Ministry has also partnered with a private company, Intuitive Controls Sdn. Bhd., in the use of ICTs for medical training and research. In the RM 1.5 million project (around US$ 395,000 at current exchange rates), Hospital Kuala Lumpur's five operating theatres in its urology department are linked to the main auditorium for real-time training sessions through the use of sensitive cameras, microphones and other equipment. The events and sessions are archived and accessible through the Internet for students to refer to during their course of study, making medical training more flexible and cheaper as students need not necessarily be sent overseas to train. The University Malaya Medical Centre also uses similar solutions to conduct its training and academic curriculum.

ICTs have also helped increase access to information and research for healthcare workers in developing countries. One example is Health InterNetwork (http://www.healthinternetwork.net), which provides access to a vast online library of more than 2,100 high-quality medical journals with the latest information on public health to providers in 69 developing countries for free, and another 42 for a significantly reduced subscription fee. Institutions in

new countries just need to invest US$ 1,000 per year for online access, beginning with a six-month free trial. Health InterNetwork was created to bridge the digital divide in health, ensuring that relevant information – and the technologies to deliver it – are widely available and effectively used by professionals, researchers, scientists and policy makers.

Launched by the UN Secretary General in September 2000 and led by WHO, Health InterNetwork has brought together public and private partners to further the principle of ensuring equitable access to health information. Its core elements are content, Internet connectivity and capacity building. A similar project, eMedicine.com, is making its online database available for free in countries having a per capita GDP of less than US$ 3,000.

Continuing education and training are important so that healthcare workers are aware of the latest developments and can provide better service to their patients. It will be very helpful if the role of ICTs in healthcare is emphasized at the entrance stage into the profession. For practicing doctors and health professionals, IT literacy may be incorporated into professional upgradation programmes. Fortunately, the use of ICTs to train healthcare workers, especially in remote areas, is an active and expanding field.

ICTs in hospital and healthcare administration

In Thailand, ICTs are also used to increase the efficiency of database management in healthcare systems, such as hospital administration systems. Most medium to large hospitals now use ICTs, to some extent, to manage patient records and treatment procedures, hospital supplies and inventories, as well as other back-office functions. This allows them to serve patients more effectively and efficiently, and enables them to come up with surveillance systems for communicable diseases such as malaria, measles and tuberculosis that allow for more efficient tracking and planning.

Western China has initiated the Angel Programme, also known as the Hospital Management Support for Poverty Alleviation Programme. Its aim is to use ICTs to create a Hospital Information System to enhance the management of hospitals and their equipment, thus improving the quality of healthcare service. Electronically-based support systems are being deployed to support healthcare workers, providing support tools that allow them to increase the accuracy of the data flowing through the healthcare reporting structure. These developments have ensured significant improvements in healthcare in western China, especially in terms of alleviating infant and child mortality.

Vietnam, Pakistan and Indonesia are all at the preliminary stages of setting up their hospital information systems. In Vietnam, the Institute of Information Technology and some universities have carried out research on health applications of ICTs. The Ministry of Health has also set up a medical intranet connecting 30 hospitals and institutes. The initial target date in the Master Plan for connecting all district hospitals was 2000 but due to financial constraints, the unofficial target is now 2005. Wide Area Networks (WANs) are used by hospitals to send their periodical reports to the Ministry of Health (www.moh.gov.vn) electronically. Some hospitals use LANs to facilitate the management and processing of patient records.

In Pakistan, hospitals like Shifa International Hospital and Shaukat Khanum Memorial Hospital are using computers for maintaining data. Computers are available in most Indonesian hospitals, primarily for recording and reporting data of individual divisions, such as patient admissions, medical records, billing systems, and personnel and logistics data. Many hospitals do not have online intranet facilities that allow the sharing of data between divisions, but they have their own homepages. A noteworthy difference between the homepages of profit and non-profit institutions is the availability of pages for public education. The state-owned Infection Hospital, has webpages for basic information on major communicable diseases. In contrast, a number of private hospitals' websites focus primarily on the types of services and products offered by them.

Malaysia's foray into ICT is comparatively more advanced. The Primary Care Doctors' Organization of Malaysia (PCDOM) project – Primary Health Care Network Services (PNS) – consists of a clinic and patient management system and an e-community environment. Under the pilot project that started a few years

One of the main problems in eradicating child mortality has always been the lack of awareness, information and education. Timely and effective dissemination of information for healthcare is the key to overcoming this problem. In this context, ICTs can play a very powerful role in improving public awareness of healthcare

ago, 50 general practitioners were selected to be part of an e-community. PNS helps to simplify management processes, which reduces administrative costs.

ICTs for the management of patient/health information

Information is vital in improving the health status of a population and preventing the spread of communicable diseases. ICTs can play a role in the management of such information, through database storage and retrieval of information. In Thailand, ICTs are used to promote maternal and child health through the Perinatal HIV Implementing Monitoring System. Developed by the Office of Health Promotion, Department of Health, the system aims to improve the management of maternal and child health information, starting from data collection at public hospitals and health facilities, through the transmission of such data to the central office and ending with the analysis of that data. Programmes are distributed via CD-ROM and sent to all public hospitals and health facilities, which are then advised to enter the data of all cases of HIV-infected pregnant women and also all cases of children born to HIV-infected mothers. The information is sent to the Bangkok central office on a monthly basis, so that appropriate measures can be taken to prevent transmission, and to follow up on infected cases. The programme has been used for a few years and found to have achieved satisfactory outcomes.

Time is of importance in stopping the spread of communicable diseases. ICTs can play an integral role in preventing disease dispersion through the tracking of cases and incidents. This will enable healthcare professionals to be alert enough to warn people to take the necessary precautions, and thus stop the spread of the disease at the initial stages

An interesting ICT for health project in India is Community Access to Sustainable Health (CASH) which uses PDAs loaded with a database of patient records. Local paramedic workers can quickly and accurately collect patient information and often make on-the-spot diagnoses based on the patient's medical history in the PDAs. As the information is uploaded daily into a central database, it also helps to effectively track the spread of diseases, allowing for epidemiological research and fast responses. The project is based at the Comprehensive Rural Health Centre, a 60-bed hospital in Ballabhgarh, Haryana, and provides healthcare to around 147,000 people in 100 villages. An Electronic Medical Record (EMR) system that runs on a handheld computer was designed. Over 40,000 patient records, previously collected by the Ballabhgarh centre, are entered into the four handheld computers. The EMR allows for clinical documentation of pregnancies and deliveries, alerts for medications used during pregnancy, and scheduling of immunization for children.

The Auxiliary Nurse Midwives (ANMs) reported that the computers made an immediate difference to their work in that they now had the past medical history of the expectant mother at their fingertips. This helped them with on-the-spot decisions on whether the patient needed iron or vitamin supplements or whether there had been a difficult pregnancy in the past. The ANMs also found it easier to collect data during their rounds as the point-and-click interface made data entry fast and easy. It also replaced the cumbersome paper-based process for data collection in the past, which would be dictated to a data entry operator in the computer centre at Ballabhgarh every month. With the new system, data gathered by the ANMs on the handheld computers are collected by a van and transferred to the computer centre at Ballabhgarh daily. Since data are now collected on a daily basis, diseases can be tracked as they spread and corrective action taken. The doctors at Ballabhgarh are now deeply interested in using the CASH system to combat infectious diseases such as malaria and tuberculosis which are prevalent in the area. There are other examples of the use of similar data collection and management techniques in the country (Box 10.2).

The use of ICTs in public education and awareness

One of the main problems in eradicating child mortality has always been the lack of awareness, information and education. Timely and effective dissemination of information for healthcare is the key to overcoming this problem. In this context, ICTs can play a very powerful role in improving public awareness of healthcare.

Many of the Thai government's major health promotion programmes and projects have a health-education component, and ICTs are used to deliver health information and/or knowledge to pregnant women and mothers of newborns, as well as healthcare workers. Traditional ICTs such as radio, video and television programmes are mostly used and these accompany less-costly print media such as booklets, newsletters and

Box 10.2 ***The Handy Vaid project in India: using ICT for consultation***

Teledoc, also known as Handy Vaid, is an initiative of Jiva Ayurveda in the state of Haryana, India, that seeks to get timely health advice and medication to the patient's doorstep by making innovative use of Personal Digital Assistants (PDAs). A representative carrying a PDA through the village collects information and queries from the villagers using a pre-designed consultation form. This information is then transferred to a city doctor, who diagnoses the problem and suggests appropriate treatment and precautions. The doctor's diagnosis and suggested treatment is then transferred to the PDA and carried back to the villager. Teledoc is seen as the solution to improving health services and the overall living conditions in some of the world's most under-served areas. Since this programme does not require doctors to travel to or live in remote locations, it will be possible to get the benefits of specialist medical advice even to the most remote and inaccessible population. It also provides an opportunity for international travellers to volunteer as field consultants to the programme.

The project, supported by the Soros Foundation, began in June 2002 for a period of three years and six months: till December 2005. With a total budget of US$ 327,180 and a per patient cost of US$ 15, it aims to provide treatment to 7,500 people in five villages by December 2002; to 12,000 people in eight villages by December 2003; 18,000 people in 12 villages by December 2004; and 22,500 people in 15 villages by the end of 2005.

Sources: http://www.apnic.net/mailing-lists/s-asia-it/archive/2003/01/msg00017.html and http://www.jiva.org/programs/description.asp?program_id=2

magazines. Some major health promotion programmes include:

- the Thalassaemia Prevention and Control Project, which aims to reduce the number of thalassaemic infants by 10 per cent
- Baby-Friendly Hospitals which promote breastfeeding
- the Safe Motherhood Project which provides special care to women during pregnancy, labour and post-labour, and
- the Under-Five Child Development Project, which instructs mothers on child development through a nutrition and development corner at each hospital and health facility.

The Office of Health Promotion also has its own radio programme, which broadcasts health information on AM and FM channels for 30 minutes each week. About 20 to 30 per cent of the airtime is allocated to maternal and child-related health information. Video cassettes have also been used extensively to provide health-related knowledge and these are distributed to public and community hospitals as well as health facilities. Hospitals generally run these programmes at the outpatient lobby or in the nutrition and development corner.

Since 1999, Thailand's Department of Health has been operating a 24-hour hotline where people can phone to make health-related inquiries and/or look for health consultation. The automated answering machine guides users through 692 topics, grouped under 23 categories of health-related issues. In 2002, a total of 673,885 calls were received. The three most popular categories were sex (583,706 calls or 86.62 per cent), mental health (64,554 calls or 9.6 per cent), and general health and communicable diseases-related issues (55,080 calls or 8.17 per cent).[1]

Similarly in China, television plays a very important role in enhancing public awareness of healthcare due to its high penetration density nationwide. China's Central Television (CCTV) network has launched a special programme on maternal and child health. Such disease prevention techniques have had a positive impact on mass behaviour and achieved significant results. Carefully tailored and targeted messages have played a role, through a combination of local and nationwide broadcasting, where appropriate, so that the majority is exposed.

In Mongolia, the Health Promotion Department is in charge of health education and promotion; media campaigns; health and behavioural surveys; developing, planning and distributing information, education and communication materials; and social mobilization to create a healthy environment. It also develops, designs and distributes health education messages and advertisements for radio and TV. The ESS studio

ICTs are seen as a potential tool in the global response to the HIV/AIDS pandemic because they offer the feasibility, at a relatively low cost, of providing access to information and knowledge to those working on the problem, to those who are suffering from the disease or its effects, and to those who need to take preventive action

produces and broadcasts TV spots, health advice, health-education programmes and radio promotions, which are received by more 100,000 people throughout the country. The broadcasting schedule includes a reproductive health series and TV spots. Programmes on reproductive health, safe motherhood and healthy environment for children are aired on radio twice a week.

ICTs and the prevention of diseases

Time is of importance in stopping the spread of communicable diseases. ICTs can play an integral role in preventing disease dispersion through the tracking of cases and incidents. This will enable healthcare professionals to be alert enough to warn people to take the necessary precautions, and thus stop the spread of the disease at the initial stages.

ICTs can be used as tools to collect and analyse health information, measure outcomes, and disseminate information for relevant audiences, whether they are healthcare professionals, researchers, policy makers, or citizens

Given the current and projected impact of the epidemic on development, reversing HIV/AIDS becomes the most important MDG; and progress towards this particular goal will be a precondition for reaching all other MDGs.

Though having a much longer history, malaria continues to challenge national governments and poses a significant public health problem in parts of Asia, Latin America, the Middle East, Eastern Europe, the Pacific, and sub-Saharan Africa. It is now believed that there are 300 million cases of malaria each year, and the disease kills over 1 million people a year, mainly children. This translates into a death from malaria every 30 seconds. Together with HIV/AIDS and tuberculosis (TB), malaria is a major barrier to economic and social development, especially in Africa where 90 per cent of the cases occur. In keeping with targets defined at the African Summit on Roll Back Malaria in 2000, one of the MDG's health targets also includes having halted and begun to reverse the incidence of malaria and other major diseases by 2015.

The number of TB cases has been on the decline since 1980 in most industrialized countries and still is, although the rate of decline has slowed largely because of trends in immigration. Nevertheless, the global incidence rate of TB is growing at approximately 0.4 per cent per year, and is growing much faster in sub-Saharan Africa and in countries of the former Soviet Union. Today, one-third of the world's population is infected with the TB bacillus. Of this pool of infected people, about 8 million become sick with TB every year of which 2 million die. Current trends indicate that between 2000 and 2020, nearly 1 billion people will be newly infected, 200 million will develop the disease of which 35 million will die. The rise in TB is so great that WHO's World Health Assembly, in an unprecedented step, declared TB a global emergency.

ICTs are seen as a potential tool in the global response to the HIV/AIDS pandemic because they offer the feasibility, at relatively low cost, of providing access to information and knowledge to those working on the problem, to those who are suffering from the disease or its effects, and to those who need to take preventive action. ICTs can also play a significant role in combating malaria, TB and a host of other infectious diseases. They can do so by enhancing the effectiveness of health institutions, improving primary healthcare and delivery of health services in rural areas, and also by serving as an advocacy tool in raising awareness of prevention and treatment methods.

Addressing the HIV/AIDS pandemic requires delivering timely, credible information from an array of development sectors, not just to clinicians and medical scientists, but also behavioural specialists, policy makers, donors, activists, industry leaders, and affected individuals and communities – many living and working in some of the world's poorest, least-wired countries. Table 10.1 provides a schematic picture of the kind of knowledge required by different target groups.

Knowledge about care and treatment, education and prevention efforts is a prime area for the effective use of the new ICTs in the battle against HIV/AIDS. Its promise of enabling ease of access to information and knowledge at a relatively low cost for different interest groups is its main attraction. This allows for networks that have the potential to link partners in different spheres and locations, in the North and in the South, in their efforts to apply rapidly increasing knowledge to action. Therefore, efforts should be made to take advantage of the potential of ICTs to stimulate the creation and sharing of appropriate knowledge, and to strengthen alliances among civil society institutions as well as with the private sector and local government.

Table 10.1 ***Types of organizations, their objectives and types of knowledge***

Objectives	Types of organizations	Type of knowledge
Communication	International	• Biomedical • Social/behavioural
Mobilization	National	• Interventions • Treatment
Sharing • To inform about research • To inform about care and treatment • To inform about prevention activities	Regional • Local /community • Governmental, non-governmental • Research: medical, social, public • Health action • Education • Health systems	• Policy • Monitoring/ evaluation • Quantitative studies • Qualitative studies

Source: Driscoll, November 2001.

For example, with low levels of AIDS awareness in a country like Pakistan, and a cultural infrastructure that discourages the discussion of sexual practices and drug use, information dissemination is essential. Television and radio advertising campaigns have been the primary mechanism employed by the Government of Pakistan in spreading awareness about AIDS. It has also used mainstream television programming, aired during prime time, to educate viewers about AIDS through several private sector television series productions that focus on life with AIDS and discrimination against AIDS patients as the central theme of the plot. The first such show was *Bujhta Hua Diya* (The Extinguishing Lamp), which aired in 1994.

Malaysia' PROSTAR is an innovative experiment at information dissemination. Initiated in 1995, PROSTAR is a community mobilization programme where youths aged between 16 and 25 are trained as peer educators who, in turn, plan and implement suitable activities to influence other youths to practise healthy lifestyles. PROSTAR has more than 850 clubs throughout the country, most of which are based in secondary schools, with a total membership of 20,000. It runs an e-forum on its website targeted at this large pool of potential users. Even if they do not have computers at home, they can make use of the computers in their schools or they can patronize Internet cafés.

The Department of Health's AIDS/STD Section printed posters and distributed them to various PROSTAR clubs to publicize the launching of the new website. The Section's emphasis on youth-related activities is understandable. According to the AIDS/STD Section's 2001 Annual Report, an average of 16 new HIV-positive cases are reported each day, the majority being people aged between 20 and 49. And, 40 per cent of those in this category are young adults aged below 29.[2]

The AIDS/STD Section is now making use of ICTs to effectively monitor peer-educator training programmes and other activities at the various PROSTAR clubs. In 2002, it launched an in-house network PROSTARNET, which links the Section with its 115 state and district-level branches throughout the country. Each branch keeps track of all the clubs within its territory and sends reports to its headquarters via PROSTARNET. The reports cover membership details, activities of the clubs, activities of PROSTAR officers, club committee meetings, proposed projects, progress on the implementation of approved projects as well as training programmes.

Previously, the Section had to rely on the telephone, fax and on-site visits to obtain reports. With the availability of PROSTARNET, it not only receives reports quickly but is also able to trace inactive clubs so that immediate steps can be taken to revive them. Earlier efforts to launch PROSTARNET were delayed due to the reluctance of various district-level branch officials to use it, as they were not very IT-literate. The problem was resolved through training on the use of PROSTARNET and they are now doing so confidently.

ICT can be used as a means of information provision and networking aimed at empowering stakeholders and facilitating consultations on policy formulation. It can also support the sharing of information among medical practitioners and researchers working in the area

Using ICTs for surveillance of HIV/AIDS and other diseases

AIDS surveillance is well developed in most of the world and HIV surveillance, often based on sentinel antenatal surveys, has been extensively implemented, especially in Africa and other hard-hit areas.[3] As the diversity of HIV epidemics around the world is becoming ever more apparent, existing HIV surveillance systems are ill-equipped to capture this diversity, or to explain changes over time in mature epidemics. Efforts are now being made to build on existing systems, strengthen their explanatory power and make better use of the information they generate.

Strengthened systems, dubbed "second generation surveillance systems", are being developed to yield information that is most useful in reducing the spread of HIV and in providing care for those affected. That means tailoring the surveillance system to the pattern of the epidemic in a country. It means concentrating data collection in populations most at risk of becoming newly infected with HIV – populations with high levels of risk behaviour or young people at the start of their sexual lives. It means comparing information on HIV prevalence and on the behaviours that spread it, to build up an informative picture of changes in the epidemic over time.

The benefits of applying ICTs in healthcare are constrained by limited human and institutional capacities, common to most poor developing countries. These include large gaps in basic infrastructure availability, the ability and willingness of health workers and others to make use of the opportunities, the availability of relevant and/or localized digital content, government regulations and policies, and its sustainability and scalability

In the circumstances, ICTs can be used as tools to collect and analyse health information, measure outcomes, and disseminate information for relevant audiences, whether they are healthcare professionals, researchers, policy makers, or citizens. That is, they can be used both for monitoring the HIV/AIDS situation in the country as well as the efficacy of policies aimed at limiting the spread of disease.

With regard to the latter, by allowing for the placement of vital information in the public domain, transparency can be encouraged, financial commitments tracked and governments held accountable.[4] Having data sets that are reliable and consistent (between and within countries) is essential for planning and monitoring policies and programmes, for national and global advocacy, for making decisions about the intervention mix, and for providing a focus for the different sectors and actors.[5]

For example, in Thailand, an 'Annual Surveillance of HIV Infection' has been adopted by the Ministry of Public Health since 1995 (rather than the semi-annual surveys conducted between 1989 and1994). In this project, ICTs have played a significant role in the data collection, analysis, and dissemination of results, which enables the Ministry to have up-to-date surveillance data for better management and control of the AIDS epidemic.

The Tak Malaria Initiative, carried out in the northern Thai province of Tak, along the Thai-Myanmar border, was implemented during November - October 2002. Supported by the Bill and Melinda Gates Foundation, an information network was set up to allow the submission of diagnosed malaria cases from district health centres to provincial health centres using electronic forms. With such a system in place, provincial health centres were able to monitor and predict the number of malaria cases more effectively, and health authorities were better placed to control and prevent the spread of the malaria epidemic.

Sri Lanka also uses ICTs for purposes of surveillance and research. The Malaria Research Unit of the Department of Parasitology at the University of Colombo Medical Faculty uses a GIS to monitor the spread of the disease in several selected Grama Niladhari divisions at Badulla and Moneragala districts. This GIS database was developed using the data collected between 1997 and 2002. Based on this GIS database, the unit has prepared a risk map to indicate the areas more prone to malaria.

ICTs for information exchange and networking

ICTs can be used as a means of information provision and networking, aimed at empowering stakeholders and facilitating consultations on policy formulation. It can also support the sharing of information among medical practitioners and researchers working in the area. It gives healthcare providers, researchers and policy makers the opportunity to engage in discussion through local/global discussion groups and/or Web boards, and thereby, serve as a good venue for easy sharing and consultation on various health issues.

For example, India's Saathii (Solidarity and Action Against the HIV Infection in India) is an organization that seeks to disseminate research, training and funding-related informa-

tion on a real-time basis to those with limited access to libraries and the Internet. It publishes a weekly/daily electronic newsletter providing information on current research advances in behavioural and basic science and clinical aspects of HIV/AIDS that are relevant to resource-limited settings; updates on HIV-related national and international conferences; national and international training programmes; funding announcements that are relevant to India; and news items and letters that merit political action.

It also collaborates with AIDS-India e-forum to disseminate India-relevant information on a daily basis. It seeks to facilitate active discussions on current HIV events relevant to India, and sharing of information on various programmes, individuals and experiences. The AIDS-India e-forum is a virtual organization set up as a Yahoo! e-group forum in response to the AIDS crisis in India. It facilitates networking, communication and collaboration among those of who are involved or interested in AIDS-related issues in India. It has more than 1,700 registered members, and is currently extremely active with four or more messages/responses circulated every day (Box 10.3).

ICTs can be used as a communication tool in self-help group initiatives such as peer counselling and consultation. It can also be used as a means of building communities of those affected by HIV/AIDS and can serve as an online source of mutual support. Thailand's Kaew Diary, is one popular example of a civic movement to offer community support for HIV-infected and AIDS patients. Initiated by an HIV-infected woman, the website, (www.kaew-diary.com) is used as a medium of communication. The website started out as a personal diary posted on one of the most popular portal sites, www.pantip.com, where Ms. Kaew wrote about her experience of being diagnosed as HIV-infected when she was applying for a new job a few years ago. The feedback was very encouraging, and she got many kind words and support from people who read her story. Later on, more people volunteered to help with her "cyber community", by developing a website, and enriching its content and design. Approximately 3,000 people have applied to be a member of her website, on which they can search for information, exchange information and experiences, or seek consultation.

Through ICTs, partnerships at the regional or international level can also be formed to tap into pooled resources and focus the effort against HIV/AIDS. SEA-AIDS, for example, is an email-based information network that receives, manages, edits and disseminates information related to HIV/AIDS. It supports a discussion forum among over 1,000 people working and living with HIV in the Asia-Pacific region. The project was developed, launched and run in Thailand in 1996 with the support of UNAIDS. In

Successful ICT initiatives are usually those that respond to "real social needs" rather than being prescribed by "technology pushers" – initiatives where technical and contextual knowledge are disconnected, and where the control is located outside the community

Box 10.3 ***India's Samuha: support for people living with HIV/AIDS***

India's Samuha is an organization that has been working since 1989 among the poor in the state of Karnataka, with a range of activities in its portfolio. One of its arms is Samraksha, which focuses on counselling, care and support of People Living with HIV/AIDS (PLWHA). The organization has a network of five outreach sites for counselling, six outpatient clinics, two 10-bedded Respite Homes, and community-based home care and hospital support services.

Over the year 2002, Samuha has set up Samuha communications to combine fieldwork with information documentation and dissemination. This initiative is based on the premise that any work that requires long-term attitudinal changes, such as HIV/AIDS prevention, has to reach out to a wider number of people, and that most development organizations are not equipped to take on the additional task of communicating their findings and experiences.

One pilot project aims at using ICTs and GIS technology for a networked HIV/AIDS intervention and awareness programme in Devadurga Taluka of Koppal district in North Karnataka. Networked intervention cells ensure that the team responsible for setting up a district resource cell will also serve as an interface with the local community. The project will use macro-social feedback from a GIS mapping of HIV/AIDS afflicted communities in these areas, which will be executed in collaboration with the Centre for Knowledge Societies in Bangalore.

1998, the forum moved to the HIVNET platform hosted by the Foundation du Present (FdP) and is currently moderated and managed by Health & Development Networks with support from FdP. Experts have done research to assess the benefits of such electronic networking among HIV/AIDS organizations. It was found that SEA-AIDS has proven to be much more than a mechanism for discussion, updates and articles. It has changed the way people involved in HIV/AIDS programmes communicate and work on a day-to-day basis. By facilitating fast, easy and open communications across geographic and sectoral borders, SEA-AIDS has demonstrated that networking and information sharing are crucial to strengthening and uniting the response to the epidemic.[6]

In a survey of SEA-AIDS members, 97 per cent found the services useful, 99 per cent saw it as a good source of information and 86 per cent said it had helped them find other people working on the same topics.[7] However, almost half of those surveyed also reported that they were too busy to contribute to such a network. The researchers concluded that electronic networks could help to meet the expressed needs for improved collaboration, and sharing of information and experiences in response to HIV/AIDS. Many people participate and benefit passively by observing discussions, while others actively contribute.

Many countries lack the basic infrastructure to support use of ICTs. Failure to address these problems would mean that ICTs will not play "more than a marginal role"

In China too, ICTs have been an integral part of the country's fight to stop the spread of diseases. On 1 January 2002, China's Ministry of Health issued an Internet-based Disease Prevention Information System (DPIS) that requires the local authorities to report diseases in a timely manner. The major objective is to collect timely and accurate information on epidemic diseases nationwide so that decision makers are able to adopt appropriate measures to stop the disease early. The DPIS is an important public health programme in China. The government of Guilin city runs a Computer Telephone Integrated DPIS to monitor the programme and has significantly enhanced its efficiency.

Challenges to adopting ICTs in healthcare

The benefits of applying ICTs in healthcare are constrained by limited human and institutional capacities, common to most poor developing countries.[8] These include large gaps in basic infrastructure availability, the ability and willingness of health workers and others to make use of the opportunities, the availability of relevant and/or localized digital content, government regulations and policies, and ICT sustainability and scalability.

While ICTs can help improve the health status of populations, there are major constraints such as access to the higher bandwidth, required for transmitting physiological data and complex medical images, as well as high telecommunication costs. Many challenges to the viability of rural ICT projects remain, given the limitations of access to electricity, telephony, Net-connectivity and other basic infrastructure.[9] Except for Malaysia, constraints such as lack of access to telecommunications and high costs have prevented the deployment of ICTs on a strategic large-scale level. These constraints are more severe in developing countries like Pakistan, India and Indonesia, where even dial-up access via normal telephone lines, let alone broadband, is limited. Many countries lack the basic infrastructure to support use of ICTs. Failure to address these problems would mean that ICTs will not play "more than a marginal role"[10]. The implementation cost is far too high to achieve critical mass for realizing any real impact.

In Vietnam, the use of ICTs in healthcare is still in the start-up stage. It is mostly limited to small-scale initiatives at local levels and is not systemized. ICT applications have been deployed in over 30 hospitals but these costly applications face the problem of integration as they were developed by different software companies. The lack of ICT specialists and low computer literacy in the health sector is a big challenge for the implementation of ICT applications in the sector. The quality of the health data in Vietnam is also still a problem because ICT has not been widely and efficiently used in the health sector.

The actual impact of ICTs in healthcare hinges on the ability and willingness of health administrators to adopt ICTs as a tool. The lack of computer skills has prevented many healthcare professionals from harnessing the potential of ICTs. Inertia and the fear of new technologies have also prevented many from utilizing ICTs.

There is under-utilization of even available services in some localities due to socio-cultural and

economic barriers. Thailand's tele-consultation usage was not as high as anticipated, mainly due to rural physicians and city medical specialists being unfamiliar with the system. Also, the very high workload of rural physicians made it difficult and inconvenient to schedule consultation times.

Although the diffusion of ICTs in healthcare has had varying successes, its application is still at a primary stage. In order to reduce infant and child mortality, improve maternal health and combat infectious diseases, access to hospital services, especially for the poor, must be improved. One major challenge is to reduce the huge digital divide between rural and urban areas caused by imbalanced ICT diffusion. Specific health support is needed, including investment in ICT infrastructure, and governments should promote its use and development in rural areas, especially to improve the population's health. It is also important to focus efforts on educating health professionals on the use of ICTs and providing them with necessary connectivity, rather than to the population at large. With proper knowledge and connectivity, these professionals will, in turn, spread health benefits and knowledge to a wider group of people.[11]

Another challenge which developing countries face is that the information economy functions mainly in English. While a majority (59.8 per cent) of the total global online population comes from non-English speaking zones, 68.3 per cent of web pages are written in English.[12] Similarly, the bulk of medical information in online databases is in English. This means that familiarity with English is essential to become a digital citizen, and implies that non-English speaking countries should invest either in the generation of software in local languages or in developing English language skills, or both. Although the number of non-English websites is growing rapidly, it is still not keeping pace with the English-oriented World Wide Web.[13]

Unfortunately, for countries experimenting with ICTs for healthcare, information transmission through websites is still mainly limited to one-way transmission, from the experts to the public. This is reflected in the construction of expensive portals, accessible only to other experts, urban users and those literate in English. Interactive usage and public activism through the portal is clearly lacking due to the unavailability of innovative and interactive local-language content that is presented in an easily understood manner, without the use of medical jargon. While good training has been offered to select professionals on best practices in HIV/AIDS prevention, this type of information remains unavailable to most of the general population. Consequently, many complementary sectors of mass media and popular culture are, on the whole, under-utilized.

In some developing countries, there is lack of government will to fully exploit the benefits of ICTs. For example, in Indonesia, the medical faculty of Gajah Mada University conducted a pilot study in 1990 on radio-telemedicine that linked it with Sardjito Central Hospital and five pilot health centres in a selected district. The system allowed emergency message transmission, interactive discussions among faculty members and medical consultation from the health centre. This simple technology used low radio frequency and had notable success in the early detection of an outbreak of food poisoning. However, there seems to be no intention to upgrade or sustain the system due to shortage of funds and the low incentive has led to the lack of community enthusiasm.

The Mongolian Government has created programmes to improve the promotion of health education to the population, as well as a legal environment to implement information, education and communication activities. But the health expenditure budget on ICTs is not adequate and many websites still depend on international NGOs and cannot provide up-to-date information regularly. As for the Pakistani Government, its role in promoting telemedicine has been limited to policy commitments and the occasional reference to telemedicine at political events. The one example of a working telemedicine initiative of the government, the Distance Learning and Telehealth (DLT) clinic in Gujjar Khan, has had serious Internet access problems due to the country's still-evolving telecommunications infrastructure. The DLT was established as a pilot programme of COMSATS, a government-owned ICT and Internet service provider, managed by the Ministry of Information Technology. The telehealth programme has come to a stand still due to inappropriate and inefficient Internet service and unavailability of adequate bandwidth required for telemedical applications.

Specific health support is needed, including investment in ICT infrastructure, and governments should promote its use and development in rural areas, especially to improve the population's health

Finally, successful ICT initiatives are usually those that respond to "real social needs" rather than being prescribed by "technology pushers".[14] In contrast, initiatives, where technical and contextual knowledge are disconnected and the control is located outside the community, are more likely to fail.[15] More attention needs to be paid to innovative ways of applying ICTs to the specific information needs of communities and local groups. That includes focusing on building local skills to encourage the process of local appropriation[16] and reinforcing traditional information communication networks.[17]

Photo: Amit Khullar

MDGs

Chapter 11

ICTs and environmental sustainability

Technology's role in environmental protection and sustainability is undisputed. ICTs, in particular, are gaining in relevance amidst the increasing concern for the environment worldwide. Internet-based communities have been formed all over the world by environmental activists. ICTs, by their very nature, have various applications that go beyond mere information distribution – analysis of data is one of their key potentials. Hence, they can make a valuable contribution to a sustainable environment by improving monitoring and response systems, facilitating environmental activism and enabling more efficient resource use.

Material on most environmental management issues is scattered. It is possible to use the Internet to put together and classify the material. Information on water management would be of particular interest to most developing countries.

ICTs can also influence the functional adjustments and changes required to help sustain the environment. A free-access website that tracks industrial emissions, for example, can serve as a self-monitoring tool for private sector businesses with warning emails to the relevant offices when emissions approach a critical "limit".

Additionally, ICTs can serve as devices to communicate information and increase awareness about the importance of the environment and understanding of issues such as climate change and biodiversity. A significant benefit that ICTs offer any society or local community is the provision of effective tools to exchange ideas, knowledge and even support, not only from within a nation but also from global resources. The power of ICT as an information and networking medium enables citizens to act as environmental enforcement agents, alerting decision makers to compliance infringements while leveraging that power to reach and influence public opinion. Most, if not all, identifiable environmental initiatives that employ ICTs do so using mass media, including the Internet and email. Television and radio have also been intensively used in Asia. Any programme that exploits the connectivity these technologies offer carries the potential to increase sustainability, given appropriate content and training.

ICTs also play a unique role in ensuring environmental sustainability by bridging the information gap between the government and the public. Information flows from the public that supply qualitative, time-sensitive inputs for decision-making can be crucial for policy. On the other hand, the development of ICTs and their use in the environmental area creates the opportunity for the government to ensure public access to environmental information and broaden public participation in decision-making and implementation.

Further, ICTs directly facilitate improved decision-making. Two application areas, key to natural resource management, are GIS and remote sensing techniques. Both are relatively new developments founded on what are referred to as geospatial technologies. Their relevance for ensuring environmental sustainability is discussed here.

Overall, the effect of the use of ICTs on the environment is by no means fully clarified. Berkhout and Hertin,[1] in their report to OECD, cited three main types of ICT effects on the environment:

First Order Impacts are seen as the direct environmental effects of ICT production and use.

Internet-based communities have been formed all over the world by environmental activists. ICTs, by their very nature, have various applications that go beyond mere information distribution – analysis of data is one of their key potentials.

Positive effects include the use of ICTs for environmental protection purposes such as through the use of electronic devices for the monitoring of toxic waste disposal. The negative effects stem from the production, use and disposal of hardware such as computers, screens and network cables. Second Order Impacts are seen as stemming from efficiency gains. These relate to the indirect environment impacts of the use of ICTs upon the structure of the economy and on production processes, products and distribution systems. These effects are expected to be largely positive. The main types of positive environmental effects are dematerialization (getting more output for less resource input), virtualization (the substitution of information goods for tangible goods) and 'demobilization' (the substitution of communication at a distance for travel). Third Order Impacts are expected to result from feedback processes, which refer to indirect effects on the environment, mainly through the impacts on lifestyles, value systems and consumption patterns of ICT use. These have "rebound" or feedback effects that compensate for adverse environmental effects of higher economic growth and consumption stimulated by ICTs, through environmental efficiency. For example, the efficient use of natural resources could lead to a fall in the demand for raw materials and other production inputs. Or new online information services could provide consumers with more information about practices that positively influence consumption patterns from an environmental point of view.

The power of ICT as an information and networking medium enables citizens to act as environmental enforcement agents, alerting decision makers to compliance infringements while leveraging that power to reach and influence public opinion

Overall, the potential use of ICTs in this area, although largely untapped across developed and developing economies, remains enormous. However, technological determinism must be avoided. ICTs, like all technologies, may also be used by people who over-exploit natural resources. They deliver positive outcomes only if integrated with appropriate policies and into appropriate programmes.

GIS and remote sensing techniques

GIS and satellite remote sensing have played an important role in collecting information relating to sensitive and vulnerable forest and watershed areas. They provide essential information on both the quantity and quality of forestland as well as wildlife inhabitants. They have also been instrumental in monitoring changes in forestland.

Thailand uses GIS and satellite remote sensing to monitor progress in the country's largest reforestation project. In Thailand's "loves the trees" forestry project (launched at Her Majesty the Queen's initiative in 1999), satellite imagery is used to identify denuded forest areas in five Northern provinces. These areas constitute the most important and threatened watershed. The project involves land and air patrolling, and reforestation in forest and non-forest areas. All types of media are used – radio, village audio towers, and TV documentaries in Thai language and local dialects – to promote public awareness of the project, and to solicit support. Four hundred people volunteered to join the project, which has effectively been employing GIS to verify and monitor changes in forest areas. The Government pledged to reforest 5 million *rai* in protected areas to commemorate the fifth cycle of the reign of H.M. King Bhumiphol during 1994-2007. More than 3.5 million *rai* have been reforested.

Other, urban uses of GIS have also been experimented with in Thailand. Its Department of Environmental Quality Promotion piloted a community GIS for environmental management in four Tambon Administration Organisations (TAOs). The system provides the following outputs:

- physical data such as location, size, boundary and other geographical details
- infrastructure data such as access to electricity, piped water, telephones, roads, water sources and health stations
- information on tourist sites
- socio-economic data on population, household distribution, land ownership, occupation, income, education, and health, and
- natural resource and environment data on land, water, forests, mineral resources, pollution situation and pollution sources.

Local communities are expected to participate actively in collecting, updating and using information in the database. In this connection, the Ministry of Science and Technology supports efforts by local academic institutes to familiarize TAOs with the GIS and its potential contribution to tourism management, tax collection, and natural resource planning and management under a "Technology Clinic" project. Similar urban uses have been made in India as well (Box 11.1).

Box 11.1 ***India's water system management at Mirzapur***

GIS was applied for the rehabilitation of the water distribution system in the water zone of Mirzapur in Uttar Pradesh in India.[1] The objective was to allow the water department to make key improvements in the system to enable registration and regularization of water connections. Since the water supply is shared among several zones, identification of the required investment based only on water supply system drawings was difficult. Computer-based modelling was required; and specific information was needed for this. A picture of the basic water distribution system along with node coordinates was required. The population for each node was used to estimate the demand. Without GIS, this information would have been almost impossible to bring together quickly in the right format.

With GIS, the water supply network was evaluated along with property maps to estimate the population at each node. Coordinates for each node were easily identified. Since the water supply maps only showed recent system repairs and improvement, key elements of the system such as secondary distribution lines in neighbourhood streets were not updated. GIS was used to map physical survey information directly to the streets without creating a new water system map. This allowed a much finer grain of analysis than was possible with only the water system map.

Source: GIS Development website, http://www.gisdevelopment.net/application/urban/overview/urbano0003a.htm

The two biggest challenges for GIS in Thailand are prohibitive cost and data inconsistencies. To share cost and to overcome the data problem, the Geo-Informatics and Space Technology Development Agency (GISTDA) has a mandate to develop a national GIS master plan and a National Spatial Data Clearinghouse. GISTDA will set GIS standards, generate metadata, and develop prototypes for easy application by relevant agencies. It also has a mandate to promote GIS use not only by line ministries but also by local administrative organizations.

In Sri Lanka too, remote sensing and GIS techniques have been applied for the detection of change in forest cover. In this project, two Landsat TM images from 1988 to 1992 were used to determine the deforestation in a selected area in Habarana in the Polonnaruwa district, North-central Province. GIS overlay operations showed that more than 1.2 per cent of the study area had been deforested in the four-year period. This demonstrated how effectively the combination of TM and GIS techniques could be used to find information of operational significance related to deforestation.

The Survey Department has been using GIS applications for several years. Within their GIS database, the map of Sri Lanka has been divided into 92 units or sheets. Data collection is done using both aerial photography and plan table methods. Information collected is used to build a three dimensional model. This process involves the Photography, Remote Sensing and Airbase units of the Department. The database provides, among other things, minute details such as the start and end points of a river or the exact forest coverage in a given area. The hydro layer has information on the capacity of reservoirs and quality of water – which supports scientific management of freshwater resources. The administrative layer divides the island into provinces, districts and divisional secretariats (formerly known as assistant government agent divisions). The beneficiaries of this information include the Urban Development Authority, the Forest Department, Ceylon Electricity Board, the Department of Agriculture, the Universities of Kelaniya and Moratuwa, and Sri Lanka Telecom. For example, the Department of Agriculture analyses data on terrain patterns to locate areas with high soil erosion. The land use layer will further add value to the system from an environment angle.

In Mongolia, the "natural resources management system" project supported by DANIDA was implemented during 1998-1999 in two *soums*. The project objective was the formulation of county guidelines for pasture management, based on information derived from satellite data and geographic information systems coupled with geo-positioning systems and its application for sustainable livestock management.

Satellite data, namely, Landsat and Spot images, were captured over the territories of the *soums* selected as project sites and processed to produce dominant vegetation and land cover maps. Those maps were integrated with pasture

The development of ICTs and their use in the environmental area creates the opportunity for the government to ensure public access to environmental information and broaden public participation in decision-making and implementation

management, socio-economic and demographic data to depict the quality, carrying capacity, productivity and boundaries of pastureland. GIS analytical capabilities were mobilized to detect the overgrazed or degraded and resource lands so as to enable better pasture planning. Public participation was ensured throughout the entire process of project implementation, allowing herders and local managers to understand and apply sustainable resource management concepts in their businesses. However, despite the long-term contribution to sustainability that the use of remote sensing and GIS technologies could make, the government's commitment to provide human resources and technological services was weak and outputs were discontinued two years after project completion.

Some studies have found that GISs are often not well integrated with decision-making systems in institutions. This results in pitfalls in implementation of ICTs and their effectiveness. This is a potential problem that needs to be kept in mind when implementing these systems.

Technological determinism must be avoided. ICTs, like all technologies, may also be used by people who over-exploit natural resources. ICTs deliver positive outcomes only if integrated with appropriate policies and into appropriate programmes

GIS as a tool against natural calamities

GISs are also potent tools in the management of potential or actual calamities. GIS techniques have been used in tracking and managing forest fires and floods. China has successfully experimented with the technique in these areas.

The ICT initiatives of the Mongolian Government, with the support of UNDP and the Government of Switzerland, include a new project to deal with disasters titled 'Strengthening the Disaster Mitigation and Management System in Mongolia'. The project aims to support the Mongolian Government's priorities on sustainable development, environmental protection and poverty alleviation by developing a natural disaster mitigation and management agency accredited at international and national levels. Project activity focuses on the establishment of information and communication systems, and information databases for disaster management.

In 2002, JEMR Consulting Co. had assessed the performance of ICT emergency activities for two cases of heavy windstorms that hit most parts of Mongolia, involving human deaths and substantial livestock losses. The first windstorm with dust and snow hit Mongolia during 5-9 April 2001 and as a result, 23 people and 185,000 livestock died. The economic loss was estimated as Mongolian Tugrig 8.5 billion. Meteorologists underestimated the weather situation before this wind disaster and information dissemination was taken as "not required". Thus, information was not disseminated to the population. As a consequence, the country was devastated.

The second windstorm, that occurred during 18-21 March 2002, killed three persons and 50,000 livestock. The total economic damage was estimated as Mongolian Tugrig 2.1 billion. This windstorm had the same intensity and geographic coverage as the previous one, but there were fewer human and livestock deaths and lower economic loss due to the use of ICTs. Before the storm, the weather service issued an emergency warning and disseminated information to the entire population by means of national radio, TV, e-newsletters, and portative radio receivers. The professional weather service, ICT and Government-supplied radio communication networks, introduced at *bagh* level in 2002, have played an important role in preventing or alleviating the consequences of natural disasters.

Similarly, Thailand's Royal Irrigation Department has launched an early warning system regarding floods in 10 water basins. Information on the water level is transmitted from upstream stations to downstream stations. For example, information from the Mae Taeng station, located 32 kilometres north of Chiang Mai, provides a 12-hour warning to Chiang Mai residents. The information dissemination process uses mobile vehicles with loud speakers, manned warning boards, local radio and television. The Department is also developing a system which will provide automatic reading of the water level, transmit the information electronically to downstream stations and the Department within seven or eight minutes, and electronically disseminate the warning to the public.

The use of environmental databases

The development of effective environmental databases that can be used for tracking the status of various environmental indicators is an important way in which ICTs are applied to environmental protection. One relevant database, INFOTERRA, is an information retrieval system that provides information essential for effective environmental management that will help to ensure the sustainable development of natural resources.

On the surface, such online databases or websites represent little more than information dis-

Box 11.2 ***China's national environment databases and management systems***

In China, many national databases have been constructed for land evaluation and management, such as the 1:4,000,000 national database for population, environment and sustainable development; 1:1,000,000 national database for land cover (by county), national database for soil erosion, national database for cultivated land by slope steepness; 1:250,000 national database for land cover (two periods), national database for wetlands, etc. Some of these databases were generated through the interpretation of the remotely sensed images.

Source: China Country Report, p. 81, box 8.3

semination mechanisms on important environmental issues. However, the process by which they are constructed and maintained ensures capacity and skills development at the grassroots level (i.e. the organizations for which the websites are developed). Moreover, these websites represent an injection of new energy into the work of organizations.

There are many national level databases as well (Box 11.2). The National Agricultural Research Centre in Pakistan provides retrospective searching facilities of 23 international databases available on CD-ROMs, including major agriculture and life sciences databases such as CAB, AGRIS, AGRICOLA and Biological Abstracts as well as specific databases like TREE-CD, ECONLIT, FASTA, Pest Bank, Tropog and Rural, Aquatic Science and Fisheries Abstracts, to help scientists search through relevant world literature.

In Sri Lanka, the International Water Management Institute, part of the global network known as Consultative Group for International Agricultural Research (CGIAR), is among the leading research institutions using ICTs for natural resource management. Its work is centred on maintaining freshwater resources and irrigation research information on databases, and disseminating them through a website. Data related to research (currently under way) is first stored in a relational database within the system. This database might contain a large number of different sets of parameters relating to an irrigation system. This data will be used to create 3D models, and the results then fed to the organizational website. Two recent research efforts published in this manner are: a project to determine the possibility of utilizing the water of Walawe River immediately before it enters the sea; and the impact of tanks (Sri Lanka's man-made reservoirs) on spreading diseases such as malaria, filaria and dengue fever.

In Malaysia, the ASEAN Review of Biodiversity and Environmental Conservation (ARBEC) provides an on-line platform www.arbec.com.my, for the effective dissemination of critical research among members of the biodiversity community in the region as well as internationally. Earlier, it had been discovered that although information on biodiversity was readily available, access to it was difficult due to the disparate locations in which the research data was found. Moreover, to facilitate discussion of the topics, researchers had to either travel or use expensive modes of communication such as the telephone. With the provision of financial assistance from the Demonstrator Application Grants Scheme,[†] ARBEC has built an online portal that gives researchers access to the database and permits them to critically discuss biodiversity issues. Internet technology cost-effectively enables equitable dissemination of critical research within the biodiversity community. ARBEC also provides opportunities for upgrading research skills of budding scientists.

GIS and satellite remote sensing have played an important role in collecting information relating to sensitive and vulnerable forest and watershed areas. They provide essential information on both the quantity and quality of forestland as well as wildlife inhabitants

ICTs for better monitoring of environmental violations

ICTs can be used for emergency communication with and at the grass-roots level, with significant implications for environmental management. For example, one key use of ICT by the Forest Department in Sri Lanka is a communication

[†] The Demonstrator Applications Grants Scheme (DAGS) in Malaysia has provided seed funding for several innovative development ICT applications to support environmental management. These pilot community-based projects represent ICT best practices in the area of environmental management. The projects promote awareness for the protection and conservation of natural resources.

system that effectively delivers information regarding forest offences which helps deal with such actions immediately. The network is divided into three zones:

- from Colombo to Anuradhapura in the North-central part of the country
- from Colombo to Hambantota in the South-east of the country, and
- Kandy-Nuwara Eliya area in the Central region.

The Department head office in Colombo can contact any zone through the network, while the provincial or local offices can only access other offices within their own zone. Mobile units of each office are accessible via a radio network. In the event of illegal activities taking place in a particular region, the respective office is contacted over the network and instructed to connect over the telephone to pass on information through a secure channel. This avoids the risk of third-party interception of confidential information.

GISs are also potent tools in management of potential or actual calamities. GIS techniques have been used in tracking and managing forest fires and floods. China has successfully experimented with the technique in these areas

Additionally, Sri Lanka's Environmental Foundation Ltd. (EFL), a public interest law group, has a long history of using email to share information, and network with like-minded groups within the country and overseas. One early example is the use of a primitive type of email to search information on rock quarries. This resulted in a successful campaign against the operation of a quarry at Weragampitiya, where vibrations and noise pollution were damaging houses in the area.

In the mid-1990s, this facility was further expanded to access databases containing environmental information at foreign universities. Other successful cases of using effective email communication were the campaigns against a diesel power generation plant at Etul Kotte, near Colombo, and the proposed Colombo-Katunayake Expressway. In the latter case, environmental issues related to similar highways in Israel and the USA were obtained via email and were comprehensively analysed. EFL similarly used email to obtain information on what happened in the Nauru islands in the Pacific, when confronted with a multinational company that was about to begin exploiting extensive phosphate deposits in Eppawala in Sri Lanka.

The pivotal role the Internet now plays in campaigns for conservation and environmental justice in Sri Lanka can be better appreciated by examining how such campaigns have evolved over time:

- In the early 1990s, there was mass agitation against the construction of the Kandalama tourist hotel on the banks of the historic Kandalama reservoir. The print and broadcast media were widely used in this campaign that also had elements of sit-in protests and marches. Although the private company – supported by the then government – went ahead with the project, public protests made it more environmentally friendly than was proposed initially
- In the late 1990s, citizen groups working on both natural and cultural heritage conservation mounted opposition to the handing over of Sri Lanka's largest known phosphate deposit in Eppawala, in North-central Province, to a multinational mining company. Activists effectively used email and websites to explain their views and to lobby international support against the project. Several dozen websites or web pages were created and online petitions and email campaigns used to pressurize the Sri Lankan government and its donors to abandon this mining project in an area full of archaeological and natural sites.

In Indonesia pollution has been reduced since early 1997, when the Environmental Impact Management Agency began using the mass media to expose plants that are non-compliant with their designed environmental standard.[1] The Programme for Pollution Control, Evaluation and Rating (PROPER) rates the water pollution produced by 187 medium and large industrial plants. Performance ratings were based on the government's existing data on compliance with water regulations, responses to a survey about effluent discharges, and rigorous on-site inspections.

Prior to disclosure in the media, the Environmental Impact Management Agency rated only 35 per cent of the plants as "in compliance", but after exposing companies to the media the compliance figure rose to 50 per cent. Surprisingly, improvements at facilities were motivated as much by the information that senior management gained about their plant's environmental performance as by the external disclosure of ratings. In most cases, plant managers had simply not understood the level of wastes they were releasing and the associated business costs.

The importance of having a dedicated source of funding is highlighted by the fact that the PROPER programme went into hibernation after the economic crisis of 1998. Such is the vulnerability of enforcement programmes. Fortunately, with the economy picking up, the programme re-emerged in the year 2003 with a new round of ratings.

On a smaller scale, in Pakistan, a Self-Monitoring and Reporting Tool (SMART) for Environmental Protection Agencies was developed through the joint efforts of SDPI and the Punjab and Federal Environmental Protection Agencies. SMART is a scalable software solution developed for the management of reports generated by industries under the self-monitoring programme. SMART maintains a database of industrial activities and the emissions/pollution levels generated by specific industrial concerns, which helps redress imbalances.

Numerous opportunities exist for the use of ICTs by civil society initiatives directed at ensuring environmental sustainability. One was utilized by civil society in Pakistan in 1999 for the Save Kirthar National Park Campaign. Kirthar National Park (KNP) is a protected area of 308,733 hectares situated in Sindh province, 80 miles north of Karachi (capital of Sindh Province). Kirthar was designated a national park by the Sindh Wildlife Department in 1974, the first of Pakistan's parks to be included in the UN's listing of National Parks of 1975.

It first came into the public eye because of the proposed construction of a national highway in 1991. The active involvement of civil society resulted in a rapid assessment of the serious damage this project might have on the ecology of the national park.

In July 1997, the Federal Ministry of Petroleum (Directorate General of Petroleum Concessions) Government of Pakistan, granted the Dumbar Block Exploration License to a multinational oil and gas exploration firm (Premier Oil). The Dumbar Block encompasses more than 90 per cent of the Kirthar National Park, which enjoys 'Protected Area Status'. The Sindh Wildlife Protection Ordinance 1972, Section 15 prohibits "clearing or breaking up any land for cultivation, mining or for any other purposes". Similarly, a notification of the Sindh Government issued in January 1997 bans mining activities in national parks.

Spearheaded by The World Conservation Union (IUCN)-Pakistan, SDPI and other NGOs in Sindh province, a civil society campaign to protest the illegality of the Dumbar Block Exploration License began in 1998. It was one of the most visible and well-organized initiatives for the environment in Pakistan's history. Its use of the Internet and email to build a coalition of support for the protection of KNP is instructive for its simplicity and effectiveness. It generated frequent headlines in newspapers, both in Pakistan, and through the exposure it generated online, in global civil society journals and websites. While it failed to thwart Premier Oil's designs in KNP, it persuaded its partner organization, Shell, to disengage from the project.

The Save Kirthar National Park Campaign established a website, now located at a free host (http://www.geocities.com/savekirthar). The site generated numerous email messages to mailing lists in Pakistan (through the SDNP) and across the world, and attracted media attention. The results induced Friends of the Earth International (http://www.foei.org/) to join the campaign and take the oil and gas companies (Shell and Premier Oil) to court.

ICTs and energy consumption

Initially, ICTs generated activity in a substantially new business sector, i.e. the IT industry including software, hardware, knowledge management, and content development. The industry is characterized by the minimal use of "material" capital, and the premium it places on intellectual or human capital, i.e. knowledge.

Currently, and perhaps more importantly, ICTs are redefining the way products and services in the economy are designed, produced, and operated. The economy grows not just by adding more resources (including energy resources) but by being increasingly efficient in the way these resources are used to meet real human needs. ICTs have reshaped the very notion of productivity, allowing sharp increases in the efficiency with which materials, labour and capital are used.

Additionally, many electronic gadgets and devices have inbuilt energy saving and standby modes which significantly reduce energy consumption. This is especially important in poor countries with have low access to energy sources.

On the surface, online databases or websites represent little more than information dissemination mechanisms on important environmental issues. However, the process by which they are constructed and maintained ensures capacity and skills development at the grassroots level

ICTs can also be used to change energy consumption habits. In Thailand, one of the most successful projects using ICT to save electricity resulted in a saving of approximately 3,000 BTU per year or US$ 208 million (9,000 million Baht). The Energy Policy and Planning Office (EPPO), Ministry of Energy, has made extensive use of the media, especially TV and radio, to promote its energy saving projects under the slogan of "Divided by Two" (reducing energy use by half). Each year, EPPO invests heavily in TV and radio advertisements and public campaigns, financed by the Energy Conservation Promotion Fund which comes from an oil tax surcharge. The target audience is the general public, especially urban residents.

EPPO's award-winning website – www.eppo.go.th – provides useful and friendly content on various aspects of energy, energy development and conservation programmes, and energy tips. It also serves as a gateway to TEENET (Thailand Energy and Environment Network), a network of research and development organizations in this field.

ICTs can also be used to change energy consumption habits. In Thailand, one of the most successful projects using ICT to save electricity resulted in a saving of approximately 3,000 BTU per year

Using ICTs to empower slum dwellers

One of the indicators for the environmental sustainability MDG is the achievement of significant improvement in the lives of at least 100 million slum dwellers by 2020. ICTs are playing an invaluable role here as well. By mapping land, recording land ownerships and simplifying registration and other transactions for tenure transfer, ICTs contribute to current efforts for improving the slum environment.

ICTs can also be used to help ensure potable water supply. Their application ranges from metering and reduction of transaction costs to organizational maintenance functions such as personnel recruitment and management. The functions of some organizations that are responsible for supplying potable water include construction of reservoirs and tapping of ground water resources, building and maintenance of distribution systems, and assurance of water quality. All these have benefited from ICTs.

Furthermore, technologies on sewerage, solid waste management, and related sanitation functions can be adapted from developed countries and appropriately modified for developing nations. John Daly[2] emphasizes the importance of ICTs in empowering the urban population and in improving the environment as a whole:

"ICT can play a major role in urban planning and monitoring urban development. The technology can be applied to design and construction of housing, to the building supply industry, and to improving the markets for housing, building supplies, labour for the construction industry, etc.

"ICT rollout is likely to empower slum dwellers with access to information as well as with more voice in public affairs, and with more access to entertainment. While much can be done to disseminate information with radio and television, telephone and the Internet are important in allowing the poor to express themselves and in allowing interactive communication. The rollout of communications technology to enterprises and service centres working in slums is likely to be ultimately beneficial to the slum residents receiving those services, as is the general rollout of ICT to the larger organizations such as the health and education ministries supporting the slum health centres and schools."

Challenges and lessons

Despite the immense potential for applying ICTs to better the environment, broadcast media such as radio and television remain the most prevalently used ICTs for the environment, in terms of information dissemination and knowledge networking. Our discussion suggests that, besides better appreciation and understanding of the current state of the environment, the key challenges to utilizing ICTs for ensuring environmental sustainability are:

- ICTs are used mainly for environment monitoring and less attention is given to risk and vulnerability analysis
- the application of ICTs for environmental sustainability is uneven across North and South, highly qualified and poorly educated people, between different environmental aspects, and among agencies with respect to environmental management
- ICT tools are mainly used by State controlled organizations for environmental protection. The roles of NGOs and private organizations in ICT promotion for environmental sustainability remain weak

- the shortage of budgets results in ICT measures being focused only on major environmental problems, such as disaster monitoring, soil erosion, and forest depletion, and
- public awareness remains weak in this area.

Training of skilled people and connectivity remain the two major challenges facing developing countries aiming to use the technology for environmental management in Asia.

Currently, research grants serve as one way of encouraging ICT awareness and development in the environment arena. These efforts include UNDP's Pan Asia ICT R&D Grants Programme, which calls for building institutional capacity in the developing countries of the Asian region and encouraging innovative networking solutions to problems such as environmental management. Similarly, Virtual Foundation, an online philanthropy programme, carefully screens organizations, even at the grassroots level, so that they can be funded by online donors. This initiative encourages private philanthropy amongst citizens and also supports NGOs in their quest for environmental sustainability.

However, experience clearly shows that, although ICTs have enormous potential in ensuring environmental sustainability, the spread of ICTs must not be an objective in itself. ICTs should be implemented in appropriate circumstances coupled with the needed legislative support and dedicated funding.

Photo: UNDP Mongolia

MDGs

Chapter 12

ICTs and global partnerships in Asia

Revolutionary advances in information technology are reinforcing economic and social changes that are transforming business and society. From this evolution, a new kind of economy – the information economy – is emerging in which information is the critical resource and the basis for competition. Throughout the world, ICTs are generating a new industrial revolution already as significant and far-reaching as revolutions of the past. Old ways of doing business are being challenged, and sometimes defeated, in this process.

This is part of the process of globalization, to the extent that the latter is mediated by technology. While globalization inexorably compresses the world into a global village, ICTs intensify and accelerate the process. Developing countries need to cope with the process by adapting to it in ways that allow them to appropriate its benefits and minimize its adverse consequences. The target of MDG 8 is to manage the effects of globalization through a focused partnership for development. Such a goal-oriented partnership for development can tie multiple stakeholders into joint risk-taking and reward-sharing relationships.

In November 2002, the UN ICT Task Force was launched by the UN Secretary-General in order to harness the power of technology for development. It is a UN endeavour that aims at fully incorporating representatives from public and private sectors, non-profit organizations, and civil society as equal members. The Task Force's membership includes some of the world's most prominent business leaders whose decision-making power is equal to that of the representatives of governments and multilateral organizations.

Through this system of collective input, the Task Force has already achieved a common understanding on priorities and tasks, as well as on the most effective modalities for achieving the goals set out in its mandate. The objective is to create a win-win situation, where the goals of the private sector, based primarily on the profit/loss criteria, would be increasingly complementary and mutually reinforcing with broad development goals that the United Nations works to advance.

ICT partnerships involving the private sector, civil society and global organizations

Global companies must be persuaded to play an important role in this endeavour. This could start in their own corporate domains, through the application of good practices everywhere they operate. Understanding the far reaching effects of this benefit, UN Secretary-General Kofi Annan has gone forward to invite the business community to join the "Global Compact" by incorporating in their own corporate practices a set of core values in the areas of labour standards, human rights, the environment and the anti-corruption. This initiative has been endorsed by a wide variety of business associations, labour groups and NGOs.

However, the process cannot stop here. Governments alone cannot ensure that ICTs play their designated role in development. The effort of developing the appropriate technology and innovation aimed at reducing the costs of that technology is, most often, best undertaken by individuals, autonomous institutions, private firms and civil society organizations, that have the requisite knowledge and the flexibility to

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ensure success. Partnerships between these entities and the government – which serves as facilitator and financier – and international organizations, that provide technological and financial support for the process, would be necessary to accelerate the process of technology development.

An obvious area in which the private sector can contribute is to impart skills that can help the poor and the disadvantaged exploit ICTs if provided access. Even if still on a marginal scale from a global point of view, work in this area has begun as illustrated by Intel's 'Teach to the Future' programme discussed in Box 12.1. The need to multiply and strengthen such or similar projects hardly needs emphasizing. Fortunately, private firms recognizing the need for corporate social responsibility have entered the area.

Civil society organizations that play a major role in the development arena and have the knowledge, experience and the grassroots organization required to induct ICT into existing projects, and design projects aimed at utilizing ICT in innovative ways, have to be harnessed as well (Box 12.2).

Finally, international donors and NGOs, with their long track record in supporting development activities, collating international experiences and scaling up small experiments, cannot but be involved in this emerging area. In Pakistan, for example, SDNP, a programme funded jointly by the UNDP, IUCN and IDRC in 1994, was responsible for helping develop websites for NGOs and development agencies at highly subsidized rates. This created a significant momentum for networking within the development community, the sharing of best practices for poverty elimination and the opening up of a world of information and knowledge that lay unexplored on the Internet.

Global partnership requires establishing relationships among all these actors and between them and the State in developing countries. An example of such a partnership is that between the Sri Lankan government and a regional

UN Secretary-General Kofi Annan has gone forward to invite the business community to join the "Global Compact" by incorporating in their own corporate practices a set of core values in three areas: labour standards, human rights and the environment

Box 12.1 ***Intel's 'Teach to the Future' programme***

Intel's 'Teach to the Future' is a worldwide effort to help both experienced teachers and pre-service teachers integrate technology into instruction and enhance student learning.

In Pakistan, Intel initiated its education programme, 'Intel Teach to the Future', in 2002 with a memorandum of understanding to train 13,000 school and college teachers across the country. Intel has exceeded its original target by training 43,000 teachers and spreading the programme to 40 cities across Pakistan. Its success in 2002 resulted in Intel receiving a letter, praising the programme, from the President of Pakistan, General Pervez Musharraf.

In December 2001, Intel launched its worldwide effort to help teachers integrate technology into instruction – 'Teach to the Future' – in Karachi, piloting two batches of master trainers, equipped with 60 hour of extensive training, an exhaustive set of modular training material, and licensed software for their personal use. The objective of the 'Teach to the Future' programme is to expand the scope of ICT use in the classroom through diffusing the capacity to use personal computing among teachers in primary, middle and high school across the country. Intel's own Senior Trainers train groups of Master Trainers who are awarded Master Trainer credentials upon committing to training at least 20 teachers from their own institutions for 40 hours each. Intel's Master Trainers monitor the follow-up training through 'Buddy Visits' and providing constant feedback and support to the Master Trainers. Among the skills imparted to teachers through the programme are the use of the Internet, web page design, and desktop publishing software such as Microsoft Publisher.

Intel's programme targeted training 15,000 teachers during 2002, and surpassed that goal by imparting ICT skills to 19,000 teachers. In 2003, it aimed at training 50,000 teachers, or Master Trainers. In theory, therefore, by the end of 2003, a total of 100,000 teachers in Pakistan will have received ICT training through this programme.

Source: Banuri *et. al.* 2003 and http://www.intel.com/education/projects/global_tour/ h_18_pakistan/

Box 12.2 ***The International Television Trust for the Environment (TVE International)***

TVE International is a non-profit organization working globally and locally to raise awareness of environment, development, health and human rights issues through the media.

Established in 1984 by the UN Environment Programme (UNEP) and World Wide Fund for Nature (WWF), TVE is both a producer and distributor of quality television programmes on environment and nature. It now holds the world's largest collection of copyright-cleared environment and development programmes that are available to television broadcasters and non-broadcast users across much of the world. Hundreds of television stations and thousands of NGOs, universities, schools and activist organizations use these programmes for education, awareness, advocacy, training and activist purposes.

organization, the Asia Pacific Broadcasting Union (ABU). Established in 1964, ABU is a membership body that brings together State and private radio and TV broadcasters in the entire Asia Pacific region. It provides skills training, scholarships, programme exchange and other services for member broadcasters which has helped raise broadcasting standards in Sri Lanka.

Collaboration using ICTs in higher education and research

Given the origins of the Internet as a tool for research collaboration, it is not surprising that one area where partnership based on ICTs has autonomously evolved to a substantial extent is higher education and research. ICT tools have linked worldwide research institutions, enhanced scientific research and developed partnerships for innovative projects. Communication between universities and research organizations has increased collaborative efforts between institutions and countries that mutually exchange research ideas, acquire interdisciplinary knowledge, solve special technical problems on-site, share public information, compare methodologies and report new achievements.

In China, educational institutions are aggressive in establishing partnerships with foreign institutions and this is often done using ICTs. Apart from China, Indonesia has also been using ICTs to build partnerships with foreign research institutes to enhance its education sector. One such initiative is the Global Distance Learning Network (GDLN) project at University of Indonesia. The project was approved by the World Bank in 2001 and had a budget of US$ 2 million. Its objective is to test the potential effectiveness and sustainability of distance learning in Indonesia, by delivering training material developed by global institutions for various segments of the public, such as students, key decision makers in the public and private sectors and the public at large.

Thailand has also started initiatives using ICTs in education. One such key initiative is the ASEAN SchoolNets project, where the ASEAN Foundation is the main sponsor of the project. This initiative, a regional partnership, is aimed at incorporating the use of ICTs in schools to improve the teaching and learning process.

Global Public Policy Networks (GPPNs)

Another set of new global partnerships have emerged between what are termed variously as global civil society organizations, global social movements and, now more recently, as Global Public Policy Networks (GPPNs). They are international networks and coalitions that can work consensually in developing sustainable policy positions. They have been effective in drawing interest from a wide group of organizations with similar objectives although operating in different local environments. GPPNs are seen to fill the gaps in terms of addressing North-South issues.

The GPPNs are increasingly using ICT; and operate rather informally. They are thus able to mobilize and respond quickly through public policy campaigns which attract broad global interest. The globalization process and the Internet have, in turn, facilitated these loose and innovative networks of organized action where traditional processes have failed to respond in an appropriate manner. The effectiveness of GPPNs can be seen in their ability to address capacity gaps in national governance as well as in global governance when conventional institutions have proven ineffectual.[1] GPPNs, on the

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other hand, have succeeded in getting new issues onto the global agenda especially through the use of ICT; facilitating negotiations and setting standards that are globally acceptable; gathering and disseminating knowledge; helping to implement ideas and decisions; and, finally, enhancing public participation through engagement with government, business and CSO networks. The potential and capability offered by global partnership networks cannot be overstated and should be leveraged fully by all sectors.

The use of technology itself generates partnerships that have larger implications for development. These partnerships share information, views and experiences, and generate discussion facilitated by the technology. They, therefore, help arrive at international positions, standards and mechanisms on development, in general, and the use of ICTs for development, in particular. Further, by helping mobilize a constituency for these democratically derived positions, standards and mechanisms they create international pressures on different actors – government, civil society organizations and the private sector to adopt them. These positions relate not just to the use of ICT for development *per se*, but to macroeconomic issues such as debt reduction, capital controls, fiscal and monetary policy and sustainable development, to name but a few areas.

In general, the impact of ICTs in developing sustainable global partnership has been positive for many countries. This has enhanced the new hope that ICTs have generated in the developing world. Indeed, social and economic development are complex phenomena depending on various factors, and ICTs alone cannot solve the developing world's problems. However, integration of ICTs into overall national and regional development strategies expands the scope and coverage of development interventions. Global partnerships that ICTs help forge can contribute substantially to realizing that goal.


SAFIA
SUPREME
SAFIA

Photo: Amit Khullar

MDGs

Chapter 13

Conclusions and policy implications

Given the nature and the power of ICTs, the perception that they can be used as enabling devices in the effort to realize the MDGs is well-grounded and indisputable. They can be used:

- for information collation and analysis
- to serve as low-cost means of communication and information dissemination
- to enhance the productivity of operations varying from production and management to marketing and delivery
- to help deliver services such as education and health more efficiently to even remote locations
- to help monitor the status of achievement and progress on all MDG fronts
- to help increase transparency and accountability in a range of organizations, including government, and
- to encourage networking of a kind that increases the power of disparate and disperse organizations working toward the same goals to jointly formulate alternatives and campaign strategies and lobby and pressurize governments into delivering on requirements and promises on various fronts.

Given the spread of the technology in Asia, countries in the region are in a position to use ICTs for socio-economic and human development. Telephone availability, personal computer ownership and Internet access are increasing rapidly, facilitated by much lower start-up costs, compared to those experienced by developed countries initially, as well as by growing government support with pro-ICT policies and regulations.

This Report points to the significant role that ICTs can play in achieving the MDGs. The evidence suggests that while countries are attempting to exploit these opportunities, progress has been slow. The experiences of the countries chosen for special study as the basis of this Report suggest that, at a macro-level, ICT policy is indeed sensitive to human development concerns and seeks to use the technology in partnership with NGOs, donors and the private sector. What needs to be examined, therefore, is the degree to which this economy-wide commitment is being translated into specific projects that advance specific MDGs. Though, many of the applications studied are in the nature of pilot projects – experimental in character, small in scale and uncertain in terms of sustainability – they provide the material to assess the role that ICTs can play as well as the models that, if successful, need to be scaled up.

An objective of this Report, besides selectively documenting the myriad experiments in different MDG-related areas, was to attempt to understand some of the constraints to extending the effects of the technology as illustrated by specific experiments. One of the most important constraints is, no doubt, sheer physical access and, where such access is available, the cost of such access. The first conclusion of significance is that there is need to increase the reach of the technology, not merely physically but also at reasonable cost. Increased reach has many aspects: spread of the required hardware; dismantling of barriers to access even when the technology is physically available; ensuring the availability of the appropriate software; and developing appropriate, people-sensitive content in local languages. There is reason to believe that, in terms of these indicators, reach is still limited. This is partly due to the inadequacy of the hardware that is in place in many countries. In many contexts, aggregate indicators of

One of the most important constraints is no doubt sheer physical access and, where such access is available, the cost of such access. The first conclusion of significance is the need to increase the reach of the technology, not merely physically but also at reasonable cost

reach are far from satisfactory even when spread is rapid. Further, aggregate figures of reach conceal the low penetration of telecommunications capacity and a high degree of urban and regional concentration.

Not surprisingly, the number of Internet users relative to the population is very small at present and many developing countries lag in terms of the bandwidth (or the pipe) necessary for people to simultaneously access information flow through the Internet. Inter- and intra-country variations in connectivity and access lend some support to the idea that ICT diffusion could well be accompanied by widening digital divides, stifling the effort to use the technology for enabling the realization of the MDGs. Those who have no or limited access to the technology or the skills and knowledge required to exploit it fall further back in terms of their ability to use the technology.

Very often the choice of policies to overcome these constraints is posed in terms of a private vs. public effort dichotomy. Advocates of private entry and dominance in an area where the public sector has for long been the dominant player, suggest that public monopoly has been detrimental to both access and cost

Very often the choice of policies to overcome these constraints is posed in terms of a private vs. public effort dichotomy. Advocates of private entry and dominance in an area where the public sector has for long been the dominant player, suggest that public monopoly has been detrimental to both access and cost. It is indeed true that, in many contexts, private entry has increased competition and reduced costs. However, focusing on this alone would lead to ignoring a number of factors.

First, private networks would be almost worthless if they could not interconnect to the large and historically evolved public network and exploit the network externalities that are widespread in these areas. Second, the private network reach is narrow, in the sense that it tends to avoid areas where the terrain is difficult and/or where line and call densities are low. This is true even in environments such as India where there is a Universal Service Obligation attached to most licences given to operators in these areas.

Narrow private reach is inevitable because of the profit motive underlying private investments. While private initiative can supplement the investment needed from the government, it is not always clear whether private providers would be willing to offer connectivity in remote locations at all, or at a reasonable cost. Reach of a kind that is required for the pursuit of the MDGs would not materialize without public involvement. The government may, in the process, avail of facilities created by the private sector in areas where traffic density is high, especially if competition among private producers has substantially reduced cost. However, in the foreseeable future, government investment would be crucial in areas where traffic density is low or where remoteness or the difficulties of geography make the investment inadequately profitable in the initial stages. The possibility of tapping profits from commercial exploitation of the technology through taxation, as in the export of software and IT-enabled services, needs to be explored to finance the government's investment for human development purposes. This would ensure some degree of holistic development of the ICT sector. Finally, private entry and competition results in the replication of communications infrastructure in the same area which, given the massive capacity of individual optical fibre networks, for example, is wasteful and has adverse cost and viability implications in the long run.

Connectivity and hardware availability are only one end of the problem. ICTs require specific skills and that comes in the way of their adoption by underprivileged groups and regions. This could negate the effectiveness of the technology for human development, even when made available, by strengthening the position of economic and political elites vis-à-vis others. The elite has larger resources at its command to own or access the technology, can acquire the necessary skills easily due to its higher levels of secondary and tertiary education, and can establish links through ICT with other productive and social sectors for appropriating new facilities and opportunities. Progress along many MDG fronts is not just enabled by ICT but, in a complex two-way relationship, is also a prerequisite for exploiting the technology.

The conclusion here is clear. A prerequisite for ensuring an equitable information infrastructure is investment: both public investment as well as complementary private investment. But the infrastructure thus created may not in itself be equally accessible. So an ICT policy sensitive to human development concerns must emphasize universal service provision in the telecom area. State initiatives to realize this are particularly important in countries with sharp social and economic divides, and in those where geography makes universal provision difficult.

ICT and poverty alleviation

In the long run, the most important MDG is that of abolishing poverty and raising incomes of the poorer sections of the population. While progress can be achieved independently in other areas, success beyond a point rests on progress on the income poverty front. Our discussion suggests that ICTs can play a major role here.

ICTs can directly contribute to poverty reduction by generating new employment opportunities and by increasing productivity, reducing costs and enhancing returns from economic activities undertaken by poorer households. They can also facilitate and reduce the costs of delivery of information and services that promote wage- and self-employment, raise productivity and improve the quality of employment-generating and poverty-alleviating projects being implemented by the government. Besides this, ICTs can facilitate poverty mapping and monitoring, help evaluate the impact of poverty reduction strategies and mediate enhanced support to the poor.

That having been said, we should be careful not to extrapolate this argument too far. Whether these uses of ICT development can be sustained and whether they can be translated into faster human development depends on factors that constitute components of the human development index. Given the skill-dependence of the technology, a prerequisite for ICT application and use is literacy and education. Poverty is the product of economic processes occurring at a variety of levels – local, national and international. Existing social and economic relations structure the impact of external factors and determine who will have access to subsistence and livelihood opportunities as well as access to education and assets, which can help to increase these choices. However, while medium-term success depends on changes in these areas, ICTs can be used to ameliorate poverty in many ways.

To do so, a number of inadequacies need to be addressed. While providing access to information to the poor is an important step in lifting them out of poverty, identifying the type and relevance of information required in the local context are aspects that have to be considered in providing information to the marginalized. It has been found that a successful ICT concept must encompass relevant information about local and indigenous situations, and must also have suitable ICTs as a tool to deliver the information effectively to the targeted local, poor communities. In addition, content provided through ICT should not be limited to knowledge from outside sources, but extended to draw on knowledge from the local community, especially the poor.

Some principles governing the use of ICTs in future poverty alleviation undertakings, thus, suggest themselves:

- technological interventions should be supplemented by strong content provision and must be combined with well-planned development programmes
- efforts should be made to coordinate viable ICT for poverty alleviation programmes across agencies in the best spirit of networking, to ensure proper focus in resource use and synergy in development efforts, and
- the small, spontaneous but fragmented initiatives among private agencies and NGOs should not only be encouraged and facilitated but be mainstreamed and coordinated.

These and other practices can make ICTs powerful tools for poverty reduction by enhancing the capabilities of the poor in education, marketing, management and planning, as well as providing links to a variety of resources such as agricultural information.

ICTs and education

There is adequate cross-country evidence to suggest that supply-side adjustments can substantially influence educational achievement. This enhances the role of ICT as an enabling device in an area such as education. It can play a role by improving the delivery and administration of educational services and by providing wider access to educational material, while improving the quality of content and pedagogy. Given the ability of ICT to provide access to quality educational resources at low cost over a wide geographical area, it can not only help boost the effort at providing education but can help reach it to the marginalized, irrespective of their location. Above all, it can serve these purposes by reducing the cost of provision of educational services as well as improving quality – two features that may keep children back at school and stem the rising drop-out rates as the

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years of schooling increase.

ICT-based distance education has been used to overcome time, space and geographic restrictions, allowing teachers and students to interact and share learning materials. Ongoing efforts to build distance learning platforms need to be strengthened since their benefits in this area are substantial. However, while ICTs can play a significant role in providing a more effective, relevant and flexible mode of learning to the underprivileged, its use calls for a completely new teaching paradigm. This shift in teaching environment needs to be taken into consideration before deployment, along with other factors specific to each country. These factors span local infrastructure limitations, localized content availability, cost to install, maintain and scale up ICT based educational programmes, familiarity and the learning curve of the target audience. These factors must relate the technologies being used, socio-cultural aspects such as age, gender and literacy levels, and penetration and perception of technologies among others.

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Choosing the appropriate ICTs will also demand a thorough understanding of the educational objectives at hand which, in turn, requires complete knowledge of the target audience's goals and aspirations. One objective should be to improve the efficiency and effectiveness of educational administrators, authorities and enablers through the strategic application of ICTs and through ICT-enabled skill development. The technology can also be used to support teacher training, learning and capacity development, and ICTs can be used to broaden the availability of quality educational materials and resources.

It must be noted, however, that while ICTs do offer many beneficial opportunities for education, they are no substitute for formal schooling. The role of technology is to support primary education, not replace it; though the technology may play a part in meeting the needs of children or adults who cannot go to a conventional school or class. Access to ICTs enhances traditional or formal education systems, enabling them to adapt to the different learning and training needs of societies. Developing countries need to focus on those technologies that compensate for the factors that are lacking: well-trained teachers and resources to pay for expensive equipment. The task at hand is to concentrate on technological alternatives that, at low cost, bring the imagination and creativity of a few excellent teachers to students. A major constraint is the lack of content for ICT delivery. The development of instructional content-ware remains a neglected area and needs special attention

Finally, questions of equity need to be prioritized. The pressing problem for educational planners is how to quickly reach the majority of the poor, uneducated rural populace, and find out how to fund, implement and maintain the educational part of ICT networks.

ICTs and the gender divide

It is clear that, throughout the region, a range of measures is required to reduce gender inequality. These could vary from creation of employment opportunities specifically for women and ensuring equal pay for equal work to changing mind-sets and reforming social practices that work against giving women an equal position in the economic, social and political mainstream. ICT use for realizing the MDG in this area must be assessed in terms of its ability to influence outcomes on one or more of these fronts. Employment creation in the ICT area, especially in IT-enabled services where women workers are an important component, is an obvious fall-out of the technology in developing countries such as India. However, as discussed in the Report, given the characteristics of those who find employment in these sectors, the direct effects of such employment on improving the status of the poor can be only marginal. Much of the benefit for the poor would be through the second-order effects of such activity and employment that generate demands for activities undertaken by the disadvantaged.

However, the principal effects of ICT on gender equality would be elsewhere. To quote some obvious applications, ICTs can deliver educational and literacy programmes, specifically targeted at poor girls and women, using appropriate technologies in both formal and non-formal educational settings (e.g. public access centres). In addition, such technologies can be used to influence public opinion on gender equality through information and communication programmes using a range of ICTs.

ICTs can also facilitate women's participation in government and political affairs. Some rural women can gain a new communication plat-

form to exchange opinions on political issues with their political leaders and use ICTs to raise awareness about women's issues. Female political candidates can also win support from voters in this way, employing ICTs in the communication of their political messages to the voters.

Perhaps the most significant positive impact of ICTs on women's empowerment is the enhanced capacity of women's advocacy and support groups to exchange information, coordinate action, and increase the reach of advocacy campaigns. Civil society and activist organizations routinely receive dozens of email containing information on emerging areas of concern.

It must be noted that relatively few applications of the technology are planned to achieve gender goals. This results in pre-existing gender inequalities determining the differential abilities of men and women to appropriate the technologies. If not addressed, the information revolution will see a continuation or a worsening of gender inequality. This requires purposive action.

There should be an allocation of financial resources in the national budget to support strategies to increase women's participation in the information economy, including funding for NGOs to strengthen opportunities for women's empowerment through ICTs. In addition, ICT education should be integrated in school curricula and be based on gender equality, in order to realize girls' full participation in science and technology education. Also, relevant distance education and training programmes should be implemented using ICTs, especially for rural women and girls, who are most disadvantaged in gaining access to education. It is thus imperative that the State play a proactive role in improving the social and economic environment for females so that they can harness ICT technologies and reap the vast benefits that they afford.

Above all, the effort at integrating gender considerations into national ICT policy and implementation must be based on representation of women's organizations at all levels of ICT-related policy and decision-making processes.

ICTs and health

Intervention to ensure improved healthcare must focus on prevention through means such as immunization and the launch of public health campaigns as well as on treatment delivered through a strengthened basic healthcare system. ICTs can help these efforts by improving the effectiveness of health promotion and disease-prevention programmes as well as facilitating health-service delivery. They are increasingly being used to facilitate two-way information exchange in healthcare between rural and urban areas, providing isolated communities with access to the latest health information and treatment, and informing officials of rural public health issues.

ICTs have been used in many other ways to enhance healthcare provision and delivery by:

- increasing access of rural care-givers to specialist support and remote diagnosis and delivering healthcare services, through tele-consultation, to remote populations, leading to a decrease in the re-allocation of medical specialists
- responding to disease epidemics through sharing lessons, treatment practices and guidelines with healthcare professionals, researchers and policy makers
- enabling governments, NGOs and health establishments to increase access to health information through various forms of ICTs, for example, radio or television programmes and the Internet
- collecting and analysing health information, measuring outcomes, and disseminating information to healthcare professionals, researchers, policy makers, citizens, and/or any other relevant parties
- facilitating intra-government coordination on healthcare and enhancing government planning, health awareness and disease prevention content across all sectors and departments, particularly in the most crisis-affected countries, and
- enhancing the delivery of basic and in-service training for healthcare workers, and serving as a medium for continuing education or lifelong learning for healthcare professionals to keep abreast of the latest knowledge.

The most reported ICT application in health is telemedicine. ICTs are being used in many developing countries to facilitate remote consultation, diagnosis and treatment. ICTs can also be used to increase the efficiency of database management in healthcare systems, such as hospital administration systems. One of the

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main obstacles to improving public health has always been the lack of awareness, information and education. In this context, ICTs can play a very powerful role in improving public awareness of healthcare. In particular, ICTs can serve as an important tool in the global response to the HIV/AIDS pandemic. They offer the feasibility, at a relatively low cost, of providing access to information and knowledge to those working on the problem, to those who are suffering from the disease or its effects, and to those who need to take preventive action. ICTs can also play a significant role in combating malaria, TB and a host of other infectious diseases, by enhancing the effectiveness of health institutions, improving primary healthcare and delivery of health services in rural areas, and also by serving as an advocacy tool in raising awareness of prevention and treatment methods.

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ICTs can be used as a means of information provision and networking aimed at empowering stakeholders and encouraging consultations on policy formulation. It can also support the sharing of information among medical practitioners and researchers working in the area. It provides the opportunity for healthcare providers, researchers, and policy makers to engage in discussion through local/global discussion groups and/or Web boards, and, thereby, serve as a good venue for easy sharing and consultation on various health issues.

The benefits of applying ICTs in healthcare are constrained by a number of factors common to most poor developing countries. These include large gaps in basic infrastructure availability, the ability and willingness of health workers and others to make use of the opportunities, the availability of relevant and/or localized digital content, government regulations and policies, and its sustainability and scalability.

While ICTs can help improve the health status of populations, there are major constraints. These include access to the higher bandwidth, required for transmitting physiological data and complex medical images, as well as high telecommunication costs. Many challenges to the viability of rural ICT projects remain, given the limitations of access to electricity, telephony, Net-connectivity and other basic infrastructure. Except for Malaysia, constraints such as lack of access to telecommunications and high costs have prevented the deployment of ICTs on a strategic large-scale level. These constraints are more severe in developing countries like Pakistan, India and Indonesia where even dial-up access via normal telephone lines, let alone broadband, is limited. Many countries lack the basic infrastructure to support use of ICTs. Failure to address these problems would mean that ICTs will not play "more than a marginal role". The implementation cost is far too expensive to achieve critical mass for realizing any real impact.

Further, the actual impact of ICTs in healthcare actually hinges on the ability and willingness of health administrators to adopt ICTs as a tool. The lack of computer skills has prevented many healthcare professionals from harnessing the potential of ICTs. Inertia and the fear of new technologies have also prevented many from utilizing ICTs. There is under-utilization of even available services in some localities due to socio-cultural and economic barriers. Thailand's tele-consultation usage was not as high as anticipated, mainly due to rural physicians and city medical specialists being unfamiliar with the system. Also, the very high workload of rural physicians made it difficult and inconvenient to schedule consultation times.

Although the diffusion of ICTs in healthcare has had varying successes, its application is still at a primary stage. It is important to focus efforts on educating health professionals on the use of ICTs and providing them with necessary connectivity, rather than to the population at large. With proper knowledge and connectivity, these professionals will, in turn, spread health benefits and knowledge to a wider group of people.

An important problem in an area such as health is that technical and contextual knowledge are disconnected in initiatives in which control is located outside the community. More attention needs to be paid to innovative ways of applying ICTs to the specific information needs of communities and local groups. That includes focusing on building local skills to encourage the process of local appropriation and reinforcing traditional information communication networks.

ICTs and sustainable development

Overall, the potential use of ICTs in this area, although largely untapped across developed and developing economies, remains enormous. However, technological determinism must be

avoided. ICTs, like all technologies, may also be used by people who over-exploit natural resources. They deliver positive outcomes only if integrated with appropriate policies and into appropriate programmes.

Despite the immense potential for applying ICTs to better the environment, broadcast media such as radio and television remain the most prevalently used ICTs for the environment in terms of information dissemination and knowledge networking. Our discussion suggests that, besides better appreciation and understanding of the current state of the environment, the key challenges to utilizing ICTs for ensuring environmental sustainability are as follows:

- ICTs are used mainly for environment monitoring and less attention is given to risk and vulnerability analysis
- ICT tools are mainly used by State controlled organizations for environmental protection. The roles of NGOs and private organizations in ICT promotion for environmental sustainability remains weak
- the shortage of budgets results in ICT measures being focused only on major environmental problems, such as disaster monitoring, soil erosion, and forest depletion, and
- public awareness remains weak in this area.

ICTs and partnerships for development

Developing countries need to cope with the process by adapting to ICT in ways that allow them to appropriate ICT benefits and minimize its adverse consequences. The target of MDG 8 is to manage the effects of globalization through a focussed partnership for development. Such a goal-oriented partnership for development can tie multiple stakeholders into joint risk-taking and reward-sharing relationships.

Global companies must be persuaded to play an important role in this endeavour. This could start in their own corporate domains, through the application of good practices wherever they operate. International donors and NGOs, with their long track record in supporting development activities, collating international experiences and scaling up small experiments, cannot but be involved in this emerging area.

Given the origins of the Internet as a tool for research collaboration, it is not surprising that one area in which partnership based on ICTs has autonomously evolved to a substantial extent is higher education and research. ICT tools have linked worldwide research institutions, and enhanced scientific research and developed partnerships for innovative projects. Communication between universities and research organizations has increased collaborative efforts between institutions and countries that mutually exchange research ideas, acquire interdisciplinary knowledge, solve special technical problems on-site, share public information, compare methodologies and report new achievements.

Another set of new global partnerships exist between what are termed variously as global civil society organizations, global social movements and GPPNs. These international networks and coalitions can work consensually in developing sustainable policy positions. They have been effective in drawing interest from a wide group of organizations with similar objectives although operating in different local environments. GPPNs are seen to fill the gaps in terms of addressing North-South issues.

The use of technology itself generates partnerships that have larger implications for development. These are partnerships which by sharing information, views and experiences generate discussion, all undertaken with the help of the technology that helps arrive at international positions, standards and mechanisms on development, in general, and the use of ICTs for development, in particular. Further, by helping mobilize a constituency for these democratically derived positions, standards and mechanisms it creates international pressures on different actors – government, civil society organizations and the private sector – to adopt them. These positions relate not just to the use of ICT for development *per se,* but to macroeconomic issues such as debt reduction, capital controls, fiscal and monetary policy and sustainable development, to name but a few areas.

In general, the impact of ICTs in developing sustainable global partnerships has been positive for many countries. This has strengthened the hope that ICTs have generated in the developing world. Indeed, social and economic development are complex phenomena depending on various factors, and ICTs alone cannot solve the developing world's problems. However, integration of ICTs into overall national and regional development strategies

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expands the scope and coverage of development interventions. Global partnerships that ICTs help forge can contribute substantially to realizing that goal.

To sum up, in all MDG areas, an effort to raise consciousness with regard to best practices and alternatives and a greater degree of monitoring are imperative to ensure progress. The role that ICT can play here is obvious. In addition, in specific areas, the technology can directly contribute to the realization of the MDGs, with even greater effect. Assessments of the current use of ICT for development and the potential for harnessing the technology to yield benefits in these areas needs to distinguish between these general purpose and specific uses, in order to maximize the returns from investment in the area. Further, while ICT opportunities can be identified for each of the MDGs, there is a need to prioritize the goals where ICTs can be demonstrated to have the greatest impact, e.g., education and healthcare as opposed to addressing the hunger reduction goal. There is also a need to prioritize and cost ICT opportunities for a range of implementation modalities, within the context of each of the MDGs. If this is done, even a small effort can go a long way.

However, as mentioned earlier, because of inadequate diffusion of the technology much of the potential of ICT still remains unexploited. The ICTs for human development project is in its early stages. Even if many of the experiments may prove financially unviable and/or unsustainable, the experience so far does provide the basis to identify areas in which further progress needs to be made to render the project successful.

This Report has attempted to assess and even quantify the progress of nine Asian countries towards using ICTs for advancing the MDGs. Our examination of the myriad, innovative efforts and experiments to harness the technology for human development purposes establishes that, the limited reach of the technology notwithstanding, use of the technology to help realize the MDGs has progressed substantially and cannot be reversed. However, the same examination does point to numerous inadequacies in designing and implementing projects for the purpose.

MDGs

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MDGs

Glossary

Aimags: The territory of Mongolia is divided administratively into *Aimags* and a capital city. *Aimags* are subdivided into *Soums* and *Soums* into *Baghs*. The capital city is divided into districts and districts into *Horoos*.

Analogue devices: Analogue devices are those in which continuously variable physical quantities such as electrical potential, fluid pressure, or mechanical motion are represented in a way analogous to the corresponding quantities in the problem to be solved.

ARPANET (Advance Research Projects Agency Network): The network that became the basis for the Internet, ARPANET was a large wide-area network created by the United States Defence Advanced Research Project Agency (ARPA). Established in 1969, ARPANET served as a testbed for new networking technologies, linking many universities and research centres. It consisted of a number of individual computers connected by leased lines, using a packet-switching scheme.

Bagh: Refer *Aimags* above.

Bandwidth: The range of frequencies, expressed in Kilobits per second, that can pass over a given data transmission channel within a frame relay network. The bandwidth determines the rate at which information can be sent through a channel – the greater the bandwidth, more the information that can be sent in a given amount of time.

Bits: The binary digits a computer uses to represent all data, comprising of 0s and 1s.

Body Mass Index (BMI): A measure of body mass that is calculated by dividing an individual's weight in kilograms by her/his height in square metres.

Broadband: A transmission facility having a bandwidth sufficient to carry multiple voice, video or data channels simultaneously. Each channel occupies (is modulated to) a different frequency bandwidth on the transmission medium and is demodulated to its original frequency at the receiving end. In general, broadband refers to telecommunication in which a wide *band* of frequencies is available to transmit information. Because a wide band of frequencies is available, information can be multiplexed and sent on many different frequencies or channels within the band concurrently, allowing more information to be transmitted in a given amount of time (much as more lanes on a highway allow more cars to travel on it at the same time).

British Thermal Unit (BTU): 1 BTU equals 1 055.05585 Joules.

Caller Party Pays (CPP): CPP is the arrangement in which the mobile subscriber does not pay for incoming calls. Instead, the calling party pays for those calls.

Digital devices: The versatility of modern information systems stems from their ability to represent information electronically as digital signals and to manipulate it automatically at exceedingly high speeds. Information is stored in binary devices, which are the basic components of digital technology. Because these devices exist only in one of two states, information is represented in them either as the absence or the presence of energy (electric pulse). The two states of binary devices are conveniently designated by the binary digits, or bits, zero (0) and one (1). Digital devices can be broken down into three basic categories: input devices, output devices, and manipulating devices.

Input devices allow for the conversion of hardcopy pieces of paper into digital 1s and 0s, which computers can understand, to allow these documents to then be manipulated in the computer world. Output devices are hardware, which allow those digital 1s and 0s to be converted into hardcopy output. Manipulating devices would be the servers, PCs, or any other device which are used to alter the state of those digital 1s and 0s.

Digital Signal Processor (DSP): A DSP is a special-purpose Central Processing Unit that provides ultra-fast instruction sequences, such as shift and add, and multiply and add, which are commonly used in math-intensive signal processing applications. DSPs are not the same as typical microprocessors though. Microprocessors are typically general purpose devices that run large blocks of software. They are not often called upon for real-time computation and they work at a slower pace, choosing a course of action, then waiting to finish the present job before responding to the next user command. A DSP, on the other hand, is often used as a type of embedded controller or processor that is built into another piece of equipment and is dedicated to a single group of tasks. In this environment, the DSP assists the general purpose host microprocessor.

Division by Mean (DM) method: The method of building composite indices of multiple indicators. In applying the DM method, the indicators are divided by their respective means which permits the coefficients of variation of different indicators to remain different even after making them scale-free and lets these differences be reflected in the composite index and ranking. The coefficients of variation of the original indicators, thus, become the standard deviations of the scale-free indicators, which are then carried into the component indices.

E1 connection: European Digital Signal 1, which is the European standard for digital transmission at 2,048 kb/s.

***Falciparum* malaria:** The most dangerous type of malaria. Red blood cells infected with the parasite tend to sludge and form "microinfarctions" or small areas of dead tissue due to lack of oxygen in capillaries in the brain, liver, adrenal gland, intestinal tract, kidneys, lungs, and other organs.

Human Development Index (HDI): The HDI is a summary measure of human development. It measures the average achievements in a country in three basic dimensions of human development: a long and healthy life, as measured by life expectancy at birth; knowledge, as measured by the adult literacy rate (with two-thirds weight) and the combined primary, secondary and tertiary gross enrolment ratio (with one-third weight); and a decent standard of living, as measured by GDP per capita (PPP US$)

Geographical Information System (GIS): GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information (i.e. spatial data). The system combines database management system functionality with information about location. In this way it is able to capture, manage, integrate, manipulate, analyse and display data that is spatially referenced to the earth's surface.

Gross Enrolment Ratio (GER): The ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. However, what matters is the net enrolment ratio, which is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age.

Haemorrhage: Flow of blood from a ruptured blood vessels.

Infant Mortality Rate (IMR): IMR is the annual number of deaths among children younger than one year as a proportion of the annual number of live births.

Internet: The vast collection of inter-connected networks that all use the TCP/IP protocols and that evolved from the ARPANET of the late 1960s and early 1970s.

Internet Service Provider (ISP): A company or organization which provides access to the Internet to businesses and/or consumers. An ISP purchases an Internet link from another company that has a direct link to the Internet and resells portions of that bandwidth to the general public.

HIV/AIDS: Human Immunodeficiency Virus (HIV) and Acquired ImmunoDeficiency Syndrome (AIDS). HIV is the virus that causes AIDS. Immunodeficiency means having a faulty immune system so that a person can become very ill or die from a disease that others can fight off. HIV is passed from person to person through blood or other bodily fluids, either

through a transfusion of infected blood, to a baby from its mother, through use of contaminated hypodermic needles, or through sexual contact with a person who has the disease.

***Kala-azar* (*kalajar*):** An infectious disease caused by an intracellular flagellate protozoan *Leishmania donovani*, common in rural parts of the tropical and subtropical countries of the world.

Khurals: *Khurals* are local public self-governing assemblies in Mongolia.

Local Area Network (LAN): A group of computers and other devices in a relatively limited area (such as a single building) that are connected by a communications link, which enables any device to interact with any other device on the network.

***Mandal*:** An administrative unit between a block and a district in the state of Andhra Pradesh, India.

Megabit: A megabit is roughly 1 million (precisely 1,048,576) bits. Mbit/s is a unit of measurement in digital transmission, indicating the number of megabits transmitted per second.

Megahertz (MHz): A measure of signal frequency expressing millions of cycles per second. This unit is typically used to measure the processor speeds of computers. Every command given to a computer (from the keyboard, mouse, software, hardware, etc.) requires a fixed number of MHz to execute. The more MHz available, the faster commands can be executed, and the faster a computer will perform.

Microprocessor: A microprocessor is an electronic computer Central Processing Unit (CPU) made from miniaturized transistors and other circuit elements on a single semiconductor integrated circuit (IC) or chip. Before the advent of microprocessors, electronic CPUs were made from discrete (separate) TTL integrated circuits; before that, individual transistors; and before that, from vacuum tubes.

Moore's Law: An empirical observation stating, in effect, that at our rate of technological development and advances in the semiconductor industry, the complexity of integrated circuits doubles every 18 months. It is attributed to Gordon E. Moore (a co-founder of Intel). Moore outlined his "law" in 1965. His original empirical observation was that the number of components on semiconductor chips with lowest per component cost doubles roughly every 12 months, and he conjectured that the trend will continue for at least 10 years. In 1975, Moore revised his estimate for the expected doubling time, arguing that it was slowing down to about two years.

Network Readiness Index (NRI): The NRI seeks to better comprehend the impact of ICT on the competitiveness of nations. It is a composite of three components: the environment for ICT offered by a given country or community; the readiness of the community's key stakeholders (individuals, businesses, and governments) to use ICT; and finally the usage of ICT amongst these stakeholders).

***Paan*:** Chew made of betel leaf wrapped around spices and other ingredients.

Packet: The unit of data sent across a network.

Packet Switching (network): A communications technique where a message is broken into packets that include address information and are sent to the destination on the fastest routes available; all packets may not take the same route, so the receiving station reassembles the message in proper order before forwarding the complete message to the address.

***Panchayat*:** Indian village council, often consisting five members.

Protocol: A set of formal rules describing how to transmit data, especially across a network. Low level protocols define the electrical and physical standards to be observed, bit- and byte-ordering, and transmission and error detection and correction of the bit stream. High level protocols deal with the data formatting, including the syntax of messages, the terminal to computer dialogue, character sets, sequencing of messages, etc.

Principal Component Analysis: A method of analysing multivariate data in order to express their variation in a minimum number of principal components or linear combinations of the original, partially correlated variables.

Purchasing Power Parity (PPP): A method of measuring the relative purchasing power of different countries' currencies over the same types of goods and services. Goods and services may cost more in one country than in another. Therefore, PPP allows us to make more accurate comparisons of standards of living across countries. PPP estimates use price comparisons of comparable items but since not all items can be matched exactly across countries and time, the estimates are not always "robust".

Rai: Land area measure in Thailand. 1 rai = 1,600 square metres.

Range Equalization (RE) Method: The method of computing composite indices of different indicators in which each indicator is divided by the range (after subtraction of the lowest value) to arrive at scale-free values that vary between 0 and 1. If a country has maximum values for all the indicators in a category, it will score an index value of 1. Similarly, a country will obtain a composite score of zero only when it has the minimum value in all the indicators.

Sepsis: The presence of bacteria, virus, fungus, or other organisms in the blood or other tissues and the toxins associated with the invasion. Symptoms include a sudden drop in blood pressure and changes in heart rate.

Seropositive: Having a blood test result which indicates infection with an organism (e.g., HIV). A test may detect either antibodies to an organism (antibody positive) or the organism or its proteins (antigen positive).

Soochak: The person operating a *Soochanalaya* or information centre.

Soums: Refer *Aimags* above.

Tambon: An administrative unit in Thailand

Technology Achievement Index (TAI): The TAI presents data on the performance of 72 countries in creating and diffusing technology and in building a human skills base. First used by the UNDP in the Human Development Report 2001, it measures "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 network age".[1] The TAI focuses on four dimensions of technological capacity to compute the value of the index: creation of technology, diffusion of recent innovations, diffusion of old innovations and human skills.

Transmission Control Protocol/Internet Protocol (TCP/IP): A set of protocols developed by the US Department of Defence to develop ways to connect dissimilar computers across a network. The protocol family of the Internet network combines both TCP and IP.

Tim Koordinasi Telematika Indonesia: Coordinating Team for ICT Development in Indonesia.

Tugrig: The Mongolian national currency, 1 US$ equals 1,210 MNT, as of June 2005.

***Vivax* malaria:** *Vivax* malaria is usually more common than *P. falciparum* malaria and rarely causes any complications.

Very Small Aperture Terminal (VSAT): A kind of ground station used to contact a communications satellite such as INMARSAT.

MDGs

Appendices

Appendix I: Millennium Development Goals and indicators

Goals and Targets	Indicators
Goal 1: Eradicate Extreme Poverty and Hunger	
Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than US$ 1 a day	1. Proportion of population below US$ 1 (1993 PPP) per day 2. Poverty gap ratio (incidence X depth of poverty) 3. Share of poorest quintile in national consumption
Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	4. Prevalence of underweight children (under five years of age) 5. Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve Universal Primary Education	
Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	6. Net enrolment ratio in primary education 7. Proportion of pupils starting grade 1 who reach grade 5 8. Literacy rate of 15-24 year old
Goal 3: Promote Gender Equality and Empower Women	
Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015	9. Ratio of girls to boys in primary, secondary and tertiary education 10. Ratio of literate women to men (in the age group, 15-24) 11. Share of women in wage employment in the non-agricultural sector 12. Proportion of seats held by women in national parliament
Goal 4: Reduce Child Mortality	
Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	13. Under-five mortality rate 14. Infant mortality rate 15. Proportion of one-year-old children immunized against measles

Goal 5: Improve Maternal Health	
Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	16. Maternal mortality ratio 17. Proportion of births attended by skilled health personnel
Goal 6: Combat HIV/AIDS, Malaria and Other Diseases	
Target 7: Have halted by 2015, and begun to reverse, the spread of HIV/AIDS	18. HIV prevalence among 15-24 years old pregnant women 19. Condom use rate of the contraceptive prevalence rate 20. Number of children orphaned by HIV/AIDS
Target 8: Have halted by 2015, and begin to reverse, the incidence of malaria and other major diseases	21. Prevalence and death rates associated with malaria 22. Proportion of population in malaria risk areas using effective malaria prevention and treatment measures 23. Prevalence and death rates associated with tuberculosis 24. Proportion of tuberculosis cases detected and cured under DOTS (Directly Observed Treatment Short-course)
Goal 7: Ensure Environmental Sustainability*	
Target 9: Integrate the principles of sustainable development into country policies and programmes to reverse the loss of environmental resources	25. Proportion of land area covered by forest 26. Ratio of area protected to maintain biological diversity to surface area 27. Energy use (kg oil equivalent) per US$ 1 GDP (PPP) 28. Carbon dioxide emissions (per capita) and consumption of ozone-depleting CFCs (ODP tonnes) 29. Proportion of population using solid fuels
Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and sanitation	30. Proportion of population with sustainable access to an improved water source, urban and rural
Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	31. Proportion of population with access to improved sanitation, urban and rural 32. Proportion of households with access to secure tenure (owned or rented)

* Indicators for targets 12-15 are given in a combined list (from 33 to 44)
Source: http://millenniumindicators.un.org/unsd/mi/mi_goals.asp

Goal 8: Develop a Global Partnership for Development*	
Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system. Includes a commitment to good governance, development, and poverty reduction — both nationally and internationally Target 13: Address the special needs of the LDCs. Includes: tariff- and quota-free access for LDC's exports; enhanced programme of debt relief for Heavily Indebted Poor Countries (HIPC) and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction Target 14: Address the special needs of land-locked countries and Small Island Developing States (through the Programme of Action for the Sustainable Development of of Small Island Developing States and the outcome of the 22nd Special Session of the General Assembly) Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in long term	Some of the indicators listed below will be monitored separately for the Least Developed Countries (LDCs), Africa, landlocked developing countries and Small Island Developing States (SIDS) *Official Development Assistance (ODA)* 33. Net ODA, total and to LDCs, as a percentage of OECD/Development Assistance Committee donors' gross national income (GNI) 34. Proportion of total bilateral, sector allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) 35. Proportion of bilateral ODA of OECD/DAC donors that is untied 36. ODA received in landlocked developing countried as proportion of their GINs 37. ODA received in Small Island Developing States as proportion of their GINs *Market Access* 38. Proportion of total developed country imports (by value and excluding arms) from developing countries and LDCs, admitted free of duty 39. Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries 40. Agricultural support estimate for OECD countries as a percentage of their GDP 41. Proportion of ODA provided to help build trade capacity *Debt Sustainability* 42. Total number of countries that have reached their Heavily Indebted Poor Countries Initiative decision points and number that have reached their HIPC completion points (cumulative) 43. Debt relief committed under the HIPC Initiative 44. Debt service as a percentage of exports of goods and services

* Indicators for targets 12-15 are given in a combined list (from 33 to 44)
Source: http://millenniumindicators.un.org/unsd/mi/mi_goals.asp

Target 16: In co-operation with developing countries, develop and implement strategies for decent and productive work for youth	45. Unemployment rate of young people aged 15-24 years, each sex and total
Target 17: In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries	46. Proportion of population with access to affordable essential drugs on a sustainable basis
Target 18: In co-operation with the private sector, make available the benefits of new technologies, especially information and communications	47. Telephone lines and cellular subscribers per 100 population 48. Personal computers in use per 100 population and Internet users per 100 population

Appendix II: Indicators for ICT development under different MDGs, proposed as per the guidelines of UN ICT Task Force

MDG 1 — Eradication of extreme poverty and hunger

(i) Average income from ICT as percentage of GDP
(ii) Number of ICT initiatives related to the eradication of extreme poverty and hunger
(iii) Preps (poverty reduction strategy papers) that include development of ICT (IMF)

MDG 2 — Achievement of universal primary education

(i) ICT access and usage in primary school
(ii) Number of teachers trained in the usage of ICT
(iii) Initiatives related to ICT use in primary education
(iv) Presence of ICT-related content in primary education, particularly in terms of availability of learning materials in digital form in local languages, educational websites, e-learning products/services etc.

MDG 3 — Promotion of gender equality and empowerment of women

(i) Women's ICT access and usage
(ii) ICT literacy among girls
(iii) Sensitivity of ICT policy environment to gender issues assessing importance of women in ICT plan, policy or strategy[1]
(iv) Role of women in ICT policy-making
(v) Percentage of female IT workers or female technical workers
(vi) Initiatives to bring about women's advancement through the use of ICT

MDGs 4, 5 & 6 — Reduction of child mortality, improving maternal health and combating HIV/AIDS, malaria and other major diseases

(i) Initiatives promoted through ICT for sensitization of population on health-related issues like child mortality, maternal health, HIV/AIDS, malaria and other major diseases
(ii) Investment, penetration, usage of ICT in health institutions and by medical professionals and other health workers
(iii) Importance given to health and healthcare needs in terms of allocation of resources and setting perspectives, in country's ICT plan
(iv) Number and coverage of specific programmes and campaigns related to ICT in health sector

MDG 7 — ICT impact on environmental sustainability

(i) Presence of content related to environmental protection and sustainability including climate change, biodiversity, etc., in education and information, disseminated through ICT
(ii) Indicators pertaining to prevention/monitoring of environmental disasters
(iii) Initiatives related to reduction in consumption of energy, water and other essential resources through introduction of ICT

MDG 8 — Developing a global partnership for development

(i) Number of telephone connections
(ii) Number of personal computers
(iii) Number of people trained in ICT (local capacity-building)
(iv) Number of local companies registered with ICT as main/major business

(v) Number of domain names registered locally or domain addresses registered to an address in a country
(vi) Number of personal computers, phones, mobiles, radios, radio stations, etc.
(vii) Degree of competitiveness and regulatory controls in the market
(viii) Number of Internet Service Providers (ISPs)
(ix) Patents registered related to local ICT
(x) Number of registered software licenses
(xi) Number of health and educational institutions connected electronically
(xii) Number of web pages in major 'local' languages
(xiii) Number of IP addresses, domain names and email accounts
(xiv) Number of people employed in ICT sector

Appendix III: Indicators used for construction of indices pertaining to ICT development

1. *Availability or supply-linked — skill-independent*
   - i. Telephone mainlines (per 1,000 people)
   - ii. Cellular subscribers (per 1,000 people)
   - iii. Television sets (per 1,000 people)
   - iv. Radios (per 1,000 people)

2. *Availability or supply-linked — skill-dependent*
   - i. Internet users (per 100 people)
   - ii. Personal computers in use (per 100 people)
   - iii. ICT expenditure per capita (in US dollars)

3. *Efficiency and speed*
   - i. Internet service provider charges (in US dollars)
   - ii. Telephone usage charge for Internet service (in US dollars)
   - iii. Cost of local call per 3 min (in US dollars)
   - iv. Cost of call to US per 3 min (in US dollars)
   - v. Internet speed and access
   - vi. Training and education in IT

4. *Targeting social sectors*
   - i. Internet access in schools
   - ii. Computers installed in education (in thousands)
   - iii. Government prioritization in ICT
   - iv. Government online services availability

5. *Targeting vulnerable groups*
   - i. Female professional and technical workers (% of total female workers)
   - ii. Public access to Internet
   - iii. Government's success in ICT promotion
   - iv. Competition among Internet Service Providers (ISPs)
   - v. Laws related to ICT use

ICT FACT SHEET- CHINA

S. No.	INDICATOR	China		East Asia & the Pacific	Lower middle income[a]
	ICT Infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	33	137	110	146
2	Telephone mainlines-waiting list (thousands)	1400	812	1901	27675
3	Telephone mainlines-cost of local call ($ per 3 minutes)	NA	NA	0.02	0.04
4	Mobile phones (per thousand people)	3	110	97	110
5	International telecommunications-outgoing traffic (minutes per subscriber)	33	7	49	58
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	6.70	4.62	4.50
7	Daily newspapers (per thousand people)	42	NA	NA	NA
8	Radios (per thousand people)	339	339	287	346
9	Television sets (per thousand people)	243	312	266	292
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	2.3	19.0	19.1	28.1
11	Personal computers installed in education (thousands)	315.4	2092.1	NA	NA
12	Internet-users (thousand)	60.00	33700.0	50901.8	68936.9
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	20401.0	66612.0	NA	NA
14	ICT as % GDP	2.9	5.7	NA	NA
15	ICT per capita ($)	16.6	52.7	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	4.3	4.0	4.3
17	Competition in ISPs	NA	3.7	4.3	4.2
18	Government online services availability	NA	3.5	2.7	3.1
19	Laws relating to ICT use	NA	3.5	3.5	3.3
20	Government prioritization of ICT	NA	5.3	4.9	4.0

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Lower middle income refers to countries with 2002 GNI per capita of US$ 736-2,935.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

CHINA - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	China	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.745	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	94	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.721	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	104	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.566	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	101	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	13.2	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	24	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	14.2	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	26	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.741	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	71	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.718	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	83	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	NA	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	NA	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	NA	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	NA	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.299	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	45	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	0.17	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	41	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	China	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	1,294.9	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	37.7	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	23.7	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	4.9	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	1.8	2.7	2.9	3.3	2.0

	INCOME	China	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	4,580	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	3,571	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	5,435	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	3[b]	NA	NA	NA	NA
32	Percentage of Population Below Poverty Line (US$ 1 a day) - 1990-2002	16.6	NA	NA	NA	NA
33	Percentage of Population below Poverty Line (National Poverty Line) - 1990-2001	4.6	NA	NA	NA	NA

	EDUCATION	China	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	90.9	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	86.5	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	95.1	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	64[a]	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	69[a]	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	NA	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA

S. No.	HEALTH	China	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	70.9	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	73.2	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	68.8	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	31	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	39	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	53	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	11	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	40	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	69	85	77	68	73
52	Population with access to improved water source (%), 2000	75	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	94	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	66	71	69	81	67
	ENVIRONMENT	**China**	**World**	**Developing Countries**	**South Asia**	**East Asia & the Pacific**
55	Percentage of land area covered by forests, 2000	17.5	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.07	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	2.2	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes:

[a] Data refers to the 1999-2000 school year
[b] Data refers to 2000

ICT FACT SHEET- INDIA

S. No.	INDICATOR	India		South Asia	Low income[a]
	ICT Infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	13	38	32	26
2	Telephone mainlines-waiting list (thousands)	2277	1649	2624	3663
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.02	0.02	0.02	0.05
4	Mobile phones (per thousand people)	0	6	6	10
5	International telecommunications-outgoing traffic (minutes per subscriber)	29	14	58	114
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	3.20	2.66	5.27
7	Daily newspapers (per thousand people)	NA	60	60	40
8	Radios (per thousand people)	119	120	112	139
9	Television sets (per thousand people)	61	83	81	91
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	1.3	5.8	5.3	5.9
11	Personal computers installed in education (thousands)	23.6	238.7	NA	NA
12	Internet-users (thousand)	250.0	7000.0	7973.0	15332.3
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	7250.0	19662.0	NA	NA
14	ICT as % GDP	2.1	3.9	NA	NA
15	ICT per capita ($)	7.8	19.0	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	5.8	4.2	NA
17	Competition in ISPs	NA	4.5	4.2	NA
18	Government online services availability	NA	3.9	1.9	NA
19	Laws relating to ICT use	NA	4.3	3.3	NA
20	Government prioritization of ICT	NA	5.6	4.9	NA

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Low income refers to countries with 2002 GNI per capita of US$ 735 or less.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

INDIA - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	India	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.595	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	127	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.590	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	127	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.309	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	134	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	31.4	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	48	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	33.1	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	53	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.572	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	103	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.574	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	103	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	NA	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	NA	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	NA	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	NA	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.201	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	63	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	0.23	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	39	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	India	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	1,049.5	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	28.1	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	33.3	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	5.4	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	3.0	2.7	2.9	3.3	2.0

	INCOME	India	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	2,670	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	1,442	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	3,820	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	NA	NA	NA	NA	NA
32	Percentage of Population below Poverty Line (US$ 1 a day) - 1990-2002	34.7	NA	NA	NA	NA
33	Percentage of Population Below Poverty Line (National Poverty Line) - 1990-2001	28.6	NA	NA	NA	NA

	EDUCATION	India	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	61.3	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	46.4	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	69.0	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	48[a]	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	62[a]	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	4.1	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	38.4	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	40.1	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	20.3	NA	NA	NA	NA

S. No.	HEALTH	India	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	63.7	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	64.4	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	63.1	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	67	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	93	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	540	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	47	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	28	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	61	85	77	68	73
52	Population with access to improved water source (%), 2000	84	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	95	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	79	71	69	81	67

	ENVIRONMENT	India	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	21.6	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.05	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	1.1	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes:

[a] Data refers to the 2000-01 school year.

ICT FACT SHEET- INDONESIA

S. No.	INDICATOR	Indonesia		East Asia & the Pacific	Low income[a]
	ICT Infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	17	35	110	26
2	Telephone mainlines-waiting list (thousands)	117	NA	1901	3663
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.04	0.02	0.02	0.05
4	Mobile phones (per thousand people)	1	31	97	10
5	International telecommunications-outgoing traffic (minutes per subscriber)	63	44	49	114
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	4.20	4.62	5.27
7	Daily newspapers (per thousand people)	24	23	NA	40
8	Radios (per thousand people)	153	159	287	139
9	Television sets (per thousand people)	113	153	266	91
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	5.0	11.0	19.1	5.9
11	Personal computers installed in education (thousands)	22.1	58.5	NA	NA
12	Internet-users (thousand)	50.0	4000.0	50901.8	15332.3
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	4337.0	3540.0	NA	NA
14	ICT as % GDP	2.1	2.2	NA	NA
15	ICT per capita ($)	22.3	16.6	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	4.0	4.0	NA
17	Competition in ISPs	NA	4.2	4.3	NA
18	Government online services availability	NA	2.0	2.7	NA
19	Laws relating to ICT use	NA	2.8	3.5	NA
20	Government prioritization of ICT	NA	3.7	4.9	NA

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Low income refers to countries with 2002 GNI per capita of US$ 735 or less.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

INDONESIA - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Indonesia	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.692	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	111	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.682	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	112	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.515	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	108	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	17.8	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	35	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	17.9	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	33	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.685	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	90	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.677	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	91	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	NA	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	NA	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	NA	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	NA	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.211	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	60	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	-0.13	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	51	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Indonesia	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	217.1	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	44.5	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	29.9	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	5.2	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	2.4	2.7	2.9	3.3	2.0

	INCOME	Indonesia	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	3,230	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	2,138	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	4,161	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	NA	NA	NA	NA	NA
32	Percentage of Population Below Poverty Line (US$ 1 a day) - 1990-2002	7.5	NA	NA	NA	NA
33	Percentage of Population below Poverty Line (National Poverty Line) - 1990-2001	27.1	NA	NA	NA	NA

	EDUCATION	Indonesia	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	87.9	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	83.4	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	92.5	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	64	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	66	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	1.3	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	37.8	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	38.8	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	23.4	NA	NA	NA	NA

S. No.	HEALTH	Indonesia	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	66.6	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	68.6	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	64.6	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	33	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	45	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	380	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	26	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	55	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	69	85	77	68	73
52	Population with access to improved water source (%), 2000	78	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	90	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	69	71	69	81	67

	ENVIRONMENT	Indonesia	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	58.0	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.16	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	1.3	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

ICT FACT SHEET- MALAYSIA

S. No.	INDICATOR	Malaysia		East Asia & the Pacific	Upper middle income[a]
	ICT infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	166	196	110	201
2	Telephone mainlines-waiting list (thousands)	140	91	1901	3926
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.05	0.02	0.02	0.09
4	Mobile phones (per thousand people)	50	314	97	253
5	International telecommunications-outgoing traffic (minutes per subscriber)	111	146	49	111
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	2.37	4.62	2.16
7	Daily newspapers (per thousand people)	136	158	NA	123
8	Radios (per thousand people)	422	420	287	466
9	Television sets (per thousand people)	169	201	266	308
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	37.3	126.1	19.1	84.7
11	Personal computers installed in education (thousands)	31.4	121.9	NA	NA
12	Internet-users (thousand)	40.0	6500.0	50901.8	27607.4
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	4438.0	6325.0	NA	NA
14	ICT as % GDP	5.0	6.6	NA	NA
15	ICT per capita ($)	220.7	262.1	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	3.9	4.0	4.9
17	Competition in ISPs	NA	4.4	4.3	3.7
18	Government online services availability	NA	3.3	2.7	3.5
19	Laws relating to ICT use	NA	4.8	3.5	3.6
20	Government prioritization of ICT	NA	5.9	4.9	4.6

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Upper middle income refers to countries with 2002 GNI per capita of US$ 2,936-9,075.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

MALAYSIA - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Malaysia	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.793	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	59	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.790	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	58	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.790	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	57	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	NA	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	NA	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	NA	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	NA	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.786	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	52	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.784	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	53	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	0.519	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 | (Out of 78 countries)	44	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	0.503	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	45	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.396	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	30	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	0.69	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	27	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Malaysia	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	24.0	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	63.3	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	33.2	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	5.2	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	2.9	2.7	2.9	3.3	2.0

	INCOME	Malaysia	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	9,120	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	5,219	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	13,157	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	NA	NA	NA	NA	NA
32	Percentage of Population Below Poverty Line (US$ 1 a day) - 1990-2002	<2	NA	NA	NA	NA
33	Percentage of Population below Poverty Line (National Poverty Line) - 1990-2001	15.5[a]	NA	NA	NA	NA

	EDUCATION	Malaysia	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	88.7	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	85.4	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	92.0	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	72	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	69	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	7.9	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	28.1	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	34.5	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	32.1	NA	NA	NA	NA

S. No.	HEALTH	Malaysia	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	73.0	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	75.6	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	70.7	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	8	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	8	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	30	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	12	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	NA	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	NA	85	77	68	73
52	Population with access to improved water source (%), 2000	NA	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	NA	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	94	71	69	81	67

	ENVIRONMENT	Malaysia	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	58.7	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.05	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	6.2	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes:

[a] Data refers to a period other than that specified.

ICT FACT SHEET- MONGOLIA

S. No.	INDICATOR	Mongolia		East Asia & the Pacific	Low income[a]
	ICT infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	35	52	110	26
2	Telephone mainlines-waiting list (thousands)	39	38	1901	3663
3	Telephone mainlines-cost of local call ($ per 3 minutes)	NA	0.02	0.02	0.05
4	Mobile phones (per thousand people)	NA	81	97	10
5	International telecommunications-outgoing traffic (minutes per subscriber)	25	38	49	114
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	4.92	4.62	5.27
7	Daily newspapers (per thousand people)	31	30	NA	40
8	Radios (per thousand people)	145	50	287	139
9	Television sets (per thousand people)	66	72	266	91
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	3.4	14.6	19.1	5.9
11	Personal computers installed in education (thousands)	NA	NA	NA	NA
12	Internet-users (thousand)	0.2	40.0	50901.8	15332.3
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	NA	NA	NA	NA
14	ICT as % GDP	NA	NA	NA	NA
15	ICT per capita ($)	NA	NA	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	NA	4.0	NA
17	Competition in ISPs	NA	NA	4.3	NA
18	Government online services availability	NA	NA	2.7	NA
19	Laws relating to ICT use	NA	NA	3.5	NA
20	Government prioritization of ICT	NA	NA	4.9	NA

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Low income refers to countries with 2002 GNI per capita of US$ 735 or less.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

MONGOLIA - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Mongolia	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.668	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	117	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.661	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	117	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.578	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	100	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	19.1	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	38	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	19.1	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	36	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.664	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	94	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.659	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	95	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	0.429	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	62	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	NA	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	NA	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	NA	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	NA	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	NA	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	NA	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Mongolia	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	2.6	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	56.7	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	33.2	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	7.3	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	2.4	2.7	2.9	3.3	2.0

	INCOME	Mongolia	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	1,710	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	1,316	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	1,955	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	NA	NA	NA	NA	NA
32	Percentage of Population Below Poverty Line (US$ 1 a day) - 1990-2002	13.9	NA	NA	NA	NA
33	Percentage of Population below Poverty Line (National Poverty Line) - 1990-2001	36.3	NA	NA	NA	NA

	EDUCATION	Mongolia	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	97.8	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	97.5	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	98.0	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	76	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	64	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	6.5	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA

S. No.	HEALTH	Mongolia	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	63.7	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	65.7	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	61.7	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	58	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	71	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	160	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	13	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	30	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	46	85	77	68	73
52	Population with access to improved water source (%), 2000	60	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	77	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	30	71	69	81	67

	ENVIRONMENT	Mongolia	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	6.8	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.12	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	3.1	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

ICT FACT SHEET- PAKISTAN

S. No.	INDICATOR	Pakistan		South Asia	Low income[a]
	ICT infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	17	23	32	26
2	Telephone mainlines-waiting list (thousands)	209	230	2624	3663
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.05	0.02	0.02	0.05
4	Mobile phones (per thousand people)	0	6	6	10
5	International telecommunications-outgoing traffic (minutes per subscriber)	31	53	58	114
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	3.54	2.66	5.27
7	Daily newspapers (per thousand people)	23	40	60	40
8	Radios (per thousand people)	102	105	112	139
9	Television sets (per thousand people)	51	148	81	91
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	3.5	4.1	5.3	5.9
11	Personal computers installed in education (thousands)	NA	NA	NA	NA
12	Internet-users (thousand)	0.2	500.0	7973.0	15332.3
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	NA	NA	NA	NA
14	ICT as % GDP	NA	NA	NA	NA
15	ICT per capita ($)	NA	NA	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	NA	4.2	NA
17	Competition in ISPs	NA	NA	4.2	NA
18	Government online services availability	NA	NA	1.9	NA
19	Laws relating to ICT use	NA	NA	3.3	NA
20	Government prioritization of ICT	NA	NA	4.9	NA

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Low income refers to countries with 2002 GNI per capita of US$ 735 or less.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

PAKISTAN - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Pakistan	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.497	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	142	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.499	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	144	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.311	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	132	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	41.9	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	71	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	40.2	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	65	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.471	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	120	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.469	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	120	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	0.416	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	64	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	0.414	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	58	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.167	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	65	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	-0.38	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	63	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Pakistan	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	149.9	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	33.7	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	41.5	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	6.3	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	5.1	2.7	2.9	3.3	2.0

	INCOME	Pakistan	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	1,940	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	915	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	2,789	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	13[a]	NA	NA	NA	NA
32	Percentage of Population Below Poverty Line (US$ 1 a day) - 1990-2002	13.4	NA	NA	NA	NA
33	Percentage of Population below Poverty Line (National Poverty Line) - 1990-2001	32.6	NA	NA	NA	NA

	EDUCATION	Pakistan	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	41.5	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	28.5[b]	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	53.4[b]	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	31[c]	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	43[c]	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	1.8	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA

S. No.	HEALTH	Pakistan	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	60.8	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	60.7	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	61.0	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	83	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	107	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	530	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	38	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	62	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	95	85	77	68	73
52	Population with access to improved water source (%), 2000	90	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	95	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	87	71	69	81	67

	ENVIRONMENT	Pakistan	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	3.1	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.05	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	0.8	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes:

[a] Data refers to 2000.
[b] Data refers to a year between 1995 and 1999.
[c] Data refers to 2000/01 school year.

ICT FACT SHEET- SRI LANKA

S. No.	INDICATOR	Sri Lanka		South Asia	Lower middle income[a]
	ICT infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	11	44	32	146
2	Telephone mainlines-waiting list (thousands)	227	258	2624	27675
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.03	0.04	0.02	0.04
4	Mobile phones (per thousand people)	3	36	6	110
5	International telecommunications-outgoing traffic (minutes per subscriber)	138	58	58	58
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	2.66	2.66	4.50
7	Daily newspapers (per thousand people)	28	29	60	NA
8	Radios (per thousand people)	214	215	112	346
9	Television sets (per thousand people)	78	117	81	292
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	1.1	9.3	5.3	28.1
11	Personal computers installed in education (thousands)	NA	NA	NA	NA
12	Internet-users (thousand)	1.0	150.0	7973.0	68936.9
	ICT expenditures	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	NA	NA	NA	NA
14	ICT as % GDP	NA	NA	NA	NA
15	ICT per capita ($)	NA	NA	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	4.2	4.2	4.3
17	Competition in ISPs	NA	4.2	4.2	4.2
18	Government online services availability	NA	1.9	1.9	3.1
19	Laws relating to ICT use	NA	3.3	3.3	3.3
20	Government prioritization of ICT	NA	4.9	4.9	4.0

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Lower middle income refers to countries with 2002 GNI per capita of US$ 736-2,935.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

SRI LANKA - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Sri Lanka	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.740	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	96	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.730	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	99	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.663	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	86	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	18.2	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	36	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	18.3	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	34	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.738	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	73	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.726	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	80	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	0.276	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	74	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	0.272	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	67	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.203	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	62	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	-0.49	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	71	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Sri Lanka	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	18.9	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	21.1	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	25.0	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	4.1	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	2.0	2.7	2.9	3.3	2.0

	INCOME	Sri Lanka	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	3,570	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	2,570	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	4,523	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	24[a]	NA	NA	NA	NA
32	Percentage of Population below Poverty Line (US$ 1 a day) - 1990-2002	6.6	NA	NA	NA	NA
33	Percentage of Population Below Poverty Line (National Poverty Line) - 1990-2001	25.0	NA	NA	NA	NA

	EDUCATION	Sri Lanka	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	92.1	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	89.6	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	94.7	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	66[b]	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	64[b]	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	1.3	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA

S. No.	HEALTH	Sri Lanka	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	72.5	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	75.8	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	69.8	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	17	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	19	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	92	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	29	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	94	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	97	85	77	68	73
52	Population with access to improved water source (%), 2000	77	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	98	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	70	71	69	81	67

	ENVIRONMENT	Sri Lanka	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	30.0	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.13	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	0.6	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.
5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes:

[a] Data refers to 2000
[b] Data refers to 1998-9 school year

ICT FACT SHEET- THAILAND

S. No.	INDICATOR	Thailand		East Asia & the Pacific	Lower middle income[a]
	ICT infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	61	99	110	146
2	Telephone mainlines-waiting list (thousands)	1083	544	1901	27675
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.12	0.07	0.02	0.04
4	Mobile phones (per thousand people)	23	123	97	110
5	International telecommunications-outgoing traffic (minutes per subscriber)	67	52	49	58
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	1.49	4.62	4.50
7	Daily newspapers (per thousand people)	46	64	NA	NA
8	Radios (per thousand people)	188	235	287	346
9	Television sets (per thousand people)	198	300	266	292
	Computers and the internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	14.1	27.8	19.1	28.1
11	Personal computers installed in education (thousands)	88.9	271.5	NA	NA
12	Internet-users (thousand)	55.0	3536.0	50901.8	68936.9
	ICT expenditure	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	4464.0	4751.0	NA	NA
14	ICT as % GDP	2.7	3.7	NA	NA
15	ICT per capita ($)	75.2	75.6	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	3.9	4.0	4.3
17	Competition in ISPs	NA	4.9	4.3	4.2
18	Government online services availability	NA	3.2	2.7	3.1
19	Laws relating to ICT use	NA	3.5	3.5	3.3
20	Government prioritization of ICT	NA	5.1	4.9	4.0

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Lower middle income refers to countries with 2002 GNI per capita of US$ 736-2,935.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

THAILAND - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Thailand	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.768	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	76	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.768	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	74	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.715	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	74	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	13.1	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	22	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	12.9	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	24	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.766	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	61	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.766	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	61	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	0.461	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	57	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	0.457	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	55	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	0.337	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	40	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	0.27	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	36	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Thailand	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	62.2	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	31.6	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	25.6	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	5.0	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	1.9	2.7	2.9	3.3	2.0

	INCOME	Thailand	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	7,010	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	5,284	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	8,664	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	7[a]	NA	NA	NA	NA
32	Percentage of Population below Poverty Line (US$ 1 a day) - 1990-2002	<2	NA	NA	NA	NA
33	Percentage of Population Below Poverty Line (National Poverty Line) - 1990-2001	13.1	NA	NA	NA	NA

	EDUCATION	Thailand	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	92.6	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	90.5	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	94.9	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	72[b]	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	74[b]	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	5.0	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	42.3	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	20.5	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	21.7	NA	NA	NA	NA

S. No.	HEALTH	Thailand	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	69.1	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	73.4	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	65.2	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	24	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	28	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	36	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	19[c]	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	96	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	96	85	77	68	73
52	Population with access to improved water source (%), 2000	84	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	95	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	81	71	69	81	67

	ENVIRONMENT	Thailand	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	28.9	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.14	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	3.3	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.

2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.

3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.

4 For rows 19,20: UNDP (2001) Human Development Report 2001, Oxford University Press, New York.

5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes

[a] Data refers to 2000

[b] Data refers to the 2000-01 school year.

[c] Data refers to a year/period other than that specified, differs from the standard definition or refers to only part of the country

ICT FACT SHEET- VIETNAM

S. No.	INDICATOR	Vietnam		East Asia & the Pacific	Low income[a]
	ICT infrastructure and access	**1995**	**2001**	**2001**	**2001**
1	Telephone mainlines (per thousand people)	11	38	110	26
2	Telephone mainlines-waiting list (thousands)	150	NA	1901	3663
3	Telephone mainlines-cost of local call ($ per 3 minutes)	0.10	0.02	0.02	0.05
4	Mobile phones (per thousand people)	0	15	97	10
5	International telecommunications-outgoing traffic (minutes per subscriber)	50	18	49	114
6	International telecommunications-cost of calls to US ($ per 3 minutes)	NA	NA	4.62	5.27
7	Daily newspapers (per thousand people)	4	4	NA	40
8	Radios (per thousand people)	107	109	287	139
9	Television sets (per thousand people)	163	186	266	91
	Computers and the Internet	**1995**	**2001**	**2001**	**2001**
10	Personal computers per thousand people	1.4	11.7	19.1	5.9
11	Personal computers installed in education (thousands)	7.7	27.0	NA	NA
12	Internet-users (thousand)	NA	1009.5	50901.8	15332.3
	ICT expenditures	**1995**	**2001**	**2001**	**2001**
13	Total ICT ($, million)	740.0	2124.0	NA	NA
14	ICT as % GDP	3.6	6.7	NA	NA
15	ICT per capita ($)	10.0	26.2	NA	NA
	ICT business and government environment*	**1995**	**2002**	**2002**	**2002**
16	Local specialized IT services availability	NA	3.4	4.0	NA
17	Competition in ISPs	NA	2.7	4.3	NA
18	Government online services availability	NA	2.2	2.7	NA
19	Laws relating to ICT use	NA	2.8	3.5	NA
20	Government prioritization of ICT	NA	4.7	4.9	NA

Notes

* Ratings from 1 to 7. The highest/best rating is 7.

[a] Low income refers to countries with 2002 GNI per capita of US$ 735 or less.

Source: World Bank website: http://www.worldbank.org/data/countrydata/countrydata.html

VIETNAM - HUMAN DEVELOPMENT FACT SHEET

INDICES

S. No.	INDICES	Vietnam	World	Developing Countries	South Asia	East Asia & the Pacific
1	Human Development Index Value, 2002	0.691	0.729	0.663	0.584	0.740
2	Human Development Index Rank, 2002 (Out of 177 countries)	112	NA	NA	NA	NA
3	Human Development Index Value, 2001	0.688	0.722	0.655	0.582	0.722
4	Human Development Index Rank, 2001 (Out of 175 countries)	109	NA	NA	NA	NA
5	Human Development Index Value, 1990	0.472	NA	NA	NA	NA
6	Human Development Index Rank, 1990 (Out of 173 countries)	115	NA	NA	NA	NA
7	Human Poverty Index Value (%), 2002	20.0	NA	NA	NA	NA
8	Human Poverty Index Rank, 2002 (Out of 95 countries)	41	NA	NA	NA	NA
9	Human Poverty Index Value (%), 2001	19.9	NA	NA	NA	NA
10	Human Poverty Index Rank, 2001 (Out of 94 countries)	39	NA	NA	NA	NA
11	Gender-Related Development Index Value, 2002	0.689	NA	NA	NA	NA
12	Gender-Related Development Index Rank, 2002 (Out of 144 countries)	87	NA	NA	NA	NA
13	Gender-Related Development Index Value, 2001	0.687	NA	NA	NA	NA
14	Gender-Related Development Index Rank, 2001 (Out of 144 countries)	89	NA	NA	NA	NA
15	Gender Empowerment Measure Value, 2002	NA	NA	NA	NA	NA
16	Gender Empowerment Measure Rank, 2002 (Out of 78 countries)	NA	NA	NA	NA	NA
17	Gender Empowerment Measure Value, 2001	NA	NA	NA	NA	NA
18	Gender Empowerment Measure Rank, 2001 (Out of 70 countries)	NA	NA	NA	NA	NA
19	Technology Achievement Index Value, 2000	NA	NA	NA	NA	NA
20	Technology Achievement Index Rank, 2000 (Out of 72 countries)	NA	NA	NA	NA	NA
21	Networked Readiness Index Score, 2004	-0.46	NA	NA	NA	NA
22	Networked Readiness Index Rank, 2004 (Out of 104 countries)	68	NA	NA	NA	NA

INDICATORS

	DEMOGRAPHY	Vietnam	World	Developing Countries	South Asia	East Asia & the Pacific
23	Total Population (millions), 2002	80.3	6,225.0T	4,936.9T	1,480.3T	1,917.6T
24	Urban Population (as % of the total), 2002	25.2	47.8	41.4	29.6	40.2
25	Population under age 15 (as % of the total), 2002	31.7	29.4	32.2	34.8	25.8
26	Total Fertility Rate, 1970-75	6.7	4.5	5.4	5.6	5.0
27	Total Fertility Rate, 2000-5	2.3	2.7	2.9	3.3	2.0

	INCOME	Vietnam	World	Developing Countries	South Asia	East Asia & the Pacific
28	GDP Per Capita (PPP US$), 2002	2,300	7,804	4,054	2,658	4,768
29	Female Estimated Earned Income (PPP US$), 2002	1,888	NA	NA	NA	NA
30	Male Estimated Earned Income (PPP US$), 2002	2,723	NA	NA	NA	NA
31	Youth unemployment (% of labour force aged 15-24), 2001	NA	NA	NA	NA	NA
32	Percentage of Population below Poverty Line (US$ 1 a day) - 1990-2002	17.7	NA	NA	NA	NA
33	Percentage of Population Below Poverty Line (National Poverty Line) - 1990-2001	50.9	NA	NA	NA	NA

	EDUCATION	Vietnam	World	Developing Countries	South Asia	East Asia & the Pacific
34	Adult Literacy Rate (% age 15 and above), 2002	90.3b	NA	76.7	57.6	90.3
35	Female Literacy Rate, 2002 (%)	86.9a	NA	NA	NA	NA
36	Male Literacy Rate, 2002 (%)	93.9a	NA	NA	NA	NA
37	Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	61	NA	NA	NA	NA
38	Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2001-02	67	NA	NA	NA	NA
39	Public Expenditure on Education (as % of GDP), 1999-2001	NA	NA	NA	NA	NA
40	Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
41	Public Exp. on Secondary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA
42	Public Exp. on Tertiary Education (as % of all levels), 1999-2001	NA	NA	NA	NA	NA

S. No.	HEALTH	Vietnam	World	Developing Countries	South Asia	East Asia & the Pacific
43	Life Expectancy at Birth (yrs.), 2002	69.0	66.9	64.6	63.2	69.8
44	Life Expectancy at Birth (Female), 2002 (yrs)	71.4	NA	NA	NA	NA
45	Life Expectancy at Birth (Male), 2002 (yrs.)	66.7	NA	NA	NA	NA
46	Infant Mortality Rate (per 1,000 live births), 2002	30	56	61	69	32
47	Under 5 Mortality Rate (per 1,000 live births), 2002	39	81	89	95	42
48	Maternal Mortality Ratio Reported (per 100,000 live births), 1985-2002	95	NA	NA	NA	NA
49	Percentage of children underweight for age (% under age 5), 1995-2002	33	NA	NA	NA	NA
50	Population with access to improved sanitation (%), 2000	47	61	51	37	48
51	Population with access to improved sanitation (%), Urban, 2000	82	85	77	68	73
52	Population with access to improved water source (%), 2000	77	82	78	85	76
53	Population with access to improved water source (%), Urban, 2000	95	95	92	95	93
54	Population with access to improved water source (%), Rural, 2000	72	71	69	81	67

	ENVIRONMENT	Vietnam	World	Developing Countries	South Asia	East Asia & the Pacific
55	Percentage of land area covered by forests, 2000	30.2	NA	NA	NA	NA
56	Ratio of protected area to surface area, 2003	0.03	NA	NA	NA	NA
57	Per capita carbon dioxide emissions (metric tons), 2000	0.7	3.8	1.9	1.1	2.3

Source:

1 UNDP (2004), Human Development Report 2004, Oxford University Press, New York.
2 For rows 3, 4, 9, 10, 13, 14, 17, 18, 31, 51, 53, 54, 55, 56: UNDP (2003) Human Development Report 2003, Oxford University Press, New York.
3 For rows 5, 6: UNDP (1993) Human Development Report 1993, Oxford University Press, New York.
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5 For rows 21,22: World Economic Forum (2005) The Global Information Technology Report 2004-2005, Palgrave Macmillan, New York.

Notes:

[a] Data refers to a year between 1995 and 1999.
[b] Data refers to a year other than that specified.

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http://regionalcentrebangkok.undp.or.th/,
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Developing countries the world over have made widespread ICT use a central feature of their development agenda. To this end, they have devised policies aimed at promoting the use of information technology for development; radically altered their communications polices; invested massively in strengthening and extending their ICT infrastructure; and launched numerous e-governance initiatives. Conviction that ICT use can accelerate the pace and improve the quality of development is strong.

This Regional Human Development Report (RHDR) on *Promoting ICT for Human Development in Asia: Realizing the Millennium Development Goals* is an attempt to holistically assess the role that ICTs can play in advancing human development in nine countries in Asia — China, India, Indonesia, Malaysia, Mongolia, Pakistan, Sri Lanka, Thailand, and Vietnam. The Report explores the relationship between ICTs and human development using the United Nation's Millennium Development Goals (MDGs) as the framework for assessment. It attempts to go beyond the hype surrounding the potential and promise of ICT for developing countries, and systematically examine how ICTs can be harnessed to address the critical concerns of human development such as poverty eradication, healthcare, education, environmental management and economic development.

The diversity of the nine countries presents a rich canvas for the research. The varied socio-economic, political, geographic and cultural circumstances in which ICT for human development has been explored, can provide useful insights on not only other Asian countries but also, more generally, the developing world. This unique Report:

- Assesses the status of ICT use and diffusion in Asia
- Maps experiences in the Asian region with harnessing these technologies for human development
- Presents a composite aggregate index that ranks the nine countries in their use of ICT for achieving human development goals
- Recognizes and identifies the limitations to applying ICTs to further human development, and the possibilities of widening the digital divide
- Draws lessons from multi-country experiences for identifying policy directions

This Report establishes that, the limited reach of technology notwithstanding, use of ICT to help realize the MDGs has progressed substantially and cannot be reversed. The Asian region is particularly well placed to harness and strategically deploy ICT for human development as it constitutes one of the fastest growing ICT industries. The way forward is to support the growth and spread of ICT, steering it in the direction of human development applications. Towards this end, the State, NGOs, and the private sector have complementary roles. There is also a need to prioritize and cost ICT opportunities for a range of implementation modalities, within the context of each MDG.

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