

THE ROLE OF ICT IN ADVANCING GROWTH IN LEAST DEVELOPED COUNTRIES

Trends, Challenges and Opportunities 2011



ICT Service / Applications

Strategies & Policies

Universal Access

Smart Skills

New & Low Cost Technologies

Emergency Telecommunications



**THE ROLE OF ICT IN ADVANCING GROWTH IN
LEAST DEVELOPED COUNTRIES**

TRENDS, CHALLENGES AND OPPORTUNITIES

2011



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International Telecommunication Union (ITU), Geneva

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Preface

I am pleased to present you this publication on *The Role of ICT in Advancing Growth in Least Developed Countries: Trends, Challenges and Opportunities*. The Fourth United Nations Conference for the LDCs (LDC-IV) is a momentous occasion to release a publication of this nature. It is with great pleasure that ITU has also launched at LDC-IV another publication on *ICT and Telecommunications in Least Developed Countries: 2001 – 2010*.

LDC-IV coincides with a critical point in the achievement of the Millennium Development Goals (MDGs), with only five more years to meet the targets set for 2015. The report examines some of the emerging trends and current challenges faced by LDCs on their road to poverty alleviation, taking into consideration changes in their political, economic and social environment, concerns regarding access to financial resources, infrastructural obstacles – in particular those of the telecommunication sector – as well as additional risks that arise due to climate change and frequent natural disasters. The issue of climate change is quite critical in view of the fact that eleven of the LDCs are also Small Island Developing States that are particularly vulnerable to natural as well as environmental disasters and have a limited capacity to respond to and recover from such disasters.

As is evident in the report, there are signs of an upturn in the growth of ICT in LDCs. Mobile communications have emerged as a key technology to bridge the digital divide in LDCs and as a means to accelerate the diffusion of government, health and environmental information throughout their countries. Yet, the challenge of making these services affordable still remains. The introduction of ICT applications, particularly those to support the administration of public activities and improve the provision of health services, will require the deployment of more advanced technologies and backbone networks, able to handle large amounts of data at higher speeds. To this end, ITU has launched a Connect the World Series initiative which mobilizes resources from the development partners for ushering the deployment of ICT infrastructure, particularly broadband technology; facilitate the harmonization of ICT policies, and support the creation of an enabling policy environment, so that LDCs can exploit all the opportunities ICT have to offer to advance growth and promote sustainable development.

ICTs and globalization offer technological opportunities to LDCs and the report outlines that:

- Telecommunications/ICTs will be the driving force of the new green economy. LDCs should be assisted to embrace these technologies for their developmental needs.
- Information and communication technologies play a catalytic role in the attainment of the Millennium Development Goals (eradicate extreme poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS, Malaria and other diseases, ensure environmental sustainability, and develop a global partnership for development).
- Information and communication technologies facilitate progress in other sectors such as trade, productive capacities, environment, disaster risk reduction, disaster management, education, gender mainstreaming, health, agriculture, and climate change as these technologies impact every facet of human life.

- The seven convergent and interdependent forces of policy, infrastructure, technology, innovation, content and applications, people and government should be harnessed by the international community to build a Broadband Dynamic.
- Finally, the importance of ICT for development in LDCs is clear, however innovative financing models for the implementation of ICT projects still remains as an urgent necessity to ensure sustainability in mid and long term. Public and private sector partnerships should be forged in order pool resources that could lead to universal access to ICTs and ultimately to the creation of the knowledge Society in LDCs.



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Foreword

Writing this foreword in early 2011, I am struck forcefully by the role of ICTs in influencing the volatility of the global political environment. Although none of the authors who contributed to this volume foresaw in their chapters the dramatic changes that have taken place in the Middle East at the start of this year, several have indeed emphasised the important ways in which ICTs can lead to a reconfiguration of the means through which social change takes place. As Chapter 6 emphasises, “Ultimately, informational spaces are those in which people feel safe and confident to develop their ideas and their capacity to understand and to act. Whilst they may be highly informal, their creation and existence may also help negotiate new opportunities for participation that did not previously exist” (p. 140). It is perhaps no coincidence that it was in Tunisia, the host country of the second phase of the World Summit on the Information Society in 2005, that the “Jasmine Revolution” first really showed the power of new ICTs to catalyse fundamental political change.

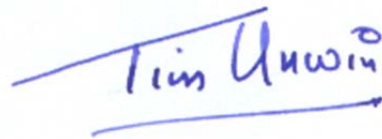
This important ITU report focuses explicitly on the experiences of people living in the world’s ‘Least Developed Countries’ (LDCs). It addresses not only how and why ‘outsiders’ have been eager to offer new ICTs as a means to encourage their ‘development’, but also how technical innovation can occur in some of the poorest countries of the world. Above all, it suggests that there is nothing automatic about the potential contribution of ICTs to ‘development’ processes, however these are defined. If marginalised people and poor countries are to take advantage of ICTs in transforming their fortunes, then specific efforts need to be made to address their needs and aspirations. The market by itself will not deliver on the information and communication requirements of the poorest and most marginalised people and communities. Three themes are of particular significance in this agenda.

First, the headlong rush into an unregulated free-for-all in the telecommunications market is increasingly recognised as not necessarily having been in the interests of the poorest people and countries. As argued in Chapter 2, “The experience with regulatory reform also revealed the limits of market-based approaches. Where high investment is necessary but demand is insufficient to justify commercial investment, unregulated market forces may lead to unacceptable outcomes” (p. 7). Despite such welcome assertions, we are not necessarily much nearer identifying optimal scenarios for regulatory systems that enable universal access to be achieved. This is not just a matter of technical solutions, plenty as they are, but rather emphasises that there needs to be the political will in place to ensure that excesses of the market are tempered by a real concern to ensure that *everyone* can benefit from the richness of opportunities that the Internet and mobile technologies can offer. We need to continue to work tirelessly to ensure that the introduction of new ICTs does not actually increase inequalities and thus poverty amongst those least able to fend for themselves. Even at a national scale, plenty of charts in this volume (see for example Charts 2.10 and 2.12) show all too clearly that whilst developing countries in general might be improving their position in terms of a range of telecommunication indicators, this is not necessarily true of LDCs. Moreover, it remains very clear that many individuals who are already marginalised in terms of their spatial or social access to technologies are becoming increasingly disadvantaged because they are living in rural areas distant from the main digital nodes or because their serious disabilities are not addressed by the available technological solutions.

A second important theme highlighted in this report is the differential impact of mobile technologies. Chapter 4, in particular, highlights the potential of mobile technology to provide greater access and services, as well as sustainable infrastructures that can support citizens of LDCs. Back at the Tunisian phase of WSIS in 2005, very few people anticipated the scale at which mobile networks and technologies would be rolled out across the world. With more than 5 billion mobile subscribers across the world at the end of 2010, and mobile network coverage at 75 per cent, mobile digital devices have helped to transform the lives of many, many people globally. However, if ICTs are really to make a significant impact on reducing inequalities, then we need to pay much more attention to identifying ways through which people living in the 25 per cent of the world that remains unconnected can indeed gain the benefits that such technologies can provide. Chapter 4 thus highlights the important catalytic role that the ITU can play in increasing connectivity in LDCs, and Chapter 5 provides case study evidence as to how some of these countries have indeed managed to use connectivity successfully to enhance socio-economic development. We still, though, need to find yet more innovative ways in which mobile devices can really serve the social, political and cultural needs of the poorest of our peoples. Poor people undoubtedly value mobile phones for the social connectivity that they provide, but the share of their limited budgets that they devote to such networking remains unacceptably high. As Chapter 6 notes, “Very poor families in South Africa, for instance, can spend up to 20 per cent of their income on mobile telephony because they do not want to be excluded from their own family networks” (p. 141). It would be interesting to know more about what these poor people have given up spending money on to be able to afford to pay for telephones and connectivity, and what the actual impact is on their social and economic well-being. Technological change does not benefit people equally; even mobile telephones can increase inequalities of many different kinds between those who have access to them, and those who do not.

Finally, this report has significant comments to make about the role of different players in the telecommunications arena. Partnerships of many different kinds are important in delivering the potential benefits of ICTs to the poorest people and countries, but for too long we have concentrated only on states and companies, as epitomised in the notion of Public-Private Partnerships (PPPs). While ruling elites and company profits have benefitted considerably from such partnerships, their failure to engage satisfactorily with civil society organisations and others involved in implementing social and cultural development activities has often meant that the poorest have been ignored or disadvantaged as a result of their activities. In recognition of the need to engage broader coalitions of partners if the benefits of ICTs are truly to serve the most marginalised, we need to focus much more explicitly on Multi-Stakeholder Partnerships (MSPs) that bring together stakeholders other than just governments and private sector corporations. This reflects the need for such partnerships to concentrate not just on economic profit, but also on ensuring that the social, cultural and political implications of ICTs are fully considered in their implementation. Moreover, to do so, we need to develop much more sophisticated means of monitoring and evaluating the impact of ICT programmes, especially where they are designed to support the least developed countries and most marginalised peoples. Developing affordable and accessible technologies specifically for the poor and those with disabilities remains a challenge for the global community.

This exciting report points in many directions. It highlights both the successes and the failures of ICT initiatives and developments over the last decade, particularly with respect to LDCs. It emphasises the many challenges that still need to be overcome before we can claim that these technologies really have had the equalising benefits that many attendees at WSIS had hoped for. However, above all, it provides suggestions for innovative ways forward through which some of the poorest countries in the world can grasp the potential of ICTs to enhance the lives of their peoples.



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Acknowledgements

This report on *The Role of ICT in Advancing Growth in Least Developed Countries: Trends, Challenges and Opportunities* was prepared by the Programme for Least Developed Countries, Countries in Special Need, Emergency Telecommunications and Climate Change Adaptation Division within the Telecommunication Development Bureau of ITU. The team was led by Cosmas Zavazava (Head of Division) and consists of: Lilia Perez-Chavolla, ICT consultant, Johannes Bauer, Professor, Department of Telecommunication, Information Studies, and Media, Michigan State University, United States; Vanessa Gray of the Statistics Division of the Telecommunication Development Bureau; Eric E. Otenyo, Associate Professor, Department of Political Sciences, Northern Arizona University United States; Rohan Samarajiva, CEO, Lirneasia, Sri Lanka; Richard Labelle, Consultant on ICT for Development; The Aylmer Group, Canada; Gabriel Solomon, Vice President, GSMA (Mobile Technologies); Ahmed Imran, Tim Turner and Shirley Gregor, National Centre for Information Systems Research, The Australian National University, Australia (ICT Applications); Arindam Bose, Chairman Maitlamo a Tswelelopele, Pty Ltd, and Dr. Kabita Bose, Faculty, University of Botswana, Botswana; Michael Powell and Sarah Cummings, from the IKM Emergent Research Programme, The Netherlands.

ITU also appreciates the information provided by Opal Lawton, Expert ICT Policy & Regulations, Trinidad, Christopher Clark, Partnerships, Promotion and Membership Division, Fuatai Purcell, Pacific Islands Forum Secretariat, and Danya Nusseir, Samer Abbas and Tareq Masarweh, Arab Advisors Group, Jordan, and Timothy Kelly, Lead ICT Policy Specialist, InfoDev (Investment Opportunities). The editorial input of Mr. Mark Woodall of the Telecommunication Development Bureau of the ITU is highly appreciated.

The ITU Publications Department was responsible for production of the report (cover and layout). Administrative support was provided by Christine Ochienghs.

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List of abbreviations

2G	Second generation (mobile technology)
3G	Third generation (mobile technology)
ADB	Asian Development Bank
ADSL	Asymmetric Digital Subscriber Line
AfDB	African Development Bank
AHI	Africa Health Infoway
ALIN	Arid Lands Information Network
ASEAN	Association of Southeast Asian Nations
AU	African Union
AVU	African Virtual University
BDP	Botswana Democratic Party
BTA	Botswana Telecommunications Authority
BTC	Botswana Telecommunications Corporation
BTNM	Budget Telecom Network Model
CAB	Central African Backbone project
CAGRs	Compound Annual Growth Rates
CDMA	Code Division Multiple Access
CDP	Committee for Development Policy
CEMAC	Communauté Economique et Monétaire de l'Afrique Centrale
CFCs	Chlorofluorocarbons
CIDA	Canadian International Development Agency
CIRCs	Community Information Resource Centres
CIS	Commonwealth of Independent States (region)
COMESA	Common Market for Eastern and Southern Africa
CONATEL	National Telecommunication Board (Haiti)
CTU	Caribbean Telecommunication Union
DAC	Development Assistance Committee (OECD)
DBCDE	Department of Broadband Communications and the Digital Economy (Australia)
DVD	Digital video disc
EAC	East African Community
EASSy	Eastern Africa Submarine System
ECOSOC	UN Economic and Social Council
ECOWAS	Economic Community of West African States
ECTEL	Eastern Caribbean Telecommunications Authority
EDGE	Enhanced Data rates for Global Evolution (mobile technology)
EPLF	Eritrean People's Liberation Front
EVI	Economic vulnerability index
FDC	Forum for Democratic Change
G2B	Government-to-business (transactions and services)

G2C	Government-to-citizen (transactions and services)
G2G	Government-to-government (transactions and services)
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GB	Gigabit
GDP	Gross domestic product
GHGs	Greenhouse gases
GNI	Gross national income
GPRS	General Packet Radio Service
GPS	Global positioning satellite
GSM	Groupe Spécial Mobile
GSP	Generalized System of Preferences
GSTP	Global System of Trade Preferences
HAI	Human assets index
HIPSSA	Harmonization of ICT policies in Sub-Saharan Africa
HSPA	High Speed Packet Access (mobile technology)
ICT	Information and communication technologies
ICTD	Information and communication technologies for development – also ICT4D
IDA	International Development Association
IEA	International Energy Agency
IGAD	Intergovernmental Authority on Development
IKM	Information and Knowledge Management
IMF	International Monetary Fund
iNGOs	International NGOs
IPCC	Intergovernmental Panel on Climate Change
IPTV	Internet-based broadcasting services
ISP	Internet Service Provider
IVR	Interactive voice response systems
KB	Kilobits – also Kilobyte or Kbytes
LDCs	Least Developed Countries
LDC-IV	Fourth United Nations Conference on the Least Developed Countries
LLDCs	Landlocked developing countries
MB	Megabit – also Megabyte or MBytes
MCT	Multipurpose Community Telecentre
MDC	Movement for Democratic Change
MDGs	Millennium Development Goals
MDN	Management Data Network
MNOs	Mobile Network Operators
MPSL	Multi-Protocol Label Switching
MTIT	Ministry of Telecommunications and Information Technology (Yemen)
MTN	Mobile Telephone Networks South Africa
NCA	National Communications Authority (Ghana)

NDP	National Development Plan (Botswana)
NEPAD	New Partnership for Africa's Development
NGN	Next generation networks
NGOs	Non-governmental organisations
NICT	National Information and Communication Technology Plan
NTC	National Telecom Corporation (Sudan)
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
PC	Personal computer
PIDA	Programme for Infrastructure Development in Africa
PPP	Purchasing power parity
PTC	Public Telecommunications Corporation (Yemen)
RCIP	Regional Communications Infrastructure Programme
RECs	Regional Economic Communities
SACU	Southern African Customs Union
SADC	Southern Africa Development Community
SASEC	South Asia Subregional Economic Cooperation
SIDS	Small Island Developing States
SIM	Subscriber identity module (mobile technology)
SIMs/100	SIMs per 100 inhabitants
SMP	Significant market power
SMS	Short Message Service
TAM	Telecommunication Authority of Maldives
TB	Terabit – also Terabyte or Tbytes
TRIPS	Agreement on Trade-Related Intellectual Property Rights
UEMOA	Union Economique et Monétaire Ouest Africaine
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-OHRLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States
UNRISD	United Nations Research Institute for Social Development
USD	United States dollar (currency)
USSD	Unstructured Supplementary Service Data
VANS	Value-added network service providers
VoIP	Voice over Internet Protocol – voice over IP
WAP	Wireless Application Protocol
WATRA	West Africa Telecommunications Regulators Assembly
WHO	World Health Organization

WiFi	Wireless Fidelity
WiLL	Wireless local loop
WiMAX	Worldwide Interoperability for Microwave Access
WSIS	World Summit on the Information Society
WTDC	World Telecommunication Development Conference
WTO	World Trade Organization

1 Introduction

The Role of ICT in Advancing Growth in Least Developed Countries: Trends, Challenges and Opportunities report is being published on the occasion of the Fourth United Nations Conference on the Least Developed Countries (LDC-IV), to be held in Istanbul, Turkey in May 2011. Ten years after the adoption of the Brussels Declaration, with its Programme of Action for the Least Developed Countries (LDCs) for the Decade 2001-2010, and in view of the assessments of results to be conducted at LDC-IV, ITU has prepared this report to evaluate the progress these countries have made in the deployment of Information and Communication Technologies (ICT) in the last decade and the opportunities ICT can bring about to help LDCs address some of the key challenges they still face. Particular emphasis is given to changes made by LDCs in their ICT policy and regulatory environment and how these changes have resulted in advances towards universal access.

LDC-IV also coincides with a critical point in the achievement of the Millennium Development Goals (MDGs), with only five more years to meet the targets set for 2015. The report examines some of the emerging trends and current challenges faced by LDCs in their road to poverty alleviation, taking into consideration concerns regarding access to financial resources, infrastructural obstacles – in particular those of the telecommunication sector –, human capacity, as well as the additional risks that climate change is bringing about to most LDCs, but specially to those that are also Small Island Developing States (SIDS).

As the report shows, mobile communications have emerged as a key technology to bridge the digital divide in LDCs and as a means to accelerate the diffusion of government, health and environmental information throughout their territories. Yet, the challenge of making these services affordable still remains. The introduction of ICT applications, particularly those to support the administration of public activities and improve the provision of health services, will require the deployment of more advanced technologies and backbone networks, able to handle large amounts of data at higher speeds. To this end, ITU and several of its partners –including development banks in Africa and Asia, other UN organizations, the telecom industry and non-governmental organisations (NGOs)– are implementing diverse global initiatives to usher the deployment of ICT infrastructure, particularly broadband technology, facilitate the harmonization of ICT policies, and support the creation of an enabling policy environment, so that LDCs can exploit all the opportunities ICT have to offer to advance growth and promote sustainable development.

While LDCs are, by definition, particularly burdened by severe structural impediments to growth, progress is possible. Chapter 5 of this report introduces the cases of the three countries that have graduated from the LDC status since this category was established (Botswana, Cape Verde and Maldives), as well as those of five countries in the Pacific region, facing the special challenges of being Small Island Developing States (SIDS): Kiribati, Samoa, Solomon Islands, Tuvalu and Vanuatu.

Finally, Chapter 6 discusses different approaches to the use of ICT for development (ICT4D) and the advantages that a user-centred approach, rather than a technology-centred one, can have in supporting LDC populations make the best use of ICT opportunities to address the development and social issues identified as priority.

As a background for the rest of the report, the sections below provide an introduction to the category of Least Developed Countries, summarizing the status of the countries that have been included under this category since its inception in 1971, as well as the criteria for inclusion and graduation used by the Committee for Development Policy during its last review in 2009.

1.1 The category of Least Developed Country (LDC)

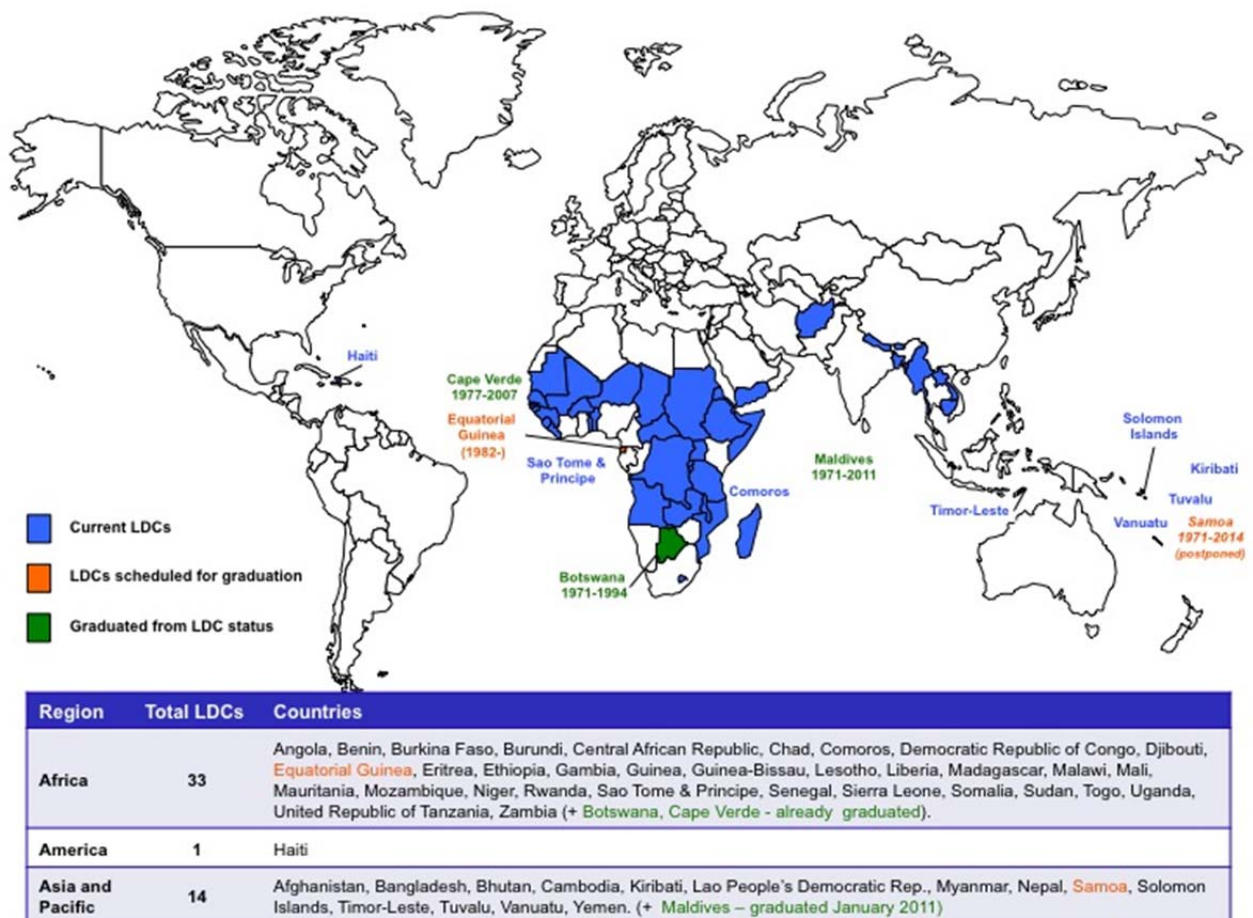
As of January 2011, there are 48 countries classified as “least developed.” LDCs are distributed across the world, with the majority (33) being located in Africa, followed by 13 countries in Asia and the Pacific, and one each in the Americas (Haiti) and the Arab States region –Yemen. Their total population was estimated in 2008 to be 815.16 million, of which, over 72 per cent lived in rural areas and was dependent on agriculture for subsistence.¹ Of the current 48 LDCs, 16 are landlocked developing countries (LLDC) and ten are Small Island Developing States (SIDS).²

While this group of countries differ in their territorial extension, population and socio-cultural characteristics, they all are low-income developing economies facing “severe structural impediments to growth”, as indicated by their high vulnerability to external economic shocks, low levels of human capital, and susceptibility to natural and man-made disasters and communicable diseases.³ When the category of least developed was officially endorsed by the UN General Assembly in its Resolution 2768 (XXVI) of 18 November 1971, 25 countries⁴ were recognised among the most vulnerable UN members, and were proposed as LDCs based on three criteria: Low per capita gross domestic product (GDP), small share of manufacturing in total GDP, and low adult literacy rates.⁵ During the last 30 years, a total of 50 countries have been included under the LDC category, with the latest member, Timor-Leste, joining the group in 2003 (Figure 1.1).

It should be pointed out that the LDC category is not permanent; as part of the advantages linked to the classification, countries are given special support in the areas of trade and official development assistance (ODA) – including development financing and technical cooperation – to foster growth. Successful graduation from this category has occurred sporadically and, to date, only three countries, Botswana (1994), Cape Verde (2007) and Maldives (2011) have met this goal, while two others (Samoa and Equatorial Guinea) have been scheduled for graduation.

The procedure for inclusion in the LDC category has been refined over time, to include three complementary eligibility criteria that reflect measurements of long-term structural weaknesses, as determined from a country’s gross national income (GNI) per capita, and two composite indices of structural handicap: a *human assets index* (HAI) that refers to education, nutrition and health levels, and an *economic vulnerability index* (EVI) for measuring the risk of and exposure to natural and trade shocks, economic remoteness and economic smallness.⁶

Figure 1.1: Least Developed Countries – Current, scheduled for graduation and graduated, as of January 2011



Source: ITU, based on UN-OHRLLS data (www.unohrrlls.org/en/ldc/related/62/).

After 1991, the Committee for Development Policy (CDP) of the UN Economic and Social Council (ECOSOC) – in charge of undertaking, every three years, a review of the list of LDCs to advise the UN Council about which countries should be included in, recommended for graduation or graduated from this group – added a population criterion that excludes any country with more than 75 million inhabitants from being considered for LDC status. The thresholds for inclusion are, in general, easier to meet than those for graduation, as summarized in Table 1.1 below.

As part of the triennial review, the CDP examines the socio-economic conditions of all low-income economies to determine whether a country should be added to or recommended for graduation from the category. The CDP also decides on threshold levels for the GNI, HAI and EVI criteria that will be used for the review.

Table 1.1: Asymmetries between LDC inclusion and graduation processes

	Inclusion	Graduation
Criteria:		
1) Number of criteria to be met	- Three	- Two*
2) Threshold of criteria	- Established at each review	- Higher than inclusion
3) Population threshold	- Smaller than 75 million	- Not relevant
Eligibility	Determined once	Determined (over consecutive reviews)
Timing	Effective immediately	Preparatory period (three years)
Approval by country	Required	Not required

Source: Committee for Development Policy & UNDESA (2008). p. 5.

* Note: Except in cases where GNI per capita is at least twice the graduation threshold level.

As illustrated in Table 1.1, inclusion as an LDC requires for a country to meet all three thresholds, while in order to be eligible for graduation, an LDC must cease to meet at least two of the three inclusion criteria or have a GNI per capita that exceeds, and is expected to remain at, a level at least twice the GNI graduation threshold.⁷ During its last review in 2009, the CDP used the following thresholds to identify LDCs and to determine eligibility for graduation:

- A *low-income criterion*, based on a three-year average estimate of the gross national income (GNI) per capita (under USD 905 for inclusion, above USD 1,086 for graduation);
- A *human capital status criterion*, involving a composite Human Assets Index (HAI) based on indicators of: (a) nutrition: percentage of population undernourished; (b) health: mortality rate for children aged five years or under; (c) education: the gross secondary school enrolment ratio; and (d) adult literacy rate; and
- An *economic vulnerability criterion*, involving a composite Economic Vulnerability Index (EVI) based on indicators of: (a) population size; (b) remoteness; (c) merchandise export concentration; (d) share of agriculture, forestry and fisheries in gross domestic product; (e) homelessness owing to natural disasters; (f) instability of agricultural production; and (g) instability of exports of goods and services.⁸

Based on these criteria, the CDP recommended adding Equatorial Guinea to the list of countries eligible for graduation. The recommendation was accepted by ECOSOC in July 2009, but the General Assembly had not confirmed the endorsement as of September 2010. Moreover, the General Assembly deferred Samoa's graduation from the LDC status for an additional three years, to 1st January 2014, as a result of the September 2009 Pacific Ocean tsunami that hit the island, destroying a considerable percentage of its infrastructure and causing economic difficulties to the country.⁹ Meanwhile, the Maldives, which was granted a postponement from graduation in 2005 due to the Indian Ocean tsunami, graduated in January 2011.

As noted in Table 1.1, countries are given the opportunity to decline being added to the LDC list, but their approval is not required to graduate from the LDC status. Since the creation of the LDC category, only Ghana, Papua New Guinea and Zimbabwe have objected to the CDP's recommendation for inclusion, questioning the accuracy of the information and the validity of the

indicators used by the CDP in evaluating their particular socio-economic conditions. Not surprisingly, countries recommended for graduation tend to be reluctant to be removed from the list, expressing concerns about continued vulnerability to economic, social and natural shocks, as well as to the effect that the cessation of preferential treatment from development partners might have on their economies.¹⁰

To facilitate the graduation process and reduce the likelihood that a graduated country would need to re-join the LDC list, the CDP set up graduation rules in 1991 to allow for a smooth transition and ensure that the graduated country would continue on its path to sustainable development.¹¹ Graduating States are thus given a three-year grace period from the time they first meet the graduation criteria and are recommended for graduation to coordinate with their development and trade partners regarding strategies to phase out preferential treatment and any special support provided under the LDC status.¹² Once the CDP confirms a graduating State is eligible for graduation after a second consecutive triennial review, graduation becomes effective. However, if during the grace period, there is any reversal in the socio-economic progress of the country or, like in the cases of Samoa and the Maldives, the graduating State is affected due to its vulnerability to natural shocks, the recommendation for graduation can be deferred.

Concerns about vulnerability issues and the commitment of development partners to support LDCs and graduated States are already being discussed during preparatory meetings for LDC-IV. The Maldives is a case in point. In January 2011, when the country's graduation became official, its Minister of State for Finance and Treasury, Aslam Shakir, encouraged the UN to develop better methods to address the particular situation and vulnerabilities of the SIDS, and highlighted the need for clarity about how the "smooth transition" period should be implemented in practice, so that responsibilities are clearly defined and the graduating States count with the full support of the UN during their negotiations with development partners for the post-graduation stage.¹³ Recommendations for further action prepared at national, regional and international preparatory meetings will be assessed during LDC-IV to determine how the new challenges and opportunities identified by the participating stakeholders can be best addressed in the future.

The following chapters introduce some of these challenges and highlight the opportunities that information and communication technologies can bring about to support LDC States in their process to sustainable development.

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2 Current status of ICT and telecommunications in LDCs

2.1 Changing policy and regulatory environment

During the past two decades, the regulatory environment of telecommunications has undergone multiple transformations. Although the patterns are diverse and vary from country to country and region to region, overarching global developments are visible and influence policy at the national level. After many decades of state monopoly, since the 1980s an increasing number of countries have pursued policies of privatization, market liberalization, and independent regulation. Countries with a stronger and more stable state tended to be more successful in managing these transitions.

The experience with regulatory reform also revealed the limits of market-based approaches. Where high investment is necessary but demand is insufficient to justify commercial investment, unregulated market forces may lead to unacceptable outcomes. Moreover, in the wake of the repercussions of the financial crisis of the past few years, the call for renewed state intervention has become stronger. Not only is the state seen as a regulator setting guidelines for other market participants, but also as an agent to facilitate the roll-out of telecommunications infrastructures via subsidies to private companies and possibly even via public investment.

Although the situation in LDCs differs in many respects from middle and high-income countries, their regulatory policy is affected by direct and indirect spillovers from these developments in other parts of the world. This section will first discuss the changes in the overall sector organization and second examine specific regulatory practices in more detail.

Overall sector organization

During the past two decades, it was widely believed that privatization, liberalization, and regulation independently were capable of improving sector performance. Although this is to a certain degree correct, experience has shown that it is the interplay of ownership structure, competitive intensity of the sector, and the quality of regulation that is most decisive for overall sector performance.

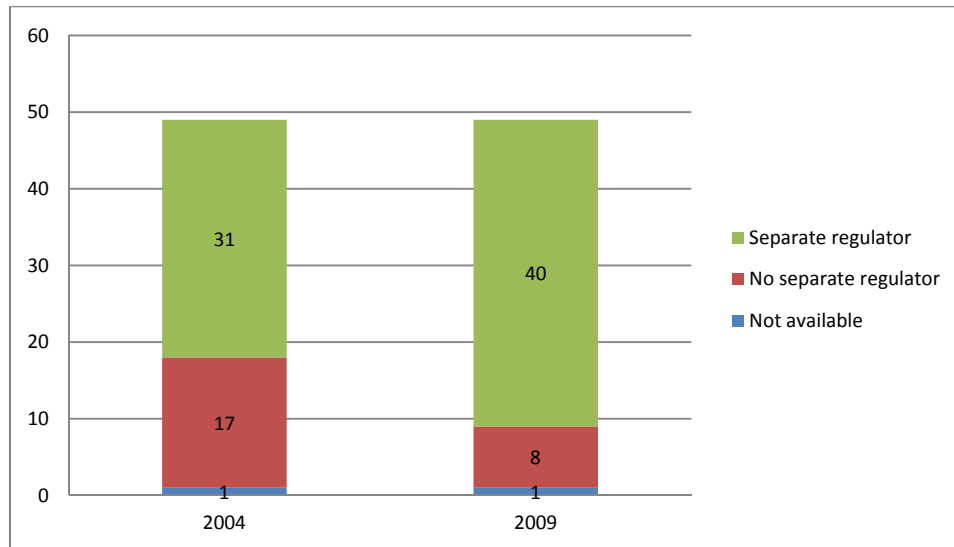
Separate regulation

Separate regulation is instrumental for managing the transition from monopoly to competition and the competitive interactions among incumbent service providers and new entrants. Given the importance of telecommunications as a critical information infrastructure, even after a transition to competition has been successful, important tasks for regulation remain. These include provisions that support universal access to telecommunications, the management of scarce resources such as electromagnetic spectrum, the facilitation of a seamless network of networks via orderly wholesale markets, interconnection, and interoperability provisions, the continued monitoring of competition in the industry with remedial interventions if necessary, and the protection of consumers.

Ideally, regulatory functions should be assigned to an agency that is independent of daily political struggles. Between 2004 and 2009, the number of LDCs that had separated regulatory tasks from the operation of telecommunications and from other government functions increased from 31 to 40 (see Chart 2.1.). Regulatory functions remained integrated with other government activities in eight countries. Not in all cases did the separation result in a truly independent regulatory agency, as in a

number of cases the ministry overseeing telecommunications service provision also is home to regulatory tasks (for instance, in Guinea-Bissau). Nonetheless, the reforms have generated more transparent organizational structures.

Chart 2.1: Separate regulation (LDCs, 2009, number of countries)



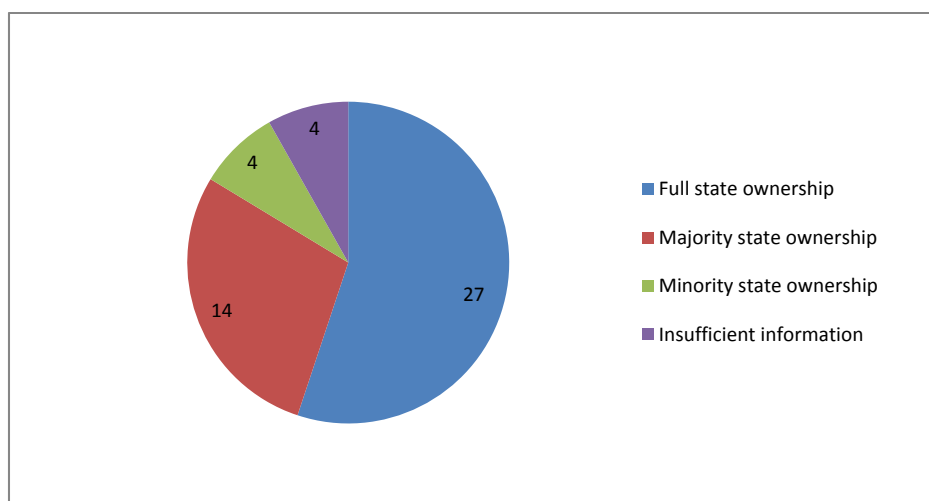
Sources: ITU Regulatory Database and J. M. Bauer’s research.

The experience of the past decade illustrates that there is no regulatory panacea, no model that suits all circumstances. Ideally, therefore, the regulatory approach would be customized to the specific needs of a country. Although good and appropriate regulation will generate many direct and indirect benefits for society, regulatory agencies in LDCs often are resource constrained. This increases the temptation to simply copy approaches found in other countries, not least because expert advisers may be familiar with these models. Such a strategy may backfire and it will often be better to emulate and carefully adapt rather than imitate lessons from other places. Where politically feasible, it may be useful to devise forms of regional regulation or at least regional collaboration. An example, although not in LDCs, is the Eastern Caribbean Telecommunications Authority (ECTEL), which coordinates regulatory policy among five Caribbean states (Commonwealth of Dominica, Grenada, Saint Christopher and Nevis, Saint Lucia, Saint Vincent, and The Grenadines). ECTEL collaborates with national regulatory authorities. Regional collaboration may also help in balancing negotiating power between national regulators and internationally operating service providers.

Ownership

In 27 of the 49 LDCs the main fixed-line telecommunications operator was fully state-owned in 2009. In 14 countries, government had sold some stake in the incumbent, but had retained majority ownership. Only in 4 countries (Lesotho, Mauritania, Senegal, and Somalia) had the state fully divested ownership in the incumbent telecommunications service provider or had reduced its stake to a non-controlling minority ownership (Chart 2.2).

Chart 2.2: Ownership structure of incumbent fixed line operator in LDCs (2009, number of countries)



Sources: ITU Regulatory Database and J. M. Bauer's research.

Although during the 1980s and 1990s the view of government ownership in telecommunications was largely negative, experience, as well as a broad body of research, has revealed a more mixed picture.¹ For example, publicly owned service providers can pursue open network policies that might be difficult to impose on private service providers without reducing investment incentives. Continued state ownership may be the only viable solution where the domestic market is too small to attract private investors. This is particularly true for the smaller LDCs, which have to compete in international capital markets to attract investors. These markets are influenced by factors beyond the control of LDCs. Public-private partnerships may offer opportunities to combine the advantages of both public and private ownership modes. For this reason, they are reconsidered in many high-income countries,² but they may also offer an interesting approach to many LDCs.

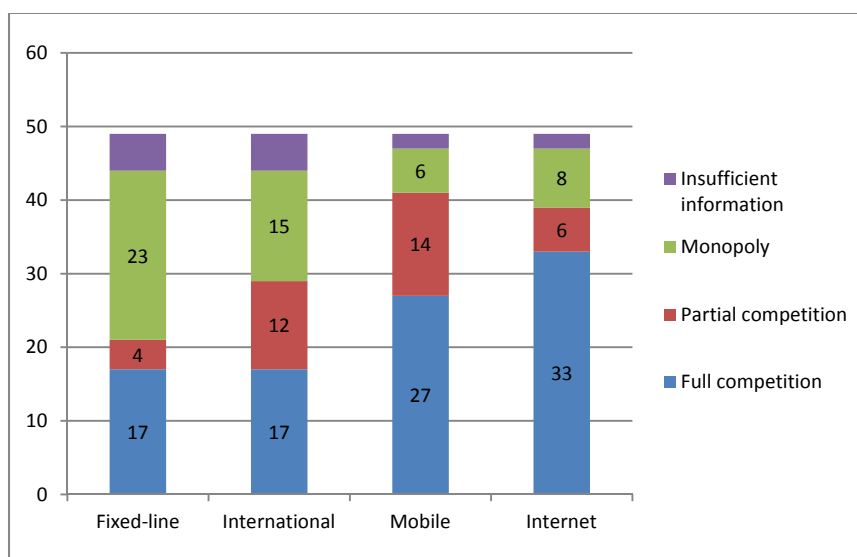
In most countries, mobile communications is the more attractive commercial proposition, leaving fewer choices for fixed-line services. The ownership situation is therefore very different in mobile communications, where most of the newly issued licenses are held by private investors, often foreign companies that have built a regional presence (such as MTN in Africa) or have significant experience in operating mobile communications services in LDCs. However, serious regulatory challenges arise with continued public ownership of fixed-line services if other segments of the market are opened to competition. Regulation is best suited to oversee private firms. Where state ownership continues, regulation faces a potential tension between serving the interests of the state as an owner and operator (hence favouring the incumbent firm) and serving competition as well as the interests of users. Independent and professional regulation is an effective safeguard against such potential conflicts of interest and the associated distortions they may cause in the sector.³

Competition

Recent experience and empirical research have provided ample evidence for the beneficial role of competition for sector performance. The majority of LDCs have abandoned legal monopoly privileges and liberalized telecommunications markets (see Chart 2.3). Of the 49 countries, 17 had fully liberalized fixed-line markets, 17 had fully liberalized international gateways, 27 had fully liberalized mobile markets and 33 the provision of Internet services. Four countries had allowed

partial competition in fixed-line services, 12 in international gateways, 14 in mobile, and 6 in Internet services (see Annex table 2).

Chart 2.3: Competitive organization of market segments in LDCs (2009, number of countries)



Sources: ITU Regulatory Database and J. Bauer's research.

In an increasing number of countries, fixed services are provided using wireless technology. For example, in Bangladesh, eight of the 14 new fixed licensees use wireless local loop (WiLL) technology. In 14 countries, mobile services are partially liberalized. In most cases, this means that additional licenses were issued on a limited geographic basis, for example, in major cities or certain regions of the country.

That a market segment was opened to competition does not necessarily imply that the resulting market structure is actually characterized by robust competition. This is particularly the case in fixed-line services, where incumbent service providers continue to have a strong, if not dominant, market position. Fixed markets illustrate that liberalization will not lead to robust competition in every situation; it has certain preconditions. It is dependent on the available technology and the overall size of the market. Competition will only be workable if the size of the market is a multiple of the minimum efficient scale of operations. If technology requires a large scale of operations relative to market size, it may not be feasible to establish workable competition, which is particularly a problem for small countries. Places such as the Pacific Islands or the very small countries in Africa may not be able to overcome this problem in fixed networks. Tuvalu with 10,500 inhabitants, Kiribati with 99,400 inhabitants, or even the Solomon Islands with nearly 560,000 inhabitants may not be sufficiently large to develop robust wireline competition. This is a potential limit on fixed-line liberalization that some LDCs face. As the user base mostly expands in wireless services, fixed-line services in many LDCs are stagnant or even shrinking. In a number of countries, therefore, although fixed-line markets are fully liberalized, they continue to be dominated by the incumbent service provider.

Fortunately, recent technological advances, in particular in wireless technology and in IP networking, have reduced the magnitude of economies of scale and scope, thus facilitating inter-modal

competition even in small and medium-sized countries. A virtuous circle is at work in which lower prices enabled by better sector organization and regulation stimulate demand, which in turn provides more room for effective competition to unfold. Particularly effective in expanding the user base is the introduction of prepaid services, mostly in mobile services. Moreover, competition within the mobile cellular sectors and between fixed and mobile service providers has supported diffusion of service. Of the 40 countries that have introduced competition in mobile cellular services, 26 have migrated to full competition whereas 14 allow competition in parts of the market (often in selected regions).

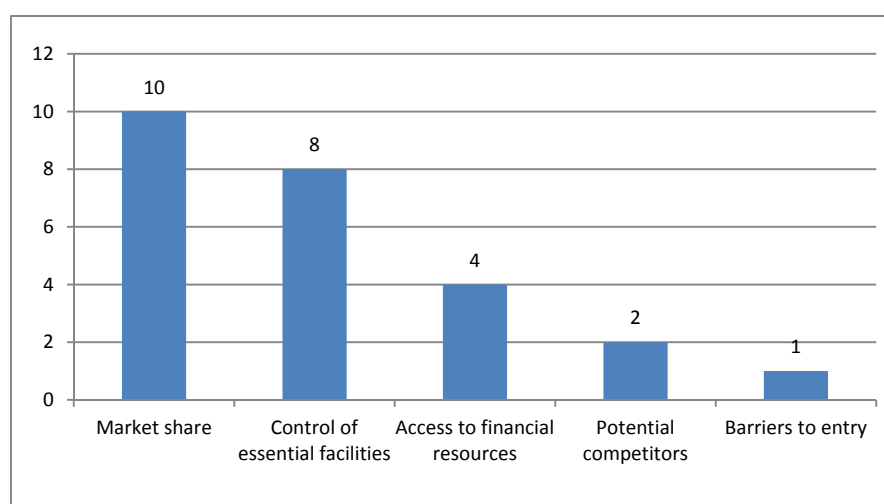
Delineating regulated and unregulated markets and players

Given the concerns discussed in the previous section about continued dominance in fixed-line and mobile markets, measures aiming at mitigating such dominance are particularly important. Regulators need to have effective means of assessing when to impose strict *ex ante* obligations. Although dominance is not the only reason for intervention, many forms of regulation, for instance non-discrimination requirements, are focused on players with market power. In an increasing number of middle and high-income countries, formal procedures are in place to establish the presence of significant market power (SMP) prior to the adoption of *ex ante* regulation. In other countries, the link is implicit but *ex ante* regulatory obligations are nonetheless imposed on the players with considerable market power. A similar pattern is visible in LDCs, although the adoption of formal policies to assess market power has followed a more gradual process.

According to the ITU Regulatory Database, in 2009, seven of the 49 LDCs (Burundi, Dem. Rep. of the Congo, Mali, Mozambique, Niger, Senegal, and Uganda) had adopted a formal definition of what constitutes significant market power or dominance. Benin, Equatorial Guinea, Tanzania, and Zambia had policies in place that were equivalent to assessing the presence of significant market power or dominance, but these countries did not base such an evaluation on a formal definition of SMP. Chart 2.4 shows the different aspects of market structure that regulatory agencies examine when assessing the market position of the dominant supplier (countries typically use more than one criterion). The most widespread criterion when assessing market power was market share of a service provider, measured by either subscriber numbers or revenues. As well, control over essential facilities was an important criterion. Other factors that were regularly taken into account were the ease of access to financial resources, existence of potential competitors, and the presence of barriers to entry. One country (Dem. Rep. of the Congo) also examined the presence of economies of scale and scope, that is, cost advantages of larger, integrated firms.

As telecommunications continue to evolve toward more advanced networks and services, the simple focus on dominance may have to be reconsidered. In the emerging environments, it may be best to apply certain types of regulations symmetrically to all service providers. For example, interoperability may require that all service providers adhere to certain minimal standards. Likewise, the increasing complexity of the value networks will challenge traditional notions of significant market power. It could well be that, in some circumstances, players that are not subject to regulation, such as providers of information services, have market power that can be leveraged to traditionally regulated market segments. Overall, a pragmatic and differentiated approach will be necessary on a going-forward basis.

Chart 2.4: Criteria used in LDCs for establishing dominance (2009, number of countries)



Sources: ITU Regulatory Database and J. Bauer's research.

Note: Data for the remaining LDCs was not available.

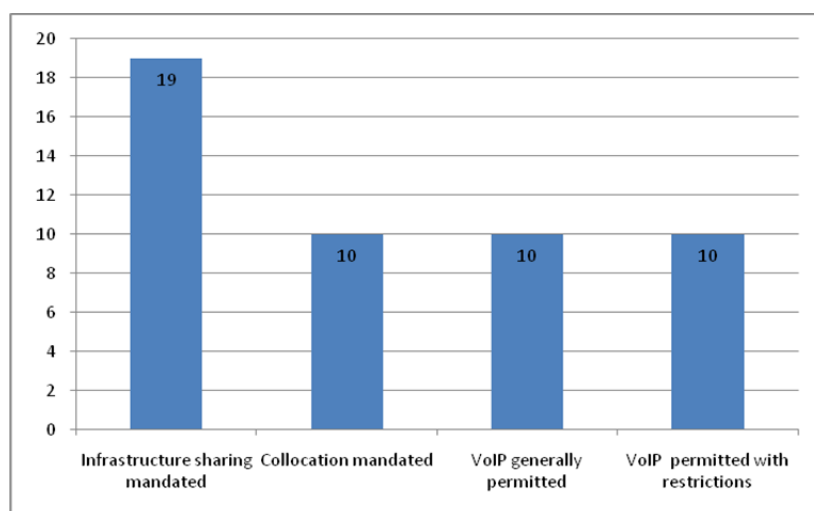
Specific regulatory practices

Within the broader developments described in the previous section, considerable diversity exists among LDCs with regard to the design and specific implementation of regulation. The following subsections discuss the status quo of rules and regulations governing market entry and access to the incumbent's network, regulations pertaining to retail and wholesale markets and provisions intended to support universal access and service.

Measures facilitating market entry

As discussed, LDCs have undertaken considerable steps toward allowing competition in fixed and mobile markets. Given the lower fixed costs of rolling out wireless networks, market entry has been more vigorous in mobile markets. Moreover, it is easier for service providers to enter Internet-based services, such as VoIP, which are configured on top of existing platforms. In middle and high-income countries the telephone network has been widely rolled out, in some countries even to saturation levels. In many areas it did not make economic sense to duplicate the existing network. Therefore, one important challenge was the opening of the existing infrastructure to new competitors. Measures such as unbundling were considered important tools for achieving this objective. Many regulatory agencies envisioned market entry would follow a ladder-of-investment process. Whereas this is correct in some cases, the model only works under specific market and regulatory conditions that are difficult to implement. Recent research shows that unbundling also has potential downsides in that it biases market entry toward services-based and not facilities-based entry. Moreover, the ladder-of-investment may come to a halt before facilities investment will take place.⁴ Much of this discussion pertains to countries where the voice network was already rolled out. LDCs face a somewhat different challenge: how to generate sufficient investment in the expansion of the existing fixed networks and in new wireless and possibly next-generation networks. Regulatory measures that facilitate market entry will have to take these different conditions into account (Chart 2.5).

Chart 2.5: Measures facilitating market entry (2009, number of countries)



Sources: ITU Regulatory Database and J. M. Bauer's research.

In 19 LDCs, infrastructure sharing was mandated in 2009 and 10 countries mandated collocation. Both measures reduce barriers to entry for net competitors. Infrastructure sharing encompasses measures that grant competitors access to towers, base stations, poles, and ducts. This civil engineering infrastructure is among the most expensive components of network rollout. Mandated access can therefore reduce costs of market entry. However, it is important that the costs for access are set with economic principles in mind so as to not distort the incentives of network operators to build such infrastructures in the first place. Collocation was mandated in Burkina Faso, Gambia, Guinea, Lesotho, Malawi, Mauritania, Rwanda, Senegal, Sudan, and Uganda. Like shared infrastructure access, collocation reduces some of the entry costs and hence, other things being equal, facilitates market entry.

Several LDCs also have policies in place that facilitate services-based entry. A total of 20 countries permit VoIP in one form or another.⁵ In half these countries, VoIP is unrestricted. VoIP calls are allowed from PC to PC, from PC to phone, from phone to phone, and on private networks. In the other half, some restrictions apply. Typically, phone-to-phone VoIP calls are restricted, but the other types are allowed. Whereas such limitations may reduce customer benefits, they also help delay potentially negative effects on the revenues of the incumbent network operator. Little is known about the strength of effects of these measures on the intensity of competition, the level of prices, or adoption rates of services. Nonetheless, it is highly likely that they make a positive contribution to sector performance.

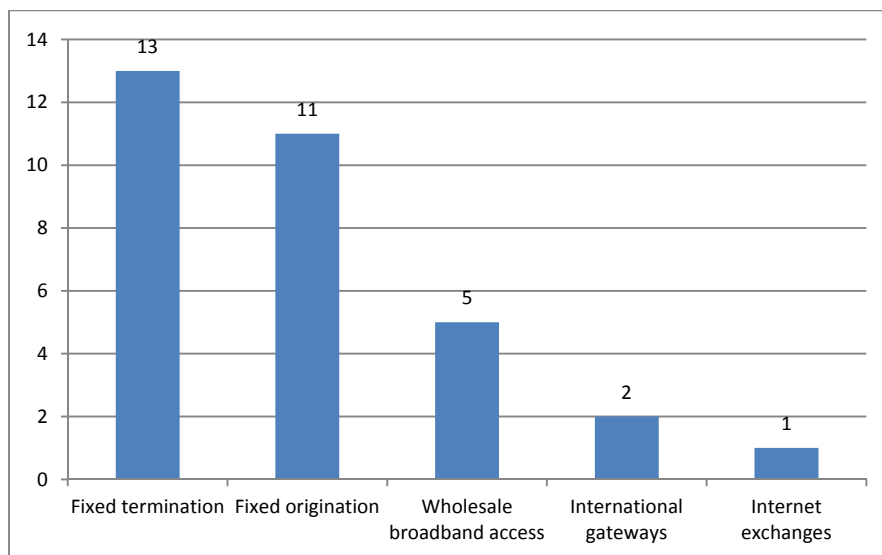
Wholesale market regulation

Given the historical sector organization, many countries introduced forms of wholesale regulation to address areas in which market power existed. In LDCs like in middle and high-income countries, access to existing fixed network facilities, especially the local loop, is such an area.

Chart 2.6 depicts the number of countries that, in 2009, reported using different types of wholesale prices regulation. Of the reporting 16 LDCs, 13 (81.3 per cent) regulated the prices for fixed call termination.⁶ This is a sensible policy, as the terminating monopoly cannot be circumvented easily by

a service provider seeking to terminate a call or by the user making the call. The case is somewhat less compelling for fixed origination, a sub-market in which 11 of the 15 reporting LDCs (73.3 per cent) had adopted price regulation.⁷

Chart 2.6: Wholesale market regulation (2009, number of countries)



Sources: ITU Regulatory Database and J. Bauer's research.

With regard to broadband services that require upgrades and new investment, the case for wholesale regulation is more disputed. In high-income countries, there is evidence that overly stringent broadband wholesale regulation, such as low-priced unbundled access, bitstream access, and fibre wholesale access, bias market entry in favour of services-based entry and reduce investment in new facilities.⁸ In LDCs, mixed factors are at play: whereas concern about new investment is high, severe resource constraints are aggravated by low purchasing power. Higher concern for investment tends to favour a more market-based approach, whereas the latter two forces call for a stronger government-led approach. Thus, every country will have to assess its situation and implement the most appropriate policy mix.

Experience in other market segments, most importantly mobile services, has demonstrated that countries with poor infrastructure availability face a unique opportunity to stimulate facilities-based competition, in particular if there is sufficient purchasing power and a large market. This holds for the larger LDCs with higher per capita income, but less so for smaller and poorer LDCs. Policies in this area therefore need to be based on a careful assessment of the local conditions and the likely effects of alternative approaches. Only five of the 13 countries that reported wholesale broadband access regulations (38.5 per cent) have instruments such as bitstream access in place.⁹ Dem. Rep. of the Congo and Djibouti reported use of price regulations for international gateways (18.2 per cent of the reporting 11 countries) and only Niger reported regulation of access to Internet exchanges (9.1 per cent of the reporting 11 countries).

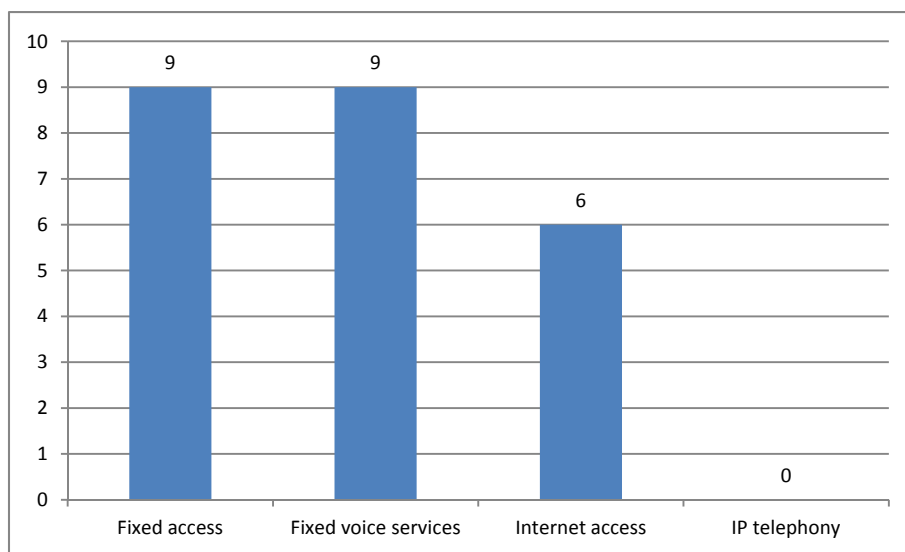
Retail market regulation

During the era of telecommunications monopoly, retail prices typically were determined in a relatively non-transparent political process. Multiple conflicting considerations, such as contributing

to public sector finances (telecommunications as a “cash cow”) and the generation of cross-subsidies to support the provision of access to rural and disadvantaged areas, often influenced and complicated pricing decisions.

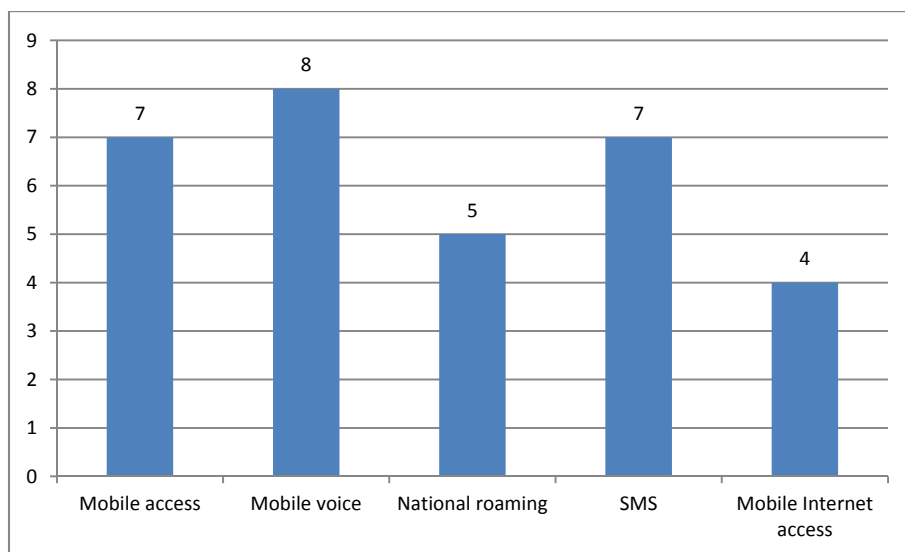
With the gradual introduction of separate regulation, the determination of retail prices has slowly become a more transparent process. This has not necessarily simplified the complicated trade-offs that may have to be addressed, but it has brought them into the open and allowed rational discussion of priorities. As competitive forces have emerged, retail price regulation of traditional services has generally been curtailed. New and emerging services in many countries are exempt from explicit retail price regulation. Chart 2.7 depicts the number of countries that reported different forms of retail price regulation in fixed-line markets and Chart 2.8 those that reported retail price regulation in mobile markets.

Chart 2.7: Retail price regulation of fixed services (2009, number of countries)



Sources: ITU Regulatory Database and J. Bauer’s research.

Chart 2.8: Retail price regulation of mobile services (2009, number of countries)



Sources: ITU Regulatory Database and J. Bauer’s research.

Nine of the reporting 14 countries (64.3 per cent) had price controls for fixed access (monthly line rental, subscription fees) in place.¹⁰ Nine of 16 reporting countries (56.3 per cent) relied on price controls for fixed voice services.¹¹ Of the 17 countries that reported regulatory policies for the pricing of Internet access, seven countries (35.3 per cent) had price controls in place.¹² None of the reporting 12 countries regulated the prices of IP telephony nor are there any reports of price control on Internet-based broadcasting services (IPTV).

Although competition is more widespread in mobile than in fixed markets, in 2009 five LDCs (Comoros, Ethiopia, Myanmar, Sao Tome and Principe, and Tuvalu) continued to rely on a single licensee to provide mobile services and another 14 had established only partial competition (see Chart 2.3).¹³ The majority of countries with limited competition also regulate the prices of mobile services (see Chart 2.8 and Annex table 3). Nine of the reporting 14 countries (64.3 per cent) regulate mobile access prices (e.g., monthly subscription fees) and eight of the reporting 17 countries (47.1 per cent) control the prices for mobile voice service. Prices for national roaming are regulated by five of 14 reporting countries (35.7 per cent). Seven of the reporting 14 countries (50 per cent) regulate the prices of SMS. Twenty-five per cent of the reporting 16 countries (i.e., four countries) control the prices for mobile Internet access. The data indicates the lower incidence of price controls in mobile markets and also the lower extent of price controls in the more advanced mobile data markets. Mobile TV is not price regulated in any of the 49 LDCs.

Universal access/service

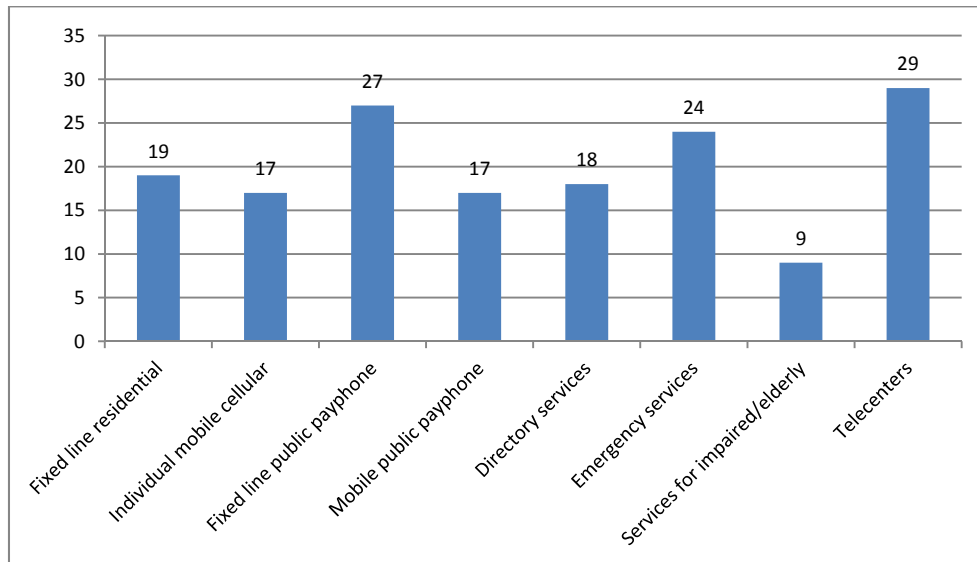
Competitive restructuring, tariff rebalancing, and the gradual elimination of price controls typically result in price and service innovations that support the further adoption of telecommunications services. Whereas competition and service adoption complement each other in many instances, there may be situations in which there is a tension between sector restructuring and service to rural, high cost areas and disadvantaged user groups. A large number of LDCs have therefore established programs to support universal access and service goals. In 2009, 38 LDCs indicated definitions of and measures in support of universal access and many countries had formal policies in place to achieve this objective. Seventeen countries also included Internet services in their universal service definition (see Annex table 4). Chart 2.9 depicts the most important services addressed in either formal or less formal programs.

Nineteen LDCs included individual fixed-line service in universal access definitions and 17 countries individual mobile cellular service. Fixed-line public payphone service was cited by 27 countries, and mobile public cellular telephony service by 17. Most widely seen as instrumental in achieving universal access were telecentres, which were core to such programs in 29 countries. Emergency services were considered in 24 countries and 18 countries also added directory assistance services to the universal access/service mandate. Nine countries also included services to impaired and elderly users.

In several countries, the scope of services to be supported from special programs was defined more narrowly over the years. For example, in Senegal, it was reduced from initially four categories (fixed-line and mobile individual service, fixed and mobile payphones) to one: fixed public payphone. Likewise, Sudan narrowed the scope of services to be included under universal access considerations from four to two. There are many universal service programs that do not work well, often because the funds collected are not disbursed in an effective manner. Where the technical skills are available,

reverse auctions may be a good way to extend the footprint of services. In this case, a license or concession to serve a particular region is awarded to the provider willing to offer the lowest price to subscribers. This way the virtuous cycle between lower prices and increased adoption can be initiated.

Chart 2.9: Universal service coverage (2009, number of countries)



Source: ITU Regulatory Database.

Spectrum management

Historically, access to electromagnetic spectrum was managed in a three-step process at international and national levels: (1) allocation of spectrum to specific uses; (2) allotment to certain regions; and (3) assignment to licensees. As wireless services expand, spectrum management becomes more important and more challenging. At a national level, spectrum management may be entrusted to the regulatory agency (in Burkina Faso or Bangladesh, for example) or to another agency, often in collaboration with the regulatory authority. The most urgent challenges faced by spectrum management worldwide are the allocation of sufficient spectrum to wireless services, the efficient assignment of spectrum to licensees and the flexible adaptation of existing allocations and assignments to changing uses of spectrum.

Beginning in the 1990s, an increasing number of countries have made major changes to the traditional approach of administrative licensing. This approach, where the spectrum authority reviews competing applications and selects the seemingly best one based on a list of criteria, has several disadvantages. Most importantly, it forces the spectrum authority to evaluate alternative projects, often without sufficient information to do so. Administrative licensing, sometimes misleadingly dubbed “command-and-control” spectrum management, may also be time consuming and lead to inflexible assignments.

To overcome these weaknesses, spectrum authorities have made several adjustments:

- For one, they have introduced flexible spectrum allocation, whereby bands are not any longer earmarked for just one application (for instance, mobile voice), but an entire range of applications is permitted as long as they do not interfere with other uses.
- Second, countries are increasingly augmenting or even replacing administrative licensing with market-based mechanisms. A first step to introducing market forces is to assess fees from licensees to induce more efficient use of spectrum. Ideally, such fees would reflect the scarcity of spectrum for alternative uses. Countries that charge spectrum fees include Benin, Ghana, and Malawi.¹⁴ Spectrum fees, by imposing a cost on the use of spectrum, create an incentive for the licensee to use it more sparingly.
- Third, countries have also experimented with spectrum auctions. Spectrum auctions replace the administrative process with a market-based evaluation mechanism. However, to achieve the goal of enhancing the efficiency of spectrum allocation and assignment, auctions need to be designed appropriately. There is a risk that spectrum auctions are abused to maximize revenues for the treasury, which will retard the growth of the wireless sector. Should spectrum auctions be considered, they would need to be carefully designed.
- Fourth, countries have increased the flexibility of licensees by introducing secondary spectrum markets, thus allowing temporary or even permanent leasing of unused spectrum to third parties without having to relinquish a license.

In the overall spectrum management concept, the role of unlicensed and license exempt services needs to be considered. WiFi and WiMAX are typically configured in the ISM band, which is license exempt. Nonetheless, many restrictions exist on WiFi, such as permission of indoor use only, that potentially reduce growth of the wireless sector. Effective spectrum management needs to establish a balance between licensed and unlicensed services, as well as between the different licensing regimes.¹⁵

Experience and Challenges

LDCs have come a long way from the historical legacy frameworks of government-owned telecommunication monopolies. Many have adopted legal and regulatory reforms aimed at increasing the efficiency of telecommunications. Like in middle and high-income countries, the main reform approaches were increased private sector participation, market liberalization, and regulatory reform. The vast majority of LDCs has separated regulation from operation and has endowed regulatory agencies with varying degrees of independence. Liberalization was more successful in mobile and Internet services where economies of scale and scope are less significant than in fixed-line networks. An increasing number of LDCs has adopted regulatory policies that support market entry and competition.

At the same time, LDCs face daunting challenges. Small population size and low purchasing power often make it exceedingly difficult to rely on competition and private sector-driven infrastructure investment, in particular if a country is seen as politically instable. These unique conditions require the drafting of legal and regulatory responses that are customized to the respective circumstances. Unfortunately, given resource constraints, the temptation to copy and imitate rather than emulate

and adapt policies developed for countries in more favourable circumstances is high and may lead to inappropriate regulation. For example, very small countries, such as the Pacific Island nations, will need very pragmatic approaches that might deviate from the dominant liberalization model developed elsewhere. At the same time, the regulatory principles that can be employed in these conditions are not well developed. Regional regulation and innovative institutional approaches might offer one feasible way to help overcome the disadvantages of small, resource-constrained countries.

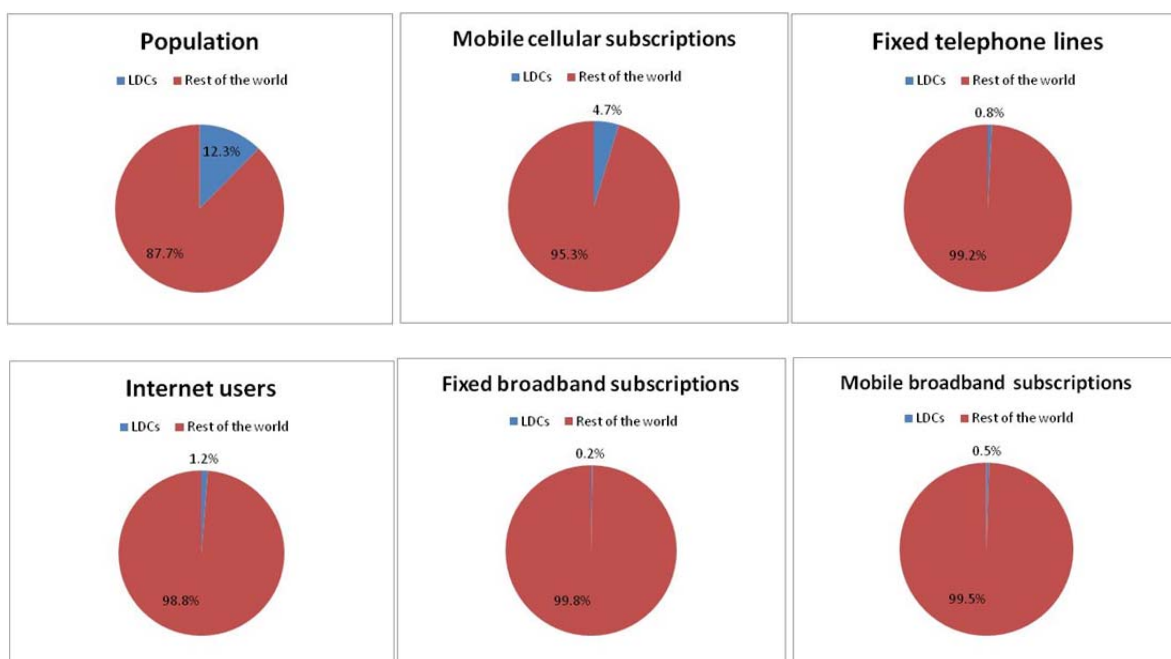
2.2 Advances in universal access

Overview

Almost one fourth of the world's countries are Least Developed Countries (LDCs). Their share in the global population is relatively smaller, though; in 2010, the 855 million people living in the 49 LDCs represent 12.3 per cent of the world's population.

In terms of the availability and use of information and communication technologies (ICT), ITU estimates that by the end of 2010, LDCs are expected to account for 4.7 per cent of the world's mobile cellular subscriptions, but only 0.8 per cent of all fixed telephone lines. Their Internet users represent 1.2 per cent of the world's total, compared to 0.2 per cent and 0.5 per cent of all fixed and mobile broadband subscriptions respectively (Chart 2.10).

Chart 2.10: Population and ICT shares, LDCs, 2010



Source: ITU World Telecommunication/ICT indicators database.

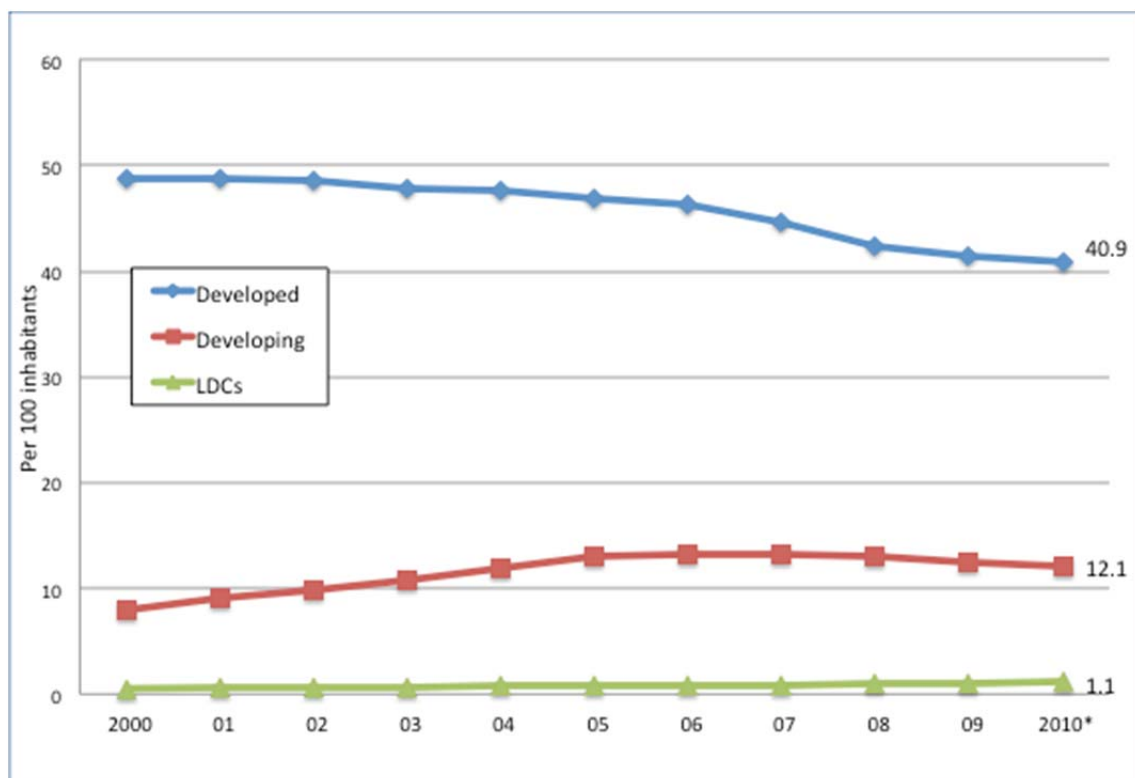
Fixed and mobile telephony

Access and use

Mobile telephony has been, without doubt, the 21st century's ICT success story. The number of mobile cellular subscriptions worldwide has increased from about 740,000, to over 5 billion by the end of 2010, when mobile cellular penetration stood at over 75 per cent. Also, access to mobile cellular networks is increasingly ubiquitous.

The difference that mobile technology has made is arguably the greatest in the developing countries, and particularly in LDCs. At just above one per cent by the end of 2010, these countries have an extremely low fixed telephone penetration (Chart 2.11). Mobile penetration, on the other hand, is expected to reach close to 30 per cent by the end of 2010, suggesting that mobile telephony has been able to at least partially tackle the infrastructure barrier and bring communication networks to the previously unconnected (Chart 2.12). These data also suggest that, while in many developed countries mobile networks are providing an additional communication network (and sometimes replacing the fixed line network), in LDCs it is often the *main* network. This is particularly true in rural areas. In Bangladesh, Burkina Faso, Dem. Rep. of the Congo, Djibouti, Eritrea, and Lao P.D.R., for example, over 90 per cent of all fixed telephone lines are in urban areas, leaving most of the rural areas without fixed line infrastructure.

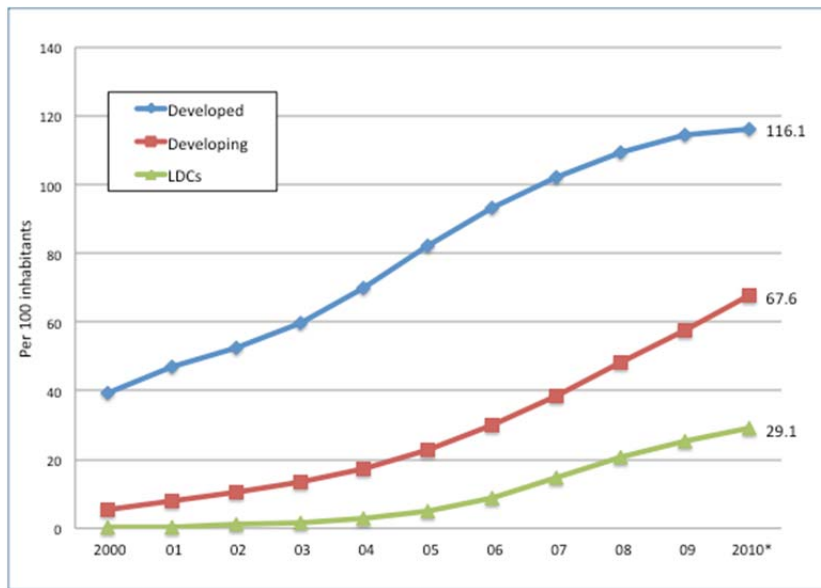
Chart 2.11: Fixed lines per 100 inhabitants, 2000-2010



*Estimates

Source: ITU World Telecommunication/ICT Indicators database.

Chart 2.12: Mobile cellular subscriptions per 100 inhabitants, 2000-2010

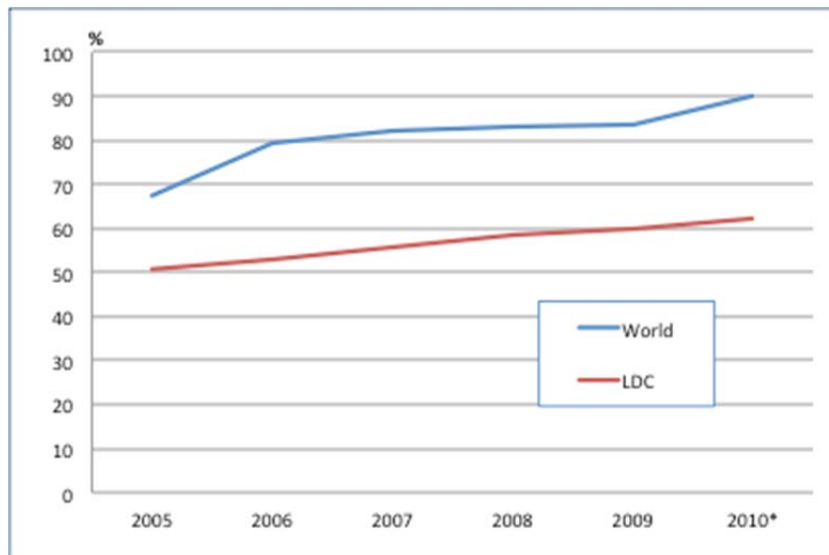


*Estimates

Source: ITU World Telecommunication/ICT Indicators database.

Access to the mobile telephone network, on the other hand, has spread beyond urban areas and by end 2010, 62 per cent of the population living in LDCs was covered by a mobile cellular signal (Chart 2.13). Compared to the world average of 90 per cent, however, this remains relatively low, suggesting that governments in LDCs need to ensure that mobile operators extend their network coverage to reach more people.

Chart 2.13: Percentage of the population covered by a mobile cellular signal, LDCs



*Estimate

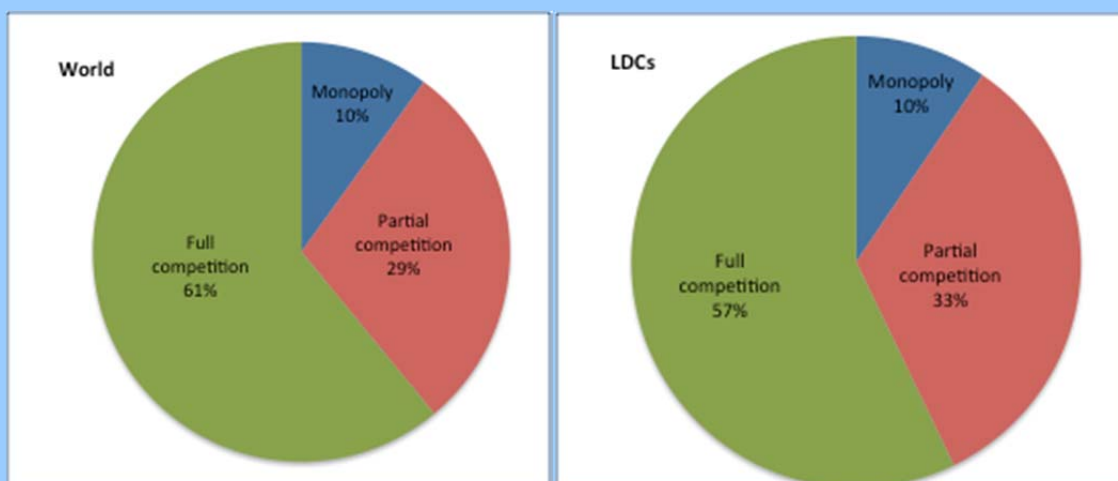
Source: ITU World Telecommunication/ICT Indicators database.

Box 2.1: Mobile success factors

Over the last decade, no other ICT has grown as fast as mobile cellular telephony and connected previously unconnected people in such a short span of time. There are a number of factors that have made the mobile boom possible:

- **Competition:** The introduction of second-generation technology opened up greater opportunities for new market entrants due to increased capacity and better spectrum efficiency. Most countries introduced competition with the launch of GSM networks. For many countries, this was their first taste of competition in the telecommunication sector. Competition has lowered prices, increased the quality and number of services and expanded coverage, creating the right conditions for mobile communications to grow. As of 2009, 90 per cent of countries worldwide allowed either partial or full competition in their cellular mobile market. The same degree of competition is found in the Least Developed Countries, although the level of partial competition –in which markets limit the number of mobile cellular operators to two– is slightly higher (Chart 1 box 2.1).

Chart 1 box 2.1: Percentage of countries with competition in the mobile market, 2009, world and LDCs



Source: ITU World Telecommunication Regulatory database.

- **Common technology:** Europe established a common regional standard for second-generation digital mobile technology – *Groupe Spécial Mobile* (GSM) – over a quarter century ago. This led to a *de facto* global standard for 2G mobile technology. The first GSM network was launched in Finland in 1991, and Australia became the first non-European country to join the GSM Association two years later. By June 2009, GSM accounted for four out of every five mobile subscriptions around the world and today, nearly 800 operators in over 200 countries operate GSM networks.¹⁶
- **Prepaid subscriptions:** The introduction of prepaid billing in 1996 brought mobile to the masses. There are millions of people around the world who would not qualify for a postpaid mobile plan, let alone be able to afford the required monthly payments. The majority of subscriptions in developing countries are prepaid, and in LDCs, where income levels are particularly low, 94 per cent of subscriptions were prepaid at the end of 2009. To cater to low-income users, operators have adopted new business models by offering, for example, low denomination airtime recharges and per second billing.

Box 2.1 (end)

- **Applications:** The growing number of mobile applications has increased demand and usage. Roaming, text messaging and mobile broadband have become desirable applications for a growing number of people, including in LDCs. Since Internet penetration remains relatively low, mobile applications can help overcome Internet access barriers.
- **Equipment:** Mobile equipment, both on the network infrastructure side as well as devices, has grown in sophistication while continuing to drop in price. The emergence of Chinese equipment vendors, such as Huawei and ZTE, has driven competition in the infrastructure segment, dramatically reducing the cost of installing a mobile network. Innovations in handset technology include the development of sophisticated smartphones, which are driving demand for mobile data services. In low-income countries, falling prices of low-end mobile phones continue to make access more affordable.

Source: Adapted from ITU (2010a).

Mobile telephony has also improved public telephone access, and mobile public access can help operators achieve universal access goals. It has also generated new business models, where owners of mobile telephones re-sell the service to others.

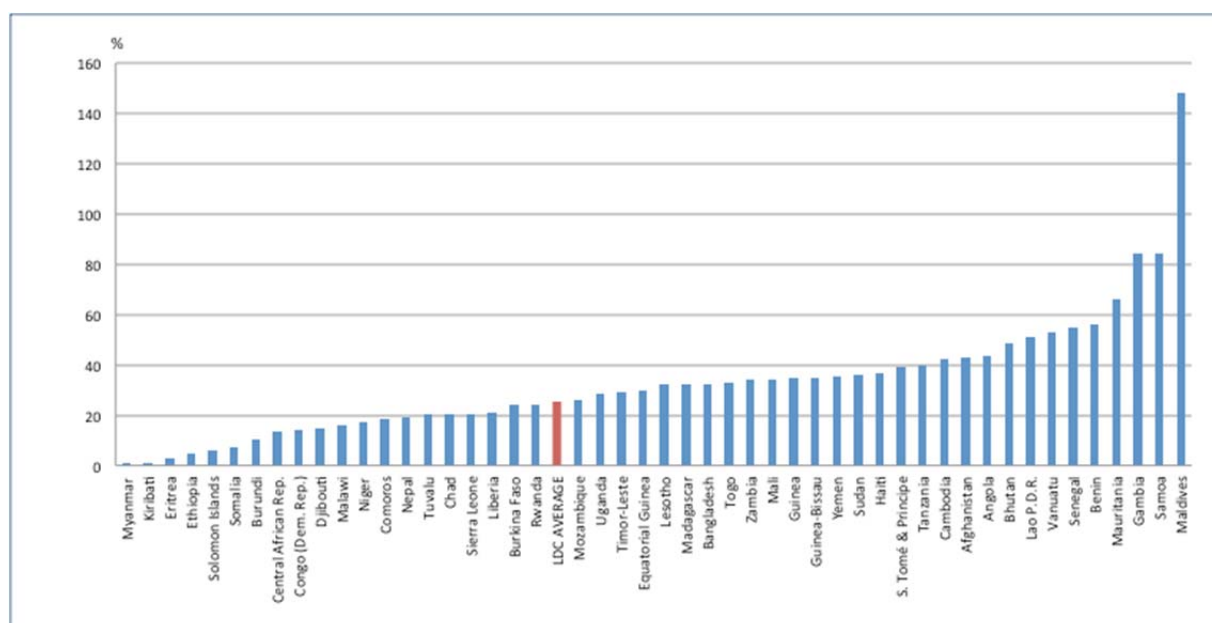
In some countries, the increasing number of mobile cellular subscriptions is actually reducing the need for public access since most people either own or have access to a mobile phone. In Senegal, for example, the number of public phones has been decreasing since 2006, when mobile cellular penetration reached close to 30 per cent. Indeed, a recent household survey conducted in Senegal suggests that by the end of 2009, over 85 per cent of households had a mobile phone, compared to only 14.5 per cent with a fixed telephone.¹⁷

Not all LDCs have equally benefitted from the mobile boom. Penetration rates vary from as low as one per cent in Myanmar and Kiribati to over 140 per cent in the Maldives, an outlier in terms of income levels and an LDC that will actually graduate from the LDC status in early 2011 (Chart 2.14). If Maldives is not taken into account, mobile cellular penetration rates still vary from one to 84 per cent. Within this latter group, seven LDCs – including Lao P.D.R., Senegal and Mauritania – achieved penetration levels of above 50 per cent by the end of 2009.

While there are other factors, the introduction of competition has played an important role in making mobile markets the most dynamic ICT market over the last decade (Box 2.1). A number of the countries with penetration rates below 10 per cent, including Ethiopia, Eritrea and Myanmar, have not yet introduced competition, an important factor in reducing prices and increasing service availability and thus penetration rates.

Another reason that mobile telephony has been so successful and spread rapidly is the growing number of applications, which has increased demand and usage. Non-voice mobile phone applications are growing, including in LDCs (Box 2.2).

Chart 2.14: Mobile cellular penetration in LDCs, 2009



Source: ITU World Telecommunication/ICT Indicators database.

Box 2.2: Examples of non-voice mobile phone applications for development in LDCs

- The *Pésinet*¹ project in Mali uses mobile technology to reduce child illness. ‘Agents de Pesée’ (ADPs) are trained and provided with Java-enabled mobile phones to send information such as weight and symptoms about children in the community. The data are transmitted over mobile phones using the General Packet Radio Service (GPRS) network to a database, which alerts doctors to any significant symptoms. A doctor can then send an SMS to the ADPs, who advise the family to bring the child to the health clinic for examination.
- In Senegal, *Manobi*² provides access to price data on various crops, collected from different markets across the country. Manobi personnel use mobile phones to send the price data to the Manobi database using the Wireless Application Protocol (WAP). Farmers use their mobile phones to query the database.
- Mobile money transfer services are an increasingly popular application, particularly in developing countries where many people do not have bank accounts. MTN’s *MobileMoney* service, for example, allows its customers in Benin, Guinea Bissau, Rwanda, and Uganda to send money, buy airtime, and make basic utility payments using their mobile phone.¹⁸ The service, which is provided in partnership with local banks, also allows customers to withdraw cash at any MTN MobileMoney agent or any participating Automatic Teller Machine (ATM). Another popular mobile money transfer service is M-PESA, which was launched in Kenya in 2007, and is now also available in Tanzania and Afghanistan.¹⁹

Source: The first two of these examples were adapted from Beardon (2009).

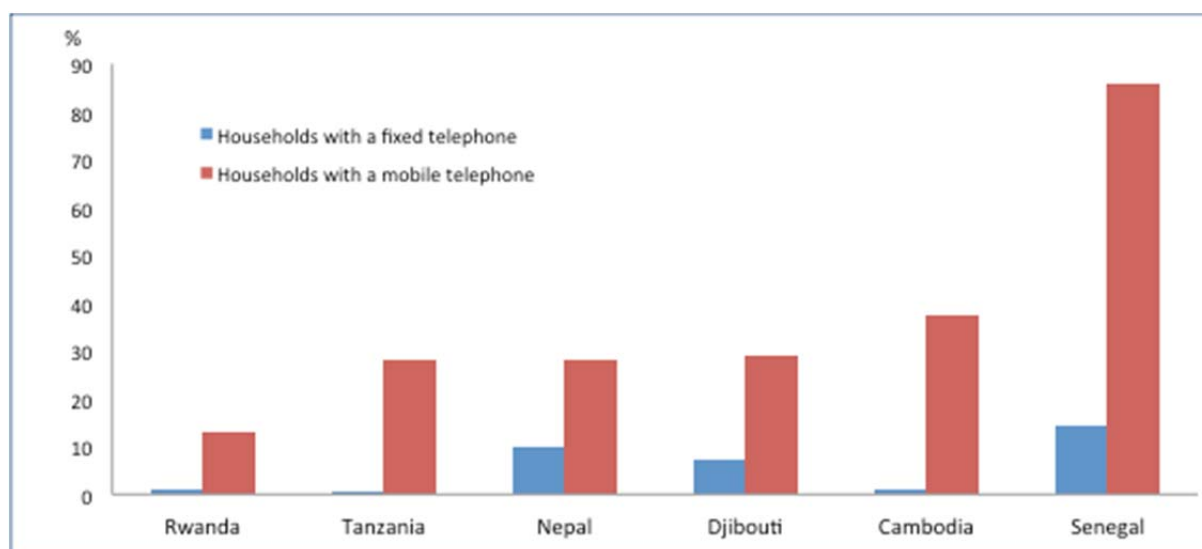
¹ See: www.pesinet.org/wp/

² See: www.manobi.sn/sites/sn/

The number of mobile cellular subscriptions is not identical to the number of mobile users, since one person may have several SIM cards and/or subscriptions. In other cases, one person may only have one subscription, but share services with other people. Reliable data on the number of mobile phone users can only be obtained through official and nationally representative surveys. While the number of countries carrying out official household ICT surveys is increasing, including among LDCs, many countries, and the majority of LDCs, only collect data on ICT access, not use.

Available data on the number of households with a fixed and/or mobile telephone suggest that mobile telephony is increasingly becoming the dominant means of phone access at home. In Rwanda, in 2008, for example, 13 per cent of households had a mobile phone, but only one per cent had a fixed telephone line. In Tanzania and Cambodia, the difference is even more pronounced and 0.7 and 1 per cent of households have a fixed line, compared to 28 and 37 per cent with a mobile telephone (Chart 2.15).

Chart 2.15: Percentage of households with a telephone, 2008-2009, selected LDCs



Source: ITU World Telecommunication/ICT Indicators database.

Prices

Prices for mobile cellular services have decreased over the last few years. Based on the ITU ICT Price Basket and its mobile cellular sub-basket,²⁰ the prices for mobile cellular services in the LDCs decreased for almost all countries between 2008 and 2009. The average change (drop) in prices between 2008 and 2009 was 23 per cent, with the highest percentage change in Rwanda (48%), Sudan (40%) and Bhutan (39%) (Table 2.1).

Table 2.1: ICT price basket and sub-baskets, selected LDCs*, 2009 and 2008

LDC rank	Overall rank	Economy	ICT Price Basket		Fixed telephone sub-basket as a % of GNI per capita		Mobile telephone sub-basket as a % of GNI per capita		Fixed broadband sub-basket as a % of GNI per capita		GNI per capita, USD, 2008 (or latest available year)
			2009	2008	2009	2008	2009	2008	2009	2008	
1	52	Maldives	1.87	2.12	1.36	1.54	1.14	1.27	3.11	3.53	3630.00
2	74	Bhutan	3.16	15.19	1.91	2.39	1.26	2.05	6.30	41.13	1900.00
3	116	Sudan	10.8	15.97	4.12	5.49	3.60	5.99	24.70	36.43	1130.00
4	120	Angola	21.4	30.55	5.76	9.47	3.83	5.52	54.76	76.67	3450.00
5	122	Djibouti	25.0	N/A	8.61	N/A	7.02	N/A	59.36	N/A	1130.00
6	123	Nepal	25.7	34.28	8.93	12.0	3.69	10.33	64.58	80.43	400.00
7	124	Lesotho	28.0	29.62	14.20	15.0	14.35	15.15	55.56	58.70	1080.00
8	126	Senegal	29.7	32.98	29.74	25.4	10.29	12.23	49.34	61.28	970.00
9	131	Vanuatu	35.1	42.12	12.22	16.5	6.67	9.84	86.64	293.4	2330.00
10	132	Banglade	35.5	35.60	3.61	3.42	3.05	3.38	116.3	137.7	520.00
11	133	Yemen	35.6	35.96	0.83	1.16	6.09	6.71	277.8	311.3	950.00
12	135	Samoa	36.0	30.99	4.46	5.07	3.78	4.30	202.4	83.59	2780.00
13	138	Zambia	37.3	53.35	31.10	41.5	16.07	18.50	64.92	137.1	950.00
14	139	Mauritani	37.9	40.58	17.07	18.4	14.16	14.12	82.58	89.18	840.00
15	140	Ethiopia	37.9	41.57	3.76	8.07	10.19	16.65	2085.	3512.	280.00
16	142	Guinea	39.6	40.24	9.22	10.1	9.60	10.57	1546.	2400.	390.00
17	143	S. Tomé	40.2	41.98	11.31	14.5	9.29	11.38	243.8	377.2	1020.00
18	145	Cambodi	41.8	43.01	15.65	17.8	9.94	11.16	177.0	201.2	600.00
19	147	Gambia	42.2	45.91	7.26	15.1	19.33	22.62	945.4	1439.	390.00
20	148	Comoros	46.6	48.76	17.73	20.5	22.23	25.74	685.4	793.6	750.00
21	149	Mali	46.7	49.25	19.50	23.7	20.78	24.02	114.6	139.5	580.00
22	150	Rwanda	47.6	54.99	23.70	27.3	19.34	37.62	257.6	344.3	410.00
23	151	Benin	47.6	51.71	17.34	22.4	25.74	32.71	204.6	220.3	690.00
24	152	Uganda	50.3	60.41	28.29	44.4	22.71	36.78	555.3	600.0	420.00
25	153	Malawi	52.8	57.82	13.84	16.0	44.70	57.39	2038.	4320.	290.00
26	154	Tanzania	53.7	55.36	33.30	32.8	27.85	33.25	173.3	204.0	440.00
27	155	Burkina	54.9	58.57	28.82	28.6	36.06	47.06	228.1	5193.	480.00
28	156	Madagas	55.4	71.71	35.80	68.5	30.63	46.64	297.2	450.2	410.00
29	157	Central	55.7	57.73	29.51	33.4	37.84	39.75	3891.	4407.	410.00
30	158	Mozambi	56.1	68.03	42.62	66.2	25.85	37.90	260.2	375.2	370.00
31	159	Myanmar	58.1	N/A	4.92	N/A	69.61	N/A	155.4	N/A	220.00
32	160	Togo	58.5	67.89	38.39	43.6	37.16	60.05	558.3	352.8	400.00
33	161	Niger	67.5	72.39	47.01	58.1	55.74	59.00	966.9	249.2	330.00

Source: ITU World Telecommunication/ICT Indicators database.

Note: The 2009 ICT Price Basket included a total of 161 economies. Out of the 49 LDCs, only 33 were included. The only reason for excluding countries from the ICT Price Basket is the lack of tariff data. In the case of LDCs, most countries had to be excluded because of the unavailability of broadband prices (either because the service does not exist or because prices are not publicly available).

In terms of the value change of the mobile cellular sub-basket, 9 out of the 10 countries showing the greatest 2008/09 decreases were LDCs (Table 2.2). This highlights that prices for mobile cellular services are decreasing faster in LDCs than in other countries of the world. At the same time, the price data show that the poorest countries in the world continue to have relatively high mobile prices, in terms of their income levels and in comparison to other countries in the world.

Despite the drop in prices, mobile cellular prices in LDCs remain relatively high and on average, the price of mobile cellular services in LDCs corresponds to 19 per cent of average monthly income, compared to 7.5 and 1.2 per cent in developing and developed countries, respectively.

Table 2.2: Ten economies with the greatest decrease in mobile telephone sub-basket value, 2008-2009

Overall 2009 Rank	Country	Mobile sub-basket as % of GNI capita, 2009	Mobile sub-basket as % of GNI capita, 2008	2008-2009 value change
160	Togo	37.2	60	-22.8
150	Rwanda	19.3	37.6	-18.3
158	Mozambique	24.8	37.9	-13.1
153	Malawi	44.7	57.4	-12.7
127	Kenya	11.7	23.7	-12.0
152	Uganda	25.4	36.8	-11.4
151	Benin	22.8	32.7	-9.9
156	Madagascar	37.6	46.6	-9.0
154	Tanzania	25.2	33.3	-8.1
155	Burkina Faso	39	47.1	-8.0

Source: ITU (2010b).

Note: Kenya is the only non-LDC in this table.

LDCs tend to rank low on the overall ICT Price Basket, which takes into account the prices of fixed telephony, mobile cellular and fixed broadband services. ITU²¹ has illustrated the high correlation between ICT prices and ICT penetration levels, hence the importance of making prices affordable. Bringing down the prices for mobile services is particularly important, given that the price of services makes up about 80 per cent of the total cost of mobile ownership.²²

There are a number of policies that governments can implement to bring down prices and make services more accessible to their populations. Above all, policy makers need to understand the mobile market by analysing market shares and to provide a favourable and transparent regulatory environment to allow new operators and investors to enter the market. Market liberalization and privatization have been key drivers to the mobile boom.

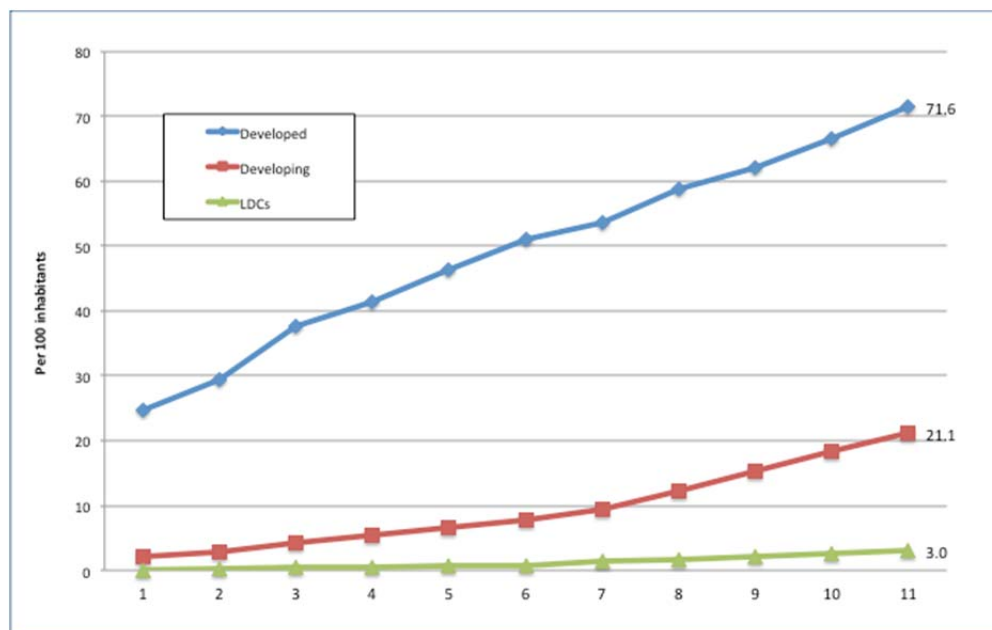
Besides opening up the market to several operators, governments can strengthen competition and sustain market growth by introducing mobile portability and by licensing wireless broadband (3G) services. A reduction of taxes, interconnection rates and regulatory fees can all help to further reduce prices and make services more affordable and accessible.

Internet

Internet use²³

A comparison of Internet use in LDCs with that in all developing and developed countries shows a very large gap between these groups. While by the end of 2010, only about 3 out of 100 people in LDCs were online, 21 out of 100 people in all developing countries were online. In the developed world, Internet penetration had reached almost 72 per cent (Chart 2.16). These data highlight the significant digital divide that separates the developed from the developing countries (and in particular LDCs) and suggests that much more must be done to bring people in developing regions online.

Chart 2.16: Internet users per 100 inhabitants, 2000-2010



*Estimates

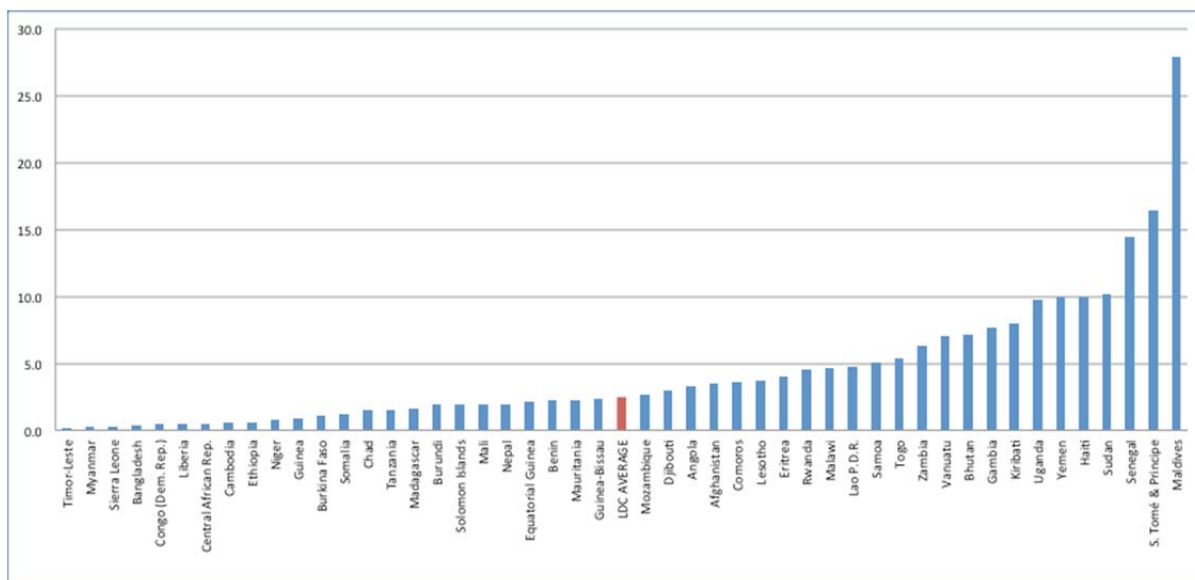
Source: ITU World Telecommunication/ICT Indicators database.

Internet penetration levels in LDCs range from below 0.5 per cent in East Timor, Myanmar, Bangladesh and Sierra Leone, to over 15 per cent in Sao Tome and Principe and the Maldives. In Maldives almost one third of the population is actually online. However, most LDCs have penetration rates below 10 per cent (Chart 2.17).

A comparison of the availability of ICTs in households between developed, all developing and Least Developed Countries shows that only a very limited number of households in LDCs have access to newer ICTs, such as a computer and the Internet. While in developed countries around two thirds of households have Internet access at home, the penetration level in all developing countries stood at around 16 per cent, compared to only 2 per cent in LDCs. The gap is much smaller in terms of households with “older ICTs”, for example television. Televisions are available in almost all households in the developed world, in almost three quarters of all households in the developing world, and in one quarter of households in LDCs (Chart 2.18).

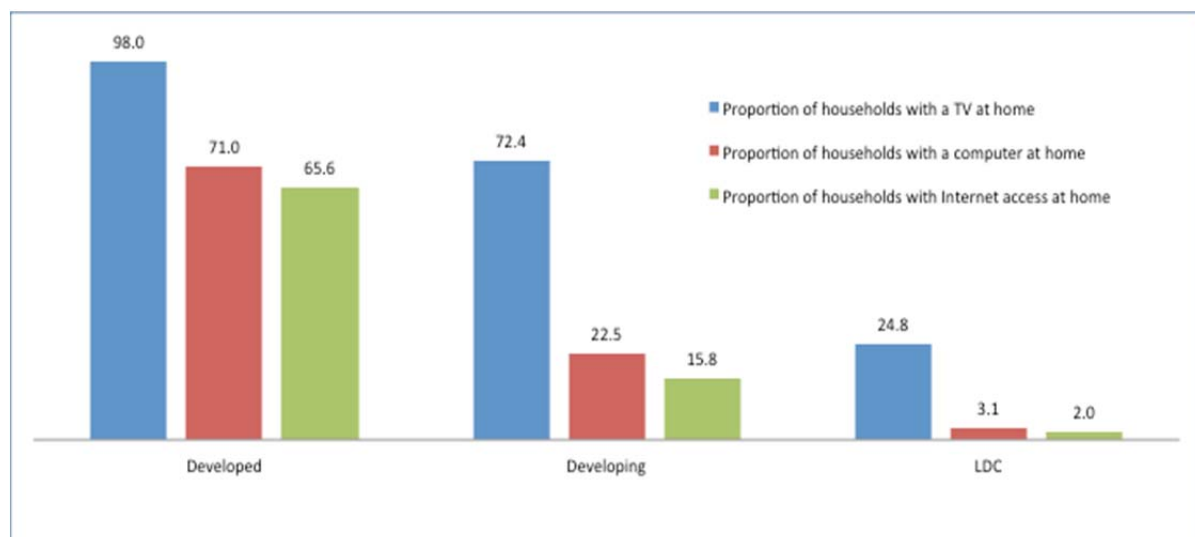
Although the possession of a television is different from Internet access – particularly in terms of the importance of literacy – TV penetration levels are a possible indicator for the potential of the Internet, since both ICTs require electricity and a certain level of household income.

Chart 2.17: Internet users per 100 inhabitants, LDCs, 2009



Source: ITU World Telecommunication/ICT Indicators database.

Chart 2.18: ICTs at home, 2010*



Source: ITU World Telecommunication/ICT Indicators database.

Note: * 2010 data are estimates.

Fixed and mobile broadband

To take advantage of the growing amount of content and applications that are available on the Internet, high-speed broadband Internet access becomes indispensable. This is particularly true for some of the applications, for example in the area of e-health or e-education, that hold great promise for development and usually require the transmission of large amounts of data. Table 2.3 illustrates

the time needed to download online content at different connection speeds. Low connection speeds make it difficult and time consuming for users in LDCs to access useful information available online.

Table 2.3: Time needed to download online content at different connection speeds

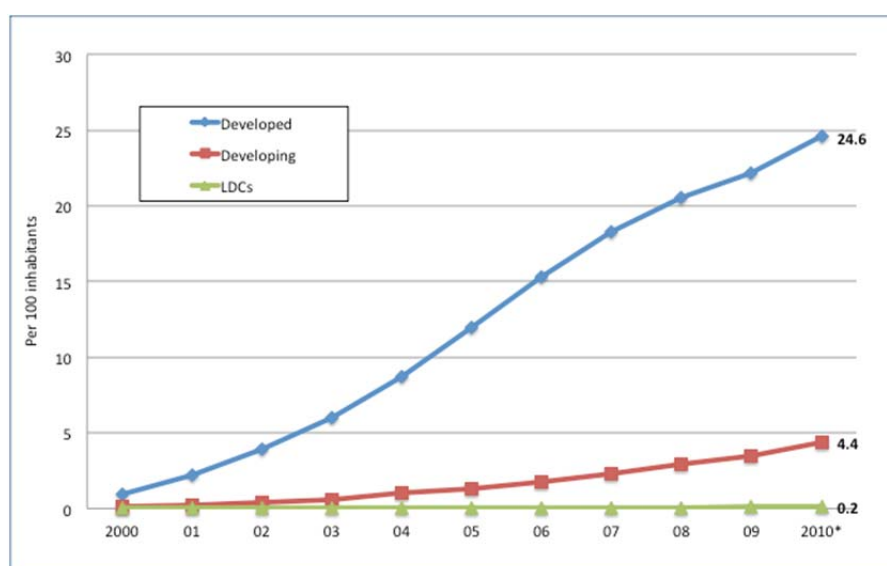
Content	Connection speed			
	256kbps	2Mbps	10Mbps	100Mbps
Google home page (160 KB)	0:00:05	00:00:01*	00:00:00*	00:00:00*
Music track (5MB)	0:02:36	0:00:20	0:00:04	00:00:00*
Video clip (20MB)	0:10:25	0:01:20	0:00:16	00:00:02*
CD / low quality movie (700MB)	6:04:35	0:46:40	0:09:20	0:00:56
DVD / high quality movie (4GB)	34:43:20	4:26:40	0:53:20	0:05:00

Source: ITU calculation.

Note: * Rounded values.

While broadband Internet access holds great promises to achieve development goals, many developing countries, and in particular LDCs, remain largely without broadband access. The average fixed broadband penetration level in LDCs is expected to remain as low as 0.2 per cent by the end of 2010. This compares to almost 25 per cent in the developed and 4.4 per cent in all developing countries (Chart 2.19).

Chart 2.19: Fixed broadband subscriptions per 100 inhabitants, 2000-2010



Source: ITU World Telecommunication/ICT Indicators database.

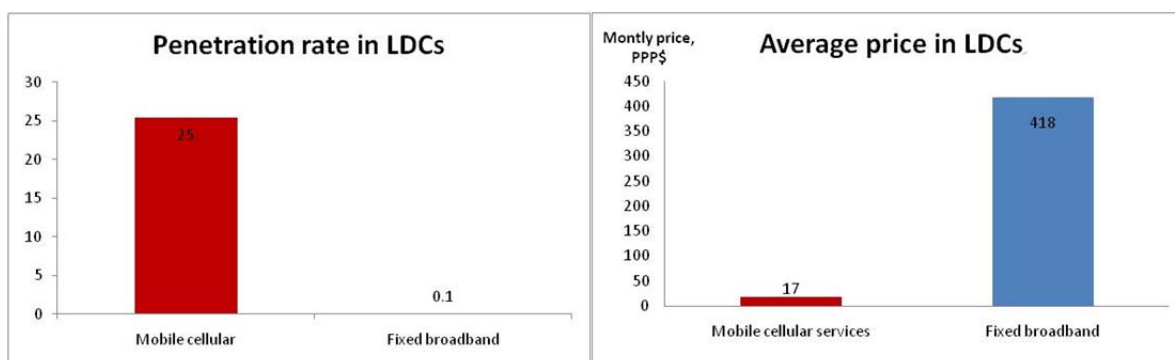
Note: * 2010 data are estimates.

Although there are various barriers to higher Internet and broadband penetration levels in LDCs – including the lack of infrastructure/access, limited international Internet bandwidth, and relatively low educational levels and literacy rates – high prices remain a key challenge. Fixed broadband Internet prices, which are tracked by ITU’s ICT Price Basket, remain prohibitively high in most LDCs,

where in 2009 an average entry-level fixed broadband subscription exceeded the average monthly GNI per capita in 22 out of the 33 LDCs included in that year's ICT Price Basket. The Central African Republic, Ethiopia, Malawi, and Guinea had the highest relative fixed broadband tariffs (See Table 2.1).

The notion that prices are a crucial factor in spreading the uptake of ICTs is supported by Chart 2.20, which compares the LDC's mobile and fixed broadband prices to the penetration rates for these services in such countries. While mobile prices are relatively lower and mobile cellular service penetration is relatively higher, fixed broadband prices in LDCs are high and the service penetration negligible.

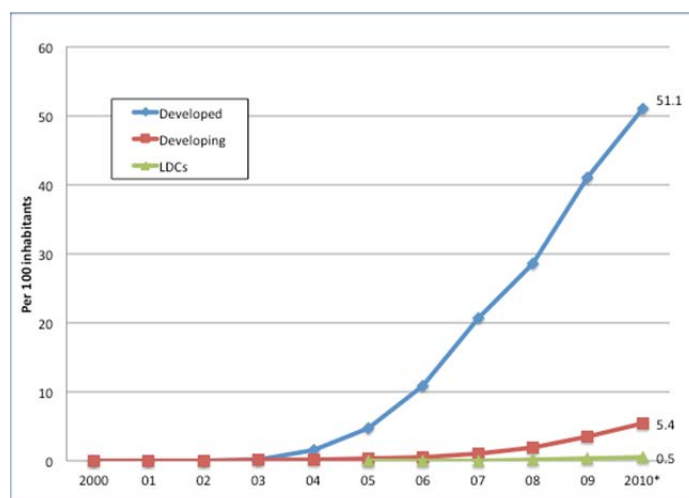
Chart 2.20: Comparison of LDC's mobile and fixed broadband prices and penetration rates, 2009



Source: ITU. For more information on the ICT Price Basket and the way it is calculated, see: ITU (2010b).

Since the availability of fixed broadband infrastructure is very limited in many rural areas in LDCs, mobile broadband technologies have a great potential to bring people online, at high speed. The number of mobile broadband subscriptions,²⁴ which is growing fast across the world and has actually surpassed the number of fixed broadband subscriptions, remains limited in LDCs, though, with only 0.5 per 100 inhabitants. In the developed world, the growth in mobile broadband subscriptions is expected to surpass 50 per cent penetration by the end of 2010 (Chart 2.21).

Chart 2.21: Mobile broadband subscriptions per 100 inhabitants, 2000-2010

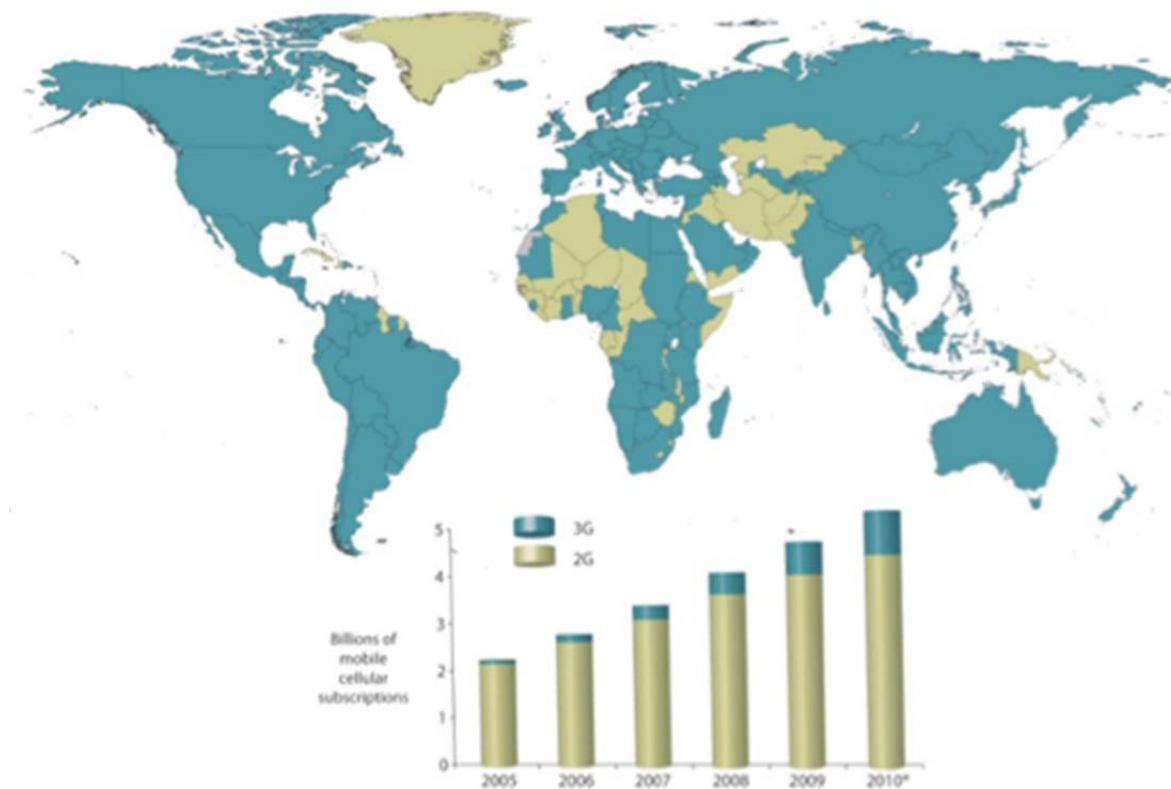


Source: ITU World Telecommunication/ICT Indicators database.

Note: * 2010 data are estimates.

One reason for the low mobile broadband uptake by mid 2010 is that in only 13 out the 49 LDCs (25 per cent) 3G services are offered commercially. Globally, in mid-2010, 143 countries were offering 3G services (Figure 2.1).

Figure 2.1: The rise of 3G



Notes: The map shows countries that are offering 2G/3G services commercially. *Estimate.

Source: ITU World Telecommunication/ICT Indicators database.

Since then, several LDCs, including Senegal and Burkina Faso, have either launched services or have announced plans to allocate 3G licenses in the near future.

The introduction of mobile broadband services is not only expected to address infrastructure challenges, but also to bring down fixed broadband prices, since it will introduce inter-modal competition into the broadband market.

Some operators in countries across the world – including in Sweden, Norway, Ukraine and the United States – have started offering beyond 3G services, but none of them are yet available in LDCs.

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3 Emerging trends and current challenges

3.1 Economic fundamentals: Competing for financial resources and market access

Historically, the participation of least developed countries in global trade has been limited. According to the UN, their share in the global merchandise trade rose from 0.62 per cent in 2002 to 1.08 per cent in 2008, with exports destined equally to developed and developing countries.¹ To promote economic growth and industrialization, LDCs require the support of schemes that facilitate access of their exports to new markets and provide stable sources of development financing. A primary benefit low-income countries derive from their inclusion in the LDC category is access to special support measures from bilateral donors and multilateral organizations, as well as preferential treatment in multilateral and regional trade agreements they participate in. Mainly, LDCs receive support in the areas of international trade – through preferential market access, special treatment in their obligations before the World Trade Organization (WTO) and support in developing capacity in trade-related matters – and of official development assistance (ODA), which can be provided through development financing or technical cooperation.

Support in international trade

Development partners aim to enhance LDC participation in the global trade system by facilitating their access to third-country markets. To this end, trading countries agree to lower their tariffs or lift any duty or quota they may impose on the import of specific LDC products. Developed countries, for instance, grant non-reciprocal and preferential duty concessions to imports from developing countries and LDCs under the Generalized System of Preferences (GSP) of the General Agreement on Tariffs and Trade and the World Trade Organization. Compared to other developing countries, those classified as LDCs are granted zero or deeper tariff cuts in a wider selection of products under the GSP. One example is the European Union's "Everything but arms" initiative, launched in 2001, that seeks to eliminate duties and quotas on all LDC products, with the exception of arms.² LDCs have also enhanced their trade relations with other developing countries by joining similar multinational and regional agreements that stimulate South-South trade and economic cooperation. One of these agreements is the Global System of Trade Preferences Among Developing Countries (GSTP), established in 1989 and administered with the assistance of the United Nations Conference on Trade and Development (UNCTAD). The GSTP provides a framework for the negotiation of progressive tariff reductions, direct measures and sectoral agreements among its 43 signatories – including seven LDCs (Bangladesh, Benin, Guinea, Mozambique, Myanmar, Sudan and Tanzania) –, under a reciprocal scheme.³ Although only a few LDCs participate in the GSTP, the framework has recognised their special needs, granting its LDC members preferential treatment and non-reciprocal concessions. Importantly, signatories of the GSTP are not required to provide reciprocal concessions to developed countries nor its concessions are available to all WTO Members on a most-favoured-nation basis.

The GSTP is one of a dozen regional agreements among developing countries established under the umbrella of the WTO's "Enabling Clause" that authorizes developed countries to give differential and most favourable treatment to developing countries. UNCTAD notes, however, that despite access to

non-reciprocal market access schemes and trade agreements, LDCs still face multiple barriers that impede them from taking full advantage of trade preferences, including supply-side constraints, restrictions regarding rules of origin, sanitary standards, and subsidies in developed countries.⁴

Participation in the WTO is also essential for LDCs to improve market access. As of January 2011, 31 of the 48 current LDCs had successfully become WTO signatories and twelve other LDCs were negotiating their accession. The organization also counts as members the three countries that have graduated from the LDC status so far (Table 3.1). Under WTO, LDC members are granted special provisions, including increased market access, greater flexibility in rules governing trade measures, longer transitional periods and technical assistance. Moreover, recognizing the role of international trade in fostering economic development, the WTO adopted the Doha Development Agenda during its Fourth Ministerial Conference held in Doha, Qatar in 2001. The Agenda establishes modalities for preferential treatment to LDC members, giving these countries greater flexibility in undertaking commitments during their negotiations on trade in services and on trade facilitation. As a result, under the Doha negotiations, LDCs are able to undertake only those commitments that are in accordance to their administrative and institutional capabilities and that respond to their development, financial, and trade needs.

WTO also conferred LDCs special concessions under the Agreement on Trade-Related Intellectual Property Rights (TRIPS), which entered into force in 1995, and the General Agreement on Trade in Services (GATS), adopted in 2003. Under TRIPS, for example, LDCs were granted an 11-year transition period to meet their obligations regarding copyrights, trademarks, patents, trade secrets and other intellectual property rights. This period was further extended in 2005, providing LDCs additional time (until July 2013 and January 2016 for pharmaceutical products) to meet their obligations.⁵

Table 3.1: LDC presence in the World Trade Organization

Current LDC Members			LDCs in the process of acceding to WTO	Graduated LDCs with membership in WTO
Angola	Guinea Bissau	Senegal	Afghanistan	Botswana (1995)
Bangladesh	Haiti	Sierra Leone	Bhutan	Cape Verde (2008)
Benin	Lesotho	Solomon Islands	Comoros	Maldives (1995)
Burkina Faso	Madagascar	Togo	Equatorial Guinea	
Burundi	Malawi	Uganda	Ethiopia	
Cambodia	Mali	United Rep. of Tanzania	Laos	
Central African Republic	Mauritania	Zambia	Liberia	
Chad	Mozambique		Sao Tomé & Príncipe	
Dem. Rep. of the Congo	Myanmar		Samoa	
Djibouti	Nepal		Sudan	
Gambia	Niger		Vanuatu	
Guinea	Rwanda		Yemen	

Source: World Trade Organization, *Understanding the WTO: Least developed countries and Members*. (

While the WTO has responded through the years to the particular needs of its LDC members, it is less prepared to deal with LDCs that reach graduation. The graduation of the Maldives from the list in January 2011 poses a new challenge, since the organization has not developed smooth transition policies to minimize the impact of the cessation of preferential treatments and special concessions

on graduated countries. Both Botswana and Cape Verde became members of the WTO shortly after the UN General Assembly had taken note of their recommendation for graduation. The experience of Cape Verde, however, might be useful to the Maldives, as it set some precedents regarding the extension of preferential market access after LDC graduation.

To ease the transition for graduating countries, the UN General Assembly has urged development partners to support smooth transition strategies, so that development financing and technical assistance are not cut abruptly after a country graduates from the LDC list. In its Resolution 52/209 of December 2004 the General Assembly also requested WTO members to consider granting graduated LDCs an extension of the preferential treatments and exemptions conferred to them under the LDC status over a period appropriate to the development situation of the particular country. The upcoming LDC-IV Conference will provide a forum for the discussion of challenges and recommendations regarding phase-out periods and strategies for special support measures.

Finally, the WTO provides additional support to LDCs through the multi-agency, multi-donor initiative called “Integrated Framework for Trade-related Technical Assistance to Least Developed Countries” (IF). Established as part of the mandates approved in WTO’s first Ministerial Conference in 1996, the IF aims at building capacity among LDCs on trade-related issues, to better enable these countries in their response to trade opportunities and their participation in the multilateral trade system.

Official development assistance

LDCs receive financing for development through bilateral or multilateral official development assistance or ODA. Bilateral agreements with donor countries, the private sector and/or multilateral agencies, such as the United Nations Development Programme (UNDP) and UNCTAD, are voluntary. Key among such bilateral agreements are the Brussels Declaration and the Programme of Action for the Least Developed Countries for the Decade 2001-2010, adopted at the Third United Nations Conference on the Least Developed Countries, held in Brussels in 2001.

With the goals of substantially reducing conditions of extreme poverty and hunger among the LDC population by 2015 and promoting sustainable development, the Programme of Action set up policies and measures to assist LDCs and their development partners in dealing with identified priority issues, including poverty eradication, gender equality, employment, governance, human, productive and institutional capacity building, mobilization of financial resources, sustainable development and environmental vulnerability. As part of the Programme, donor countries pledged to meet expeditiously their commitment to target 0.15 per cent or 0.20 per cent of GNI as ODA to least developed countries.⁶ The disbursements to LDCs by member countries of the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD/DAC) have increased from USD 29.5 billion in 2006 to USD 46.6 million in 2008. Yet, according to the UN-OHRLLS, as of 2010, only nine donors had reached the 0.15 per cent target.⁷

Some donor countries and multilateral agencies have focused their ODA on initiatives to stimulate infrastructural investment in LDCs, including the telecommunications sector. One example is the “Connect the World” initiative, launched by the ITU in 2005, in collaboration with other development partners and donor countries. This initiative seeks to mobilize financial and technical resources towards improving access to telecommunication services and ICT applications and help

LDCs reduce their digital divides. This global initiative and other financial opportunities available to LDCs are discussed in greater detail in Chapter 4 of this report.

Other UN organizations, like the UNDP, the World Meteorological Organization and the United Nations Capital Development Fund have established multilateral programmes, earmarked a proportion of their budget or set up special funds to provide technical assistance to LDCs. Support is provided in areas where LDC show particular vulnerability or need, such as adaptation to climate change, implementation of food aid programmes and the decentralization of public investment, among others. The World Bank, on its part, provides concessionary financing to low-income countries through its International Development Association (IDA). Since this type of aid is not linked exclusively to the LDC status, the financial support provided to such countries by regional and multilateral financial institutions, including IDA, depends mostly on income thresholds for low-income countries. This allows for continued access to concessionary financing facilities even after graduation.

Foreign direct investment

While the LDC status is a key factor in receiving special financial and trade assistance from bilateral and multilateral agreements, the inflow of foreign direct investment (FDI) to these countries depends mostly on other factors, such as the investors' perception of an LDC's political and economic stability, the transparency and openness of its legislative and regulatory framework, as well as on the reliability of its institutional arrangements. As discussed in the previous section, some LDCs have made considerable progress in democratizing their societies, improving stability, transparency and promoting institutional development, but there is still more work to be done, particularly in the areas of economic reform and investment liberalization.

During the last decade, investors have responded positively to development achieved so far by LDCs, increasing their FDI inflows to these countries from 4.1 billion in 2000 to 33.1 billion in 2008. Yet, as illustrated in Table 3.2 below, the global proportion of FDI reaching LDCs remains low (2.5 per cent), considering the potential for investment many of these countries have to offer.⁸ The global financial and economic crises of the last few years have had a negative impact on the inflows, aggravating the situation. UNCTAD reports a 14 per cent decline in FDI flows to LDCs in 2009, reaching only USD 28 billion, as a result of lower commodity prices and cancelled mergers.⁹

Table 3.2: FDI flows, by region, 2007-2009 (Billions of dollars and per cent)

Region	FDI inflows			FDI outflows		
	2007	2008	2009	2007	2008	2009
Structurally weak, vulnerable and small economies *	42.5	62.1	50.5	5.3	5.8	4.2
LDCs	26	32	28	2	3	1
LLDCs	16	26	22	4	2	3
SIDS	5	8	5	0	1	0
	Value					
Structurally weak, vulnerable and small economies *	2.0	3.5	4.5	0.2	0.3	0.4
LDCs	1.2	1.8	2.5	0.1	0.2	0.1
LLDCs	0.7	1.5	2.0	0.2	0.1	0.3
SIDS	0.3	0.4	0.4	0.0	0.0	0.0
	Percentage share in world FDI flows					
<i>Memorandum :</i>						
World	2 100	1 771	1 114	2 268	1 929	1 101
Developing economies	565	630	478	292	296	229

Note: Without double counting, as a number of countries belong to two of these three groups.

Source: UNCTAD, *World Investment Report 2010*.

Aware of the barriers LDCs face with respect to FDI, UNCTAD and the European Union have launched diverse programmes to improve their capability to attract investment since 2001.¹⁰ FDI and public-private partnerships have played a major role in improving infrastructure in LDCs. These financial resources have been invaluable in the deployment of submarine cable and mobile networks and will play an essential role in the introduction of broadband technology in LDCs. Interestingly, the funds are not only from developed countries. Developing countries and emerging economies are investing heavily in the telecommunication sector of LDCs, particularly in the African region. As the UN-OHRLS points out, all major players in the African telecommunication sector are from other developing countries.¹¹ Box 3.1 below introduces the case of the telecommunication industry in the three LDCs of the Arab region, examining the role of FDI in this development, among other factors.

Box 3.1: The cases of Mauritania, Sudan and Yemen

Mauritania, Sudan and Yemen are among the Least Developed Countries of the Arab world. Sudan is the most populated country among the three, with a population of 40.6 million, followed by Yemen and Mauritania at 22.8 million and 3.3 million, respectively. Their economies are mostly based on the agriculture, fishery, livestock and the service sectors, although Sudan has a rapidly developing oil industry as well.

GDP per capita in the three countries is low when compared to the rest of the Arab countries. Furthermore, these countries have a large average household size (between 5.5 and 7 persons), with a relatively small female labour force, thus limiting families' sources of income. The combination of poverty and illiteracy acts as a massive barrier facing the adoption of advanced ICT services, such as broadband Internet.

.../...

Box 3.1 (continued)**Table 1 box 3.1: Comparison of Arab LDCs' key indicators**

	Mauritania (2009)	Sudan (2009)	Yemen (2009)
Population (000s)	3,251	40,554*	22,800
Household size	5.5	6.0	7.0
GDP (US\$ million)	1,274	54,677	28,649**
GDP per capita (US\$)	392	1,348	1,291**
Fixed market operators	2	2	1
Fixed lines (000s)	74	666	997
Fixed penetration %	2.3%	1.6%	4.4%
Cellular market operators	3	3	4
Cellular lines (000s)	2,182	16,931	8,186
Cellular penetration %	67.1%	41.7%	35.9%

*Estimated

**2008

Source: Central banks, operators and Arab Advisors Group.

The three countries face varying degrees of political instability. For example, Sudan has an ongoing conflict in the Darfur region, which causes the country to face extensive international pressure. Telecommunications operators in Sudan have difficulties trying to expand their coverage into conflict-ridden areas. Drug trafficking, terrorism and illegal immigration affect Mauritania's national security. While in Yemen, there are ongoing conflicts in some regions between the government forces and local insurgents. Such instability restrains access to certain areas, hindering the expansion of telecom coverage and the roll out of services, thus limiting uptake.

The three countries have low fixed line and mobile cellular penetration rates relative to the rest of the Arab world. Mauritania, Sudan and Yemen had the lowest fixed line penetration rates by the end of 2009, not exceeding five per cent. Yemen's fixed line penetration rate reached 4.4 per cent by the end of 2009. Mauritania and Sudan followed with fixed line penetration rates of 2.3 and 1.6 per cent, respectively. As for mobile cellular penetration, Sudan and Yemen had the lowest penetration levels among the Arab countries, with 41.7 and 35.9 per cent, respectively. Meanwhile, Mauritania had a penetration rate of around 67.1 per cent.

Mauritania and Sudan have independent telecom regulatory bodies and duopoly fixed service markets. Yemen remains as one of few Arab countries with a monopoly fixed services market and no independent telecom regulator. On the cellular front, the three countries enjoy competitive markets, with at least three operators serving each market.

The Autorité de Régulation regulates Mauritania's telecommunications market. The country's fixed line and Internet markets are duopolies, controlled by Mauritel, the incumbent operator, and Chinguitel. Mauritania's cellular market became competitive in August 2007, when Chinguitel launched its mobile cellular services, ending the duopoly of Mauritel and Mattel, both of which launched their services in 2000. By end of 2009, the three Mauritanian mobile cellular operators registered 2.18 million cellular lines. Fixed lines reached 74,464 by the end of the period.

Box 3.1 (end)

The National Telecom Corporation (NTC) is the regulatory body in charge of telecommunication services in Sudan. The fixed services market monopoly ended in Sudan in late January 2006 when Canar, a consortium led by the United Arab Emirates' Etisalat, launched its fixed services based on wireless technologies. On the cellular side, the market hosts three mobile cellular service providers: Zain, MTN and Sudatel. MTN ended Zain's monopoly when it launched its services in July 2005. Later in 2005, Sudatel's cellular arm, Sudani, launched its cellular services. The Sudanese mobile cellular market reached 16.93 million lines by the end of 2009.

Yemen's Ministry of Telecommunications and Information Technology (MTIT) regulates the country's telecommunications market. Yemen's fixed line market remains a monopoly. MTIT has not announced any plans to liberalize Yemen's fixed line market yet. Furthermore, Yemen's Internet market is a duopoly, controlled by Yemen Net and TeleYemen's YNet; both being government owned entities. Yemen's mobile cellular market has been competitive since 2001, when Sabafon and MTN Yemen launched mobile cellular services in the country. Prior to their entry, TeleYemen was the sole operator in the Yemeni mobile cellular market. In 2006, competition improved the Yemeni cellular market with the replacement of the ETACS network of TeleYemen with the CDMA network of Yemen Mobile. Y Telecom, Yemen's fourth cellular operator, launched its services in 2007. By the end of 2009, the mobile cellular market had more than 8.1 million lines. As for the fixed market, The Public Telecommunications Corporation (PTC) battled to reach nearly 1 million lines by the end of the period. In spite of PTC's continuous efforts to expand the service throughout rural areas, the fixed line penetration rate has not exceeded five per cent since 2003, and is not expected to improve in the near future.

The ICT sector has been widely credited for boosting economies worldwide. ICT creates various job opportunities, increases efficiency of businesses and significantly contributes to GDP. Telecommunication services, especially mobile, facilitate the exchange of valuable information to the industries in a timely manner, thus increasing their business efficiency. For example, in Sudan the ICT sector contributed positively to the agriculture industry. ICT helped by providing regular weather updates as well as facilitating communication between buyers and sellers in addition to providing up to date market prices.

The inflow of foreign investments and job opportunity creation contribute positively to GDP. As a result of opening up their telecom markets, all three countries have telecom operators that were acquired by major foreign investors such as: Zain Group, MTN Group, Batelco Group, Maroc Telecom Group and Etisalat Group.

Source: Danya Nusseir, Samer Abbas and Tareq Masarweh, Arab Advisors Group.

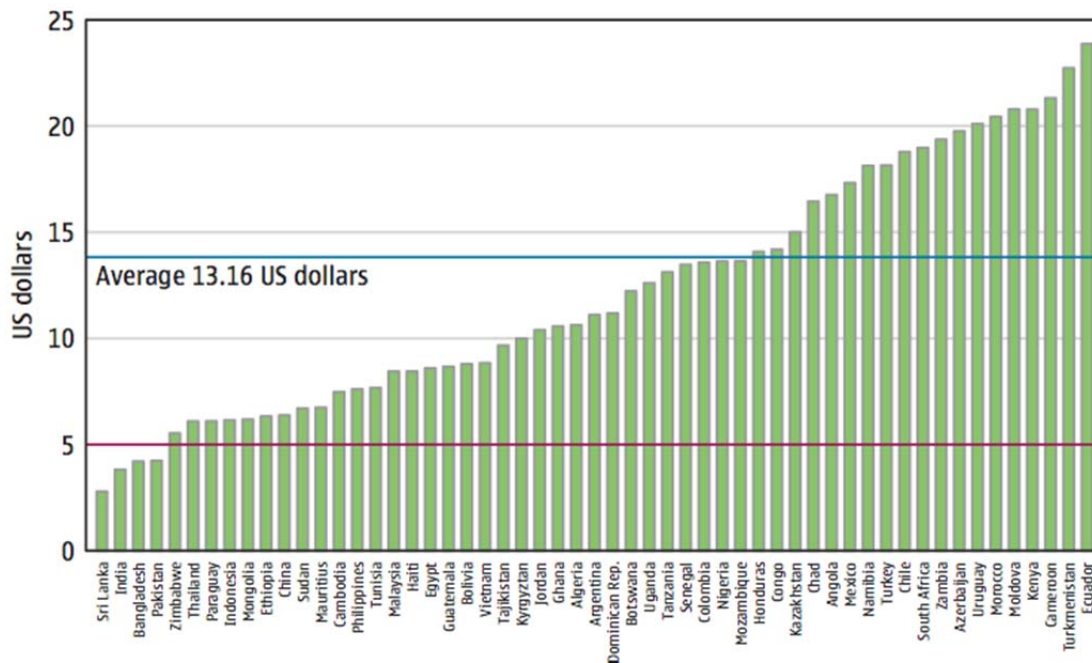
3.2 Technological challenges

LDCs are characterized by low levels of income, paucity of human resources, and multi-dimensional economic vulnerability. Among the 49 LDCs are 16 landlocked and 12 small-island states. Many have difficult terrain and most have low population densities. Majorities of the inhabitants live in rural areas, distant from domestic and international markets. While economic growth has picked up in recent years, most of their citizens live on less than USD 2 per day.¹²

Therefore, the technological challenge takes the form of providing voice and data connectivity to dispersed populations with little disposable income. It is, in essence, not a purely technological challenge, but an affordable-technology challenge. The solution must address the problems of bringing down prices to end-users by radically reducing costs at three levels: backhaul networks, access networks and terminal devices (that are appropriate for the intended users). Benefits of cost reductions will be passed on the end-users only under competitive or highly regulated conditions. Because LDCs also tend to suffer from weak government and regulatory capacity, the latter option is not practical for the most part. What has worked, with regard to voice connectivity offered in LDCs and to populations with similar characteristics in other developing countries, is innovation driven by competition.¹³ What is likely to work with regard to data connectivity in LDCs is some variant of this solution.

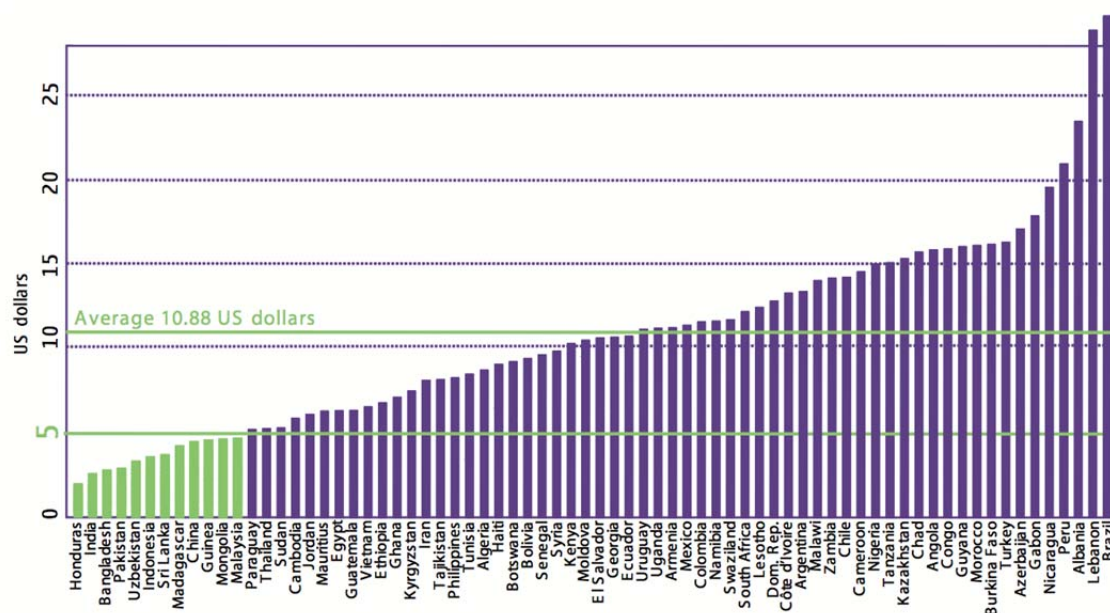
The basic outlines of the technological solution that will provide affordable voice connectivity to the poor in LDCs emerged in South Asia around 2003-04. It is now diffusing throughout the developing world. The evidence lies in the two “snapshots” taken by Nokia in 2007 and 2009 across 77 emerging economies, where the cost of the same basket of OECD low-user voice calls, monthly rentals, 1/36th of connection charges and the cheapest available Nokia handset and all associated taxes were compared.¹⁴ As illustrated in Chart 3.1 below, in 2007, the average was USD 13.16, and only four countries were below the USD 5 threshold. This included one LDC, Bangladesh. By 2009, the average had come down to USD 10.88, and 12 countries were offering the basket of services for less than USD 5. Guinea and Madagascar had joined Bangladesh in the lowest-cost group from among the 49 LDCs. Sudan, Cambodia, Ethiopia, Haiti, and Senegal were among those that showed satisfactory performance, with prices below the average for the 77 countries (Chart 3.2).

Chart 3.1: Total cost of ownership by country, emerging economies, 2007



Source: Nokia (2007), published in Nokia (2009). *Expanding Horizons*, 1/2009. Special edition 99, p.12.

Chart 3.2: Total cost of ownership by country, emerging economies, 2009



Source: Nokia Research (2009), published in Nokia (2009). *Expanding Horizons*, 2/2009, p.11.

How were 12 countries able to offer for less than USD 5, a bundle of services that cost over five times that amount in Brazil? It was the implementation of a Budget Telecom Network Model (BTNM), so named for its similarities with the Budget Airline Model that has enabled low-cost carriers across the world to make profits while offering extremely low prices to customers. This is primarily a disruptive innovation;¹⁵ it requires a whole series of technological and service-process innovations, exemplified in Box 3.2. The process is not one-off, because under the intensely

competitive conditions, constant downward pressure must be maintained on costs. Otherwise, profits will quickly turn into losses and it will become difficult to raise capital for investment.

Box 3.2: Innovations that underlie the BTNM

Following its first basket comparison of 2007 that showed Bangladesh, India, Pakistan and Sri Lanka having a total cost of ownership (TCO) of less than USD 5,¹⁶ Nokia commissioned LIRNEasia to explain why. Given below is an excerpt of a report of the findings:

First, significantly higher utilization levels were reached to accommodate the higher traffic volumes carried by the networks. In many cases, the mobile operators increased network capacity by updating their base station software, which make better use of their existing radio frequencies. The study pointed to one Sri Lankan operator that claimed to have doubled its network capacity through such software solutions with no negative consequences to quality.

Operators also shifted the way in which they expanded network capacity. Traditionally, capacity was added purely on the basis of the number of subscribers, regardless of their calling patterns. However, as lower income, pre-paid subscribers use fewer minutes, operators found that adding capacity based on call attempts per second was a more realistic and cost-effective approach.

A second area of business model innovation . . . was how operators in the four lowest TCO countries were able to serve consumers at the bottom of the income pyramid. The key issue here . . . was the shift to pre-paid solutions that better matched the type of income and spending patterns seen amongst the lowest income groups.

“Most of these countries we looked at had over 90 per cent prepaid customers. The irregular income pattern of consumers at the bottom of the pyramid and the informal economy was being recognized by the operators in these four countries,” [noted Samarajiva, LIRNEasia CEO]. . . . One operator in India deployed an electronic prepaid top-up solution in denominations as low as 0.25 US dollars. This type of micro-recharge has proven to be ideally suited for people in emerging economies who rely on sporadic and irregular wages.

And a third area where operators in the lowest TCO countries made significant progress was in reducing customer acquisition and retention costs. The study found that these operators significantly lowered distribution costs by controlling the level of commissions paid out to dealers who acquire customers. One Sri Lankan operator claimed that its acquisition costs per pre-paid customer, including the cost of the SIM, consumer promotion and dealer commission, was as low as one US dollar, and even here no commission would be paid if the consumer left the network within a certain period.¹⁷

Necessary conditions

The necessary condition for the emergence of the cluster of technological, service-process and business innovations described as the BTNM is the removal of barriers to market entry.

Ideally, market entry and necessary access to scarce resources will be permitted on a transparent basis, and regulatory actions will be undertaken to provide a level playing field for new entrants with cost-oriented and non-discriminatory access to essential facilities and to interconnection. However, the BTNM can emerge even under less-than-ideal conditions, as is demonstrated by the case of Bangladesh, an LDC, where market entry occurred under opaque conditions and interconnection was denied to new entrants for a long period by the government-owned incumbent operator. In

another LDC, Nepal, it was found that mobile voice prices came down rapidly in 2009 to South Asian levels, not because of orderly entry, but because ambiguously legal entry into the mobile space had been effected by those who had been licensed to operate fixed telecom services.¹⁸

Examination of the countries that have the lowest mobile connectivity according to the ITU, shown in Table 3.3, further illustrates the importance of market entry. The countries with low active SIMs per 100 inhabitants (SIMs/100) and low CAGRs (Compound Annual Growth Rates) have not removed barriers to entry. The few with low active SIMs/100 and high CAGRs are those that have allowed market entry recently, with the exception of Ethiopia. Its monopoly operator mobilized massive investments in 2007 through a vendor-financed loan of USD 1.9 billion, but has yet to meet the announced targets.¹⁹

Table 3.3: Countries with least mobile subscriptions, 2009

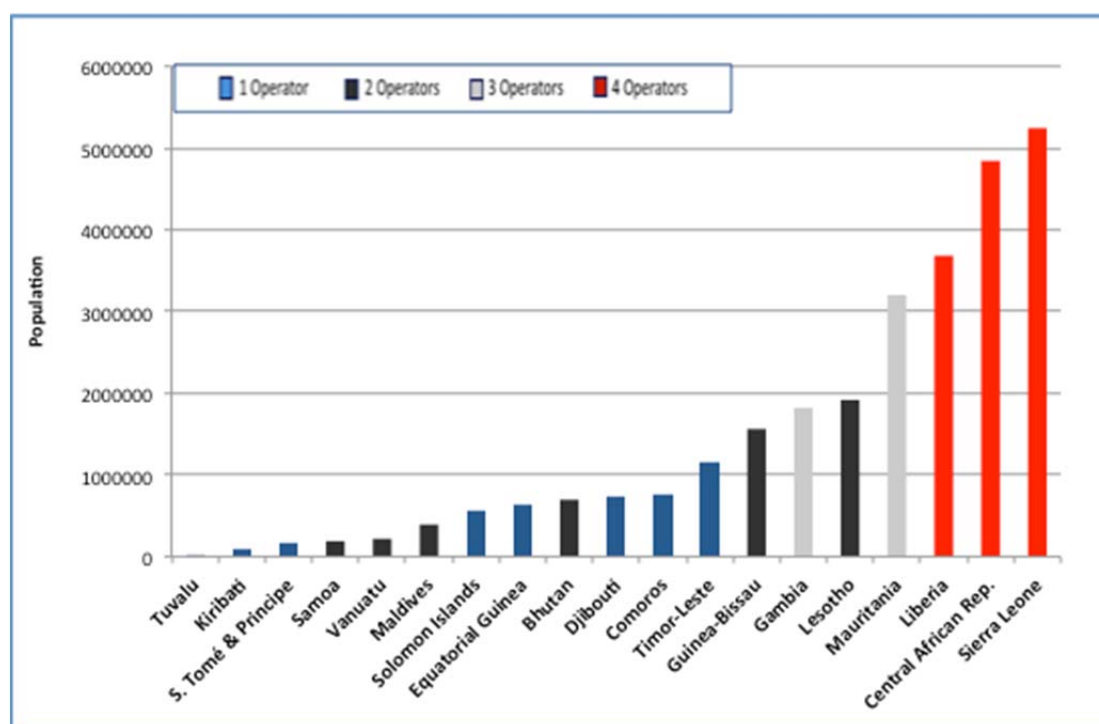
	Mobile subscriptions per 100, 2009	CAGR, 2004-09 (%)	Mobile telephone sub-basket as a % of GNI per capita
D.P.R. Korea	0.29	-	
Myanmar	1	40.3	69.61
Kiribati	1.02	10.2	
Eritrea	2.78	47.8	
Marshall Islands	4.84	36	
Ethiopia	4.89	91.9	10.19
Cuba	5.54	52.3	
Solomon Islands	5.73	58.5	
Somalia	7.02	5.1	
Burundi	10.1	52.8	

Source: ITU/ICT Indicators Database, 2009.

Simple market entry does not, by itself, cause suppliers to adopt the BTNM. When the competition reaches a high level of intensity, operators are compelled to move from the comfort zone of the conventional business model to BTNM. In the cases that have been analysed, this has occurred around the time the fourth operator gains significant market share and/or a significant change in ownership/culture occurs in one of the operators. For example, the phase shift occurred in Sri Lanka when the fixed operator entered the mobile space and found itself in an unfamiliar last place. In Thailand, the new model was triggered by a foreign investor with deep pockets and experience in BTNM from Bangladesh acquiring control of a locally owned operator. The recent acquisition of a number of African operators (many in LDCs) by India's Bharti Airtel is likely to trigger the shift in Africa.²⁰

The applicability of the BTNM to LDCs – which all have small populations, with the exception of Bangladesh – requires some discussion, in light of the above mentioned need for around four operators. Indeed, LDCs include among them micro-states, defined as having a population below 500,000: Tuvalu, Kiribati, Sao Tome and Principe, Samoa, Vanuatu, and the Maldives. It is clear from Chart 3.3 that size itself is not a determinant of monopoly. As is discussed in Chapter 5 of this report, some micro-states, like Maldives, have ended monopoly by allowing limited entry and seeing, as a result, performance improvements.

Chart 3.3: Number of Mobile Network Operators in LDCs with the smallest populations



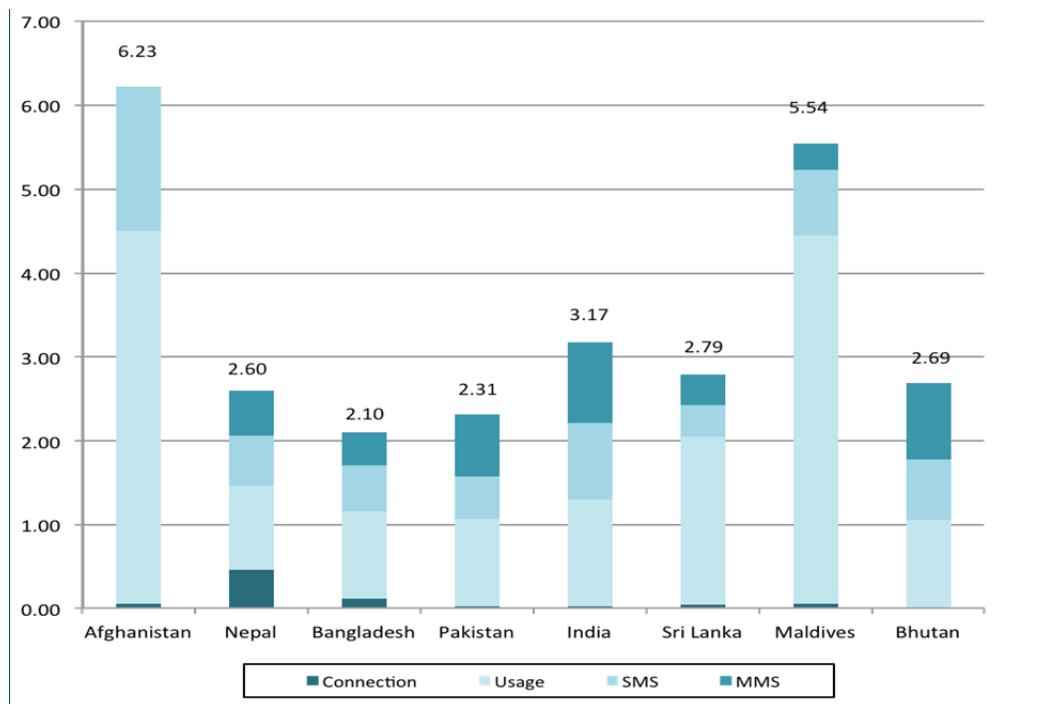
Source: R. Samarajiva.

The question then is whether one can achieve the desired result of connectivity for most, based on low prices under duopoly or with less than four operators. The evidence on whether competition will intensify to the level that will trigger adoption of the BTNM is not unambiguous: Bhutan, a country with less than a million people and only two operators, has achieved prices in the same range as the pioneers of BTNM; on the other hand, Maldives, a country with less than 500,000 people and a duopoly, has relatively higher prices (Chart 3.4). However, the gap narrows when the prices are compared in terms of purchasing power parity (PPP) (Chart 3.5).

Very clearly, some entry has to be permitted to allow the BTNM to gain traction; one does not see low prices and high growth in connectivity under monopoly. In the case of micro-states, even one additional competitor may be enough.

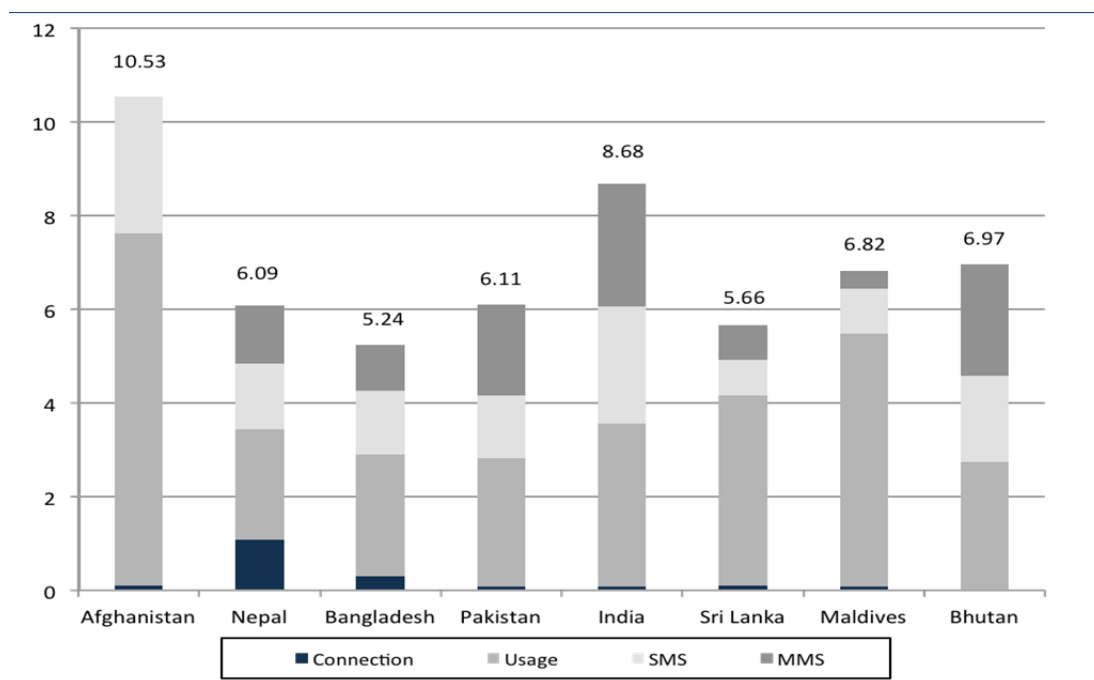
BTNM has been effective in connecting hitherto unimaginable numbers of poor people to voice networks at unimaginable prices. Whether it will be possible to extend the BTNM to data connectivity is yet to be seen. The release of 3G frequencies capable of supporting high speeds occurred late in the large developing countries.²¹ The business models have not settled and device prices are still in flux, though they will come down as take up increases in the mega-economies of China and India. Therefore the extension of the BTNM to data is still in process. At this critical point, governments have seen the mobile industry as a source of easy revenue to exploit. They have yet to appreciate the urgency of announcing roadmaps for releasing adequate quantities of spectrum at predictable times to support data communication.

Chart 3.4: Average prepaid monthly mobile cost for a low user (USD) in South Asia, Feb 2010



Source: LIRNEasia.²²

Chart 3.5: Average prepaid monthly mobile cost for a low user (USD, PPP) in South Asia, Feb 2010



Source: LIRNEasia.²³

The transition is complicated by the rapidity of voice becoming a commodity with thin margins.²⁴ The operators are grappling with the dual challenges of investing in what amounts to an overlay network (3G requires new network equipment though some antenna towers may be shared with existing 2G networks), while at the same time investing in new applications that can generate revenues that

voice no longer yields. Only some have realized that the solution lies in decentralized innovation, exemplified by the “app store” model popularized by Apple and Google (Box 3.3).

Box 3.3: Innovative business models in developing economies

For Mobile Network Operators (MNOs) content remains their weakness. Therefore, if MNOs partner with content providers, through a mutually beneficial relationship they can generate alternate sources of revenue.

Apple’s App store model sets the example. www.appzone.lk is Sri Lanka’s first SMS based mobile application platform that allows software developers to create, test and monetize applications, while operators use their existing consumer base to promote the use of these value added services and thereby their networks. A 70 per cent revenue share with the respective application developer has been assured.²⁵

Challenges

Backhaul networks

In the old circuit-switched world of fixed-telephony, it was possible to talk about reducing the reliance on the backhaul network. Most communication within rural communities is local, enabling, at least theoretically, the switching of most of the calls at the level of the access network itself. However, mobile telephony requires the interrogation of central databases, which requires the use of backhaul networks to carry signalling data long distance. Whether a call is local or not is determined at the moment the call is connected when the location of the called party is identified. Therefore, mobile has a greater reliance on backhaul than fixed. The Internet is inherently global, with many functions dependant on international connectivity, and is therefore reliant on national and international backhaul even more. Cloud computing increases the reliance even further.

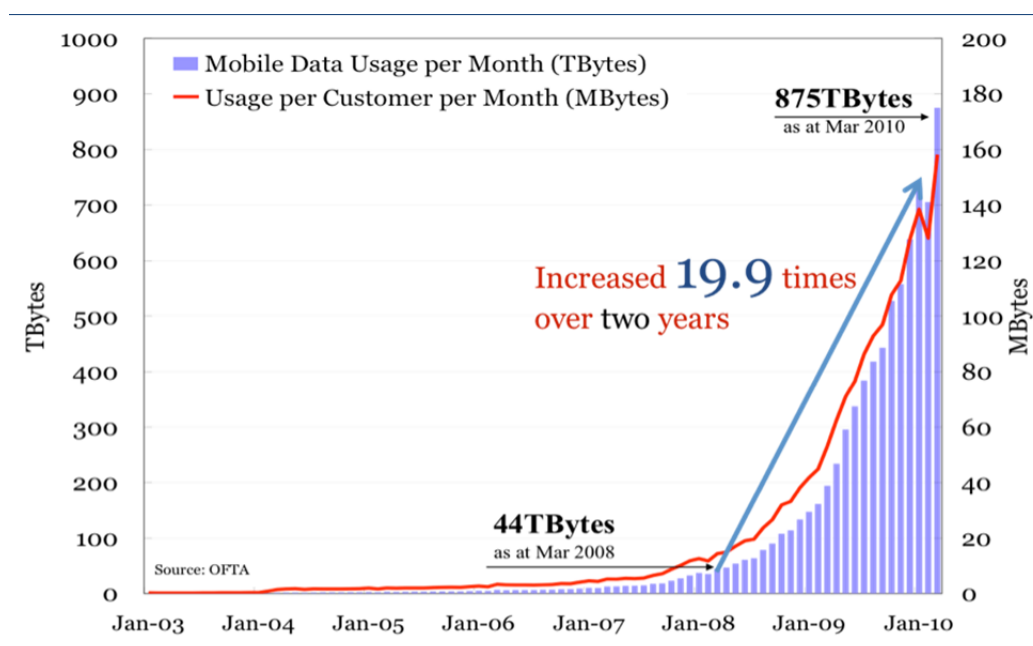
More-than-voice applications are heavy users of bandwidth, as exemplified by Chart 3.6, which shows that traffic generated by mobile networks increased by close to 20 times over a two-year period in Hong Kong, China. Unless operators build additional capacity in time, the user experience of new data services is likely to be sub-optimal, resulting in low take up of services.

Especially in light of the criticality of low latency and jitter for most ‘more-than-voice’ applications,²⁶ there is little debate about the importance of fibre optic media in backhaul networks. Backhaul, especially on the long, international routes that many operators in LDCs would have to self-supply, is likely to constitute a barrier. In addition to the required capital, operators from landlocked LDCs face difficulties in gaining rights to lay cable across other countries. Submarine cables between two countries pose fewer difficulties, as shown by operators in the Maldives, a microstate and an LDC, building two in the past few years.²⁷

Increasingly, the value placed on reliability (reaching up to 99.999% availability, known as five nines availability), because of the greater importance of data connectivity, is causing companies to migrate from point-to-point links to rings to mesh configurations. This is braking the otherwise declining costs. It is increasing the complexity of international backhaul networks. Transnational mesh

networks that include both terrestrial and undersea components are difficult to build without the active cooperation of international government organizations and governments.

Chart 3.6: Traffic generated by mobile networks



Source: Hong Kong Office of Telecom Authority.

Access networks

There is much talk about taking fibre to the home in developed market economies. This conception of the network has many advantages such as multi-megabyte download speeds. Yet it is costly; too costly for LDCs and even for more prosperous developing-country economies. However, networks in all countries will have one common characteristic: end-users will access the network wirelessly. Few would choose to be tethered to a wire when the freedom of wireless is an option. In the densely populated centres of the developed market economies the distance covered by wireless will be a few metres (as is the case today with WiFi); in rural areas in LDCs, the wireless portion will be a few kilometres.

There is no single answer on what form wireless will take in the last kilometre/metre. Multiple operators will deploy multiple designs and technologies to meet the varied requirements of the end-users. End-users who require high levels of reliability and service-quality will prefer wireguides and fixed wireless to office/home, where there is greater control over how many users are served by the exchange/base station.

But the great majority of end-users, especially in LDCs, will tend to use wireless networks such as today's 3G networks, where the service experience is affected by distance and strength of signal as well as the number of users. Neither the operator nor the individual end-user can control the number of mobile users coming into a base station's service area. Therefore, quality is likely to be variable. However, this form of wireless use is the most convenient and is also likely to offer the lowest prices.

In developed economies, base stations are connected by fibre; in too many cases in developing economies, they are connected by microwave. Service quality, especially for data services, will improve to the extent that microwave can be phased out.

In developing countries, power supply tends to be poorly managed, with rolling (announced or unannounced) blackouts, brownouts, and equipment-destroying power spikes being part of the offerings. Even in urban areas, telecom operators are compelled to provide backup power and protective devices for network equipment. This involves not only the generators and related equipment, but also the additional costs of transporting diesel and protecting it against theft.²⁸ In times of chronic shortage, such as that in Pakistan in 2010, energy costs can reach up to 70 per cent of total operational costs of telecom operators. Providing affordable connectivity to rural residents of LDCs requires technological breakthroughs in energy supply.²⁹

Terminal devices

Terminal devices must be in place if full use is to be made of networks. The difference between the period after the auction of 3G frequencies in Europe and elsewhere in the early part of the decade and the past two years after the iPhone and Android devices hit the market proves the point. The issue now is whether there is enough network capacity in place, as shown by Chart 3.6 above.

The potential users of connectivity in the rural areas of LDCs are not only poor; many are illiterate. Their eyesight may not be optimal and the digits of their hands may be too work-worn to navigate the keypads of modern mobile phones. Making available user interfaces that are easy to use by such people is perhaps the largest technological challenge to be met. Even in the Philippines, a country that has made texting a national pastime and where the local languages use the Latin alphabet, there are still end-users who can only dial a number and press the answer key for an incoming call.³⁰

Contrary to claims that poor and illiterate people would not be able dial telephone numbers, they have mastered that skill,³¹ with some help from the address-book feature that is the norm with mobile phones. Texting is very popular, in many cases with the Latin alphabet used to transliterate local languages, but in some cases such as in Thailand, using local alphabet interfaces provided by handset manufacturers. Interfaces such as USSD [Unstructured Supplementary Services Data] allow for relatively complex interactions with the network, such as checking account balances and obtaining market prices. Box 3.4 provides an example of USSD use in Sri Lanka.

While much has been done with these interim solutions, it appears that voice activation is the optimal solution, especially because it bypasses the literacy problem altogether and also provides a trust-building element. Indeed, many more-than-voice applications aimed at rural and generally illiterate audiences tend to rely on interactive voice response (IVR) systems. Given labour is not very expensive in LDCs, there is always the option of using human intermediaries in call centres until the problem of user interfaces that are easy to use by illiterate persons is solved.

Box 3.4: USSD based interface for Dialog Tradenet

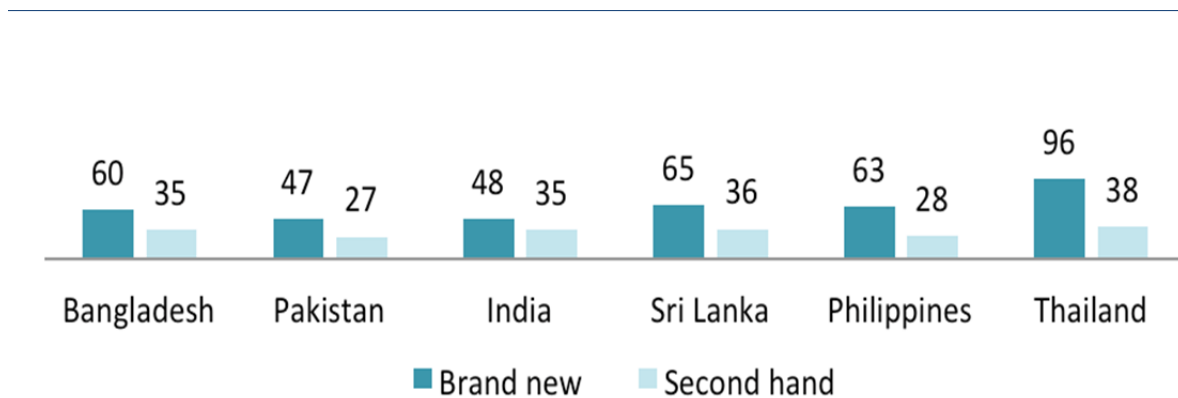


Dialog Tradenet is a trade information platform integrating the Web, Wireless Access Protocol, Unstructured Supplementary Service Data (USSD), SMS and Voice as channels to reach varying target segments to trade goods and services through mobile phones. Launched in Sri Lanka in late 2009 by Dialog Axiata PLC., it brings together buyers and sellers by giving reference prices on demand. It also provides agricultural commodity prices from the main wholesale markets in Sri Lanka. All channels, with the exception of USSD, are available in the three official languages (Sinhala, Tamil, English).

Source: Dialog Axiata.

Today's smartphones offer more computing power than computers 10 years ago.³² Their size and interfaces have compelled designers to come up with highly user-friendly interfaces. The question as to whether these devices are affordable to the majority in LDCs can be answered by looking at second-hand market prices (see Chart 3.7), rather than those for new devices. A vibrant second-hand market in mobile devices exists in many countries and the prices shadow those of new devices, which are continually declining.

Chart 3.7: Mean price USD paid by mobile owners at the bottom of the pyramid for their handsets, 2008



Source: LIRNEasia.³³

The energy for terminal devices is a challenge, but less of a challenge than that of securing low-cost energy sources for network equipment. Lack of electricity did not prevent people in the rural areas of LDCs from using 2G phones, and it will not stop them from using 3G phones and terminal devices. While some of the solar-charged phones on the market are still gimmicks and not very efficient, it is indeed highly practical to charge phones from solar-powered charging stations of the kind supported by the Universal Service Fund in Pakistan.³⁴ In the absence of such institutional solutions, car batteries and mobile charging stations will provide solutions.

In the longer term, there is promise in “wireless power.” Here, the innovation has two prongs. First, the devices are designed to use minuscule amounts of power. Second, they “harvest” power from

passing radio waves. While the technology is still in the laboratories, a few prototype products are already in operation.³⁵

The challenge of providing voice and data connectivity to dispersed populations with little disposable income in the LDCs can be met if it is properly understood as an affordable-technology challenge. Such an understanding will create the environment for appropriate policy and regulatory actions by governments and also for the necessary innovations by operators and manufacturers. The necessary innovations include business process and pricing innovations. They also include those that address energy for network equipment and terminal devices in the context of telecom developments outpacing those in electricity.

The solution must address the problems of bringing down prices to end-users by radically reducing costs at the levels of backhaul networks, access networks and terminal devices (which must also be appropriate for the intended users). Benefits of cost reductions will be passed on the end-users only under competitive or highly regulated conditions. Because LDCs also tend to suffer from weak government and regulatory capacity, there must be greater reliance on the former. What has proved effective, with regard to voice connectivity, is innovation driven by competition. What will work with data connectivity is also a variant of this approach.

3.3 Strengthening human capital

Investment in education continues to be at the core of the effort to strengthen human capital. As a first step, all LDCs have focused on eliminating illiteracy, making progress on this goal. In Africa, for instance, interest in developing its human capital system is finally growing, after several years of neglect, inefficiencies, and conflict. As in most developmental endeavours, this strategy is being implemented in partnership with international institutions. An example is the goal of the African Union/New Partnership for Africa's Development (NEPAD) initiatives to bridge the educational gap in collaboration with UNESCO and other international donors. Other priorities of AU/NEPAD's Programme of Action include reversing the brain drain and up-scaling Africa's use of science and technology to promote development by expanding education in those fields.

The most glaring success has been in the emergence of online training and education platforms in Africa. Most significantly, the expansion of the African Virtual University (AVU), with substantial involvement of the World Bank, has resulted in widening Africa's human capital base. AVU has been around since 1997 and has served more than 24,000 learners, conducting its services through satellite, the Internet, and other computer mediated technologies.

At the individual country level, investments in primary and tertiary education will continue to be a priority concern. Only a few African countries allocate more than five per cent of their budgets to education.³⁶ However, most countries have applied strategic frameworks in implementing human capital initiatives. These types of frameworks use as a foundation previous capacity building initiatives focused on areas such as social inclusion and the health of school age children. Some countries provide nutritional support to school age children from poor families and have put in place programs to support girl education. For example, the government in Bangladesh declared as a national goal to provide free elementary education to all children and sought to have free education for girls up to grade 8 (between thirteen and fourteen years old). These well-targeted interventions,

however, have not solved all the problems. According to the Bangladesh Bureau of Statistics, adult literacy remains a low 51 per cent. But there is positive net enrolment of school age children, at 80 per cent. Better results could be achieved if the current momentum is maintained.

At the tertiary level, LDCs strive to match quantitative expansion with qualitative improvements in education. Not a single university from an LDC is currently ranked among the top 100 globally.

3.4 Environmental factors: Climate change and disaster prevalence

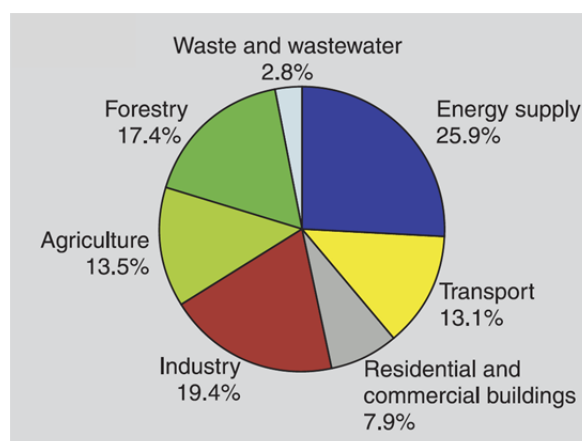
Climate change is “[a]ny change in climate over time, whether due to natural variability or as a result of human activity”.³⁷ Climate change is due to the variability in the composition of the constituents of the global atmosphere that affects the energy balance of the planet earth. The composition of the gases and of aerosols that make up the atmosphere are important because of their role in regulating the energy balance of the planet and, by extension, the temperature at its surface.

Some of the gases that make up the atmosphere absorb solar radiation more than others. These are called greenhouse gases (GHGs). The most important and climate active naturally occurring GHGs are: Water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and ozone (O₃). There are also manmade GHGs that also contribute to global warming.³⁸ The most important contributor to global warming through the greenhouse effect is made by CO₂ followed in descending order by methane, chlorofluorocarbons (CFCs), ozone and nitrous oxide.³⁹ With time, and especially over the past 50 years or so, rising concentrations of GHGs in the atmosphere have increased the level of absorption of the outgoing radiation. This has led to more heat being trapped in the atmosphere and consequently, in an increase in the average temperature of the earth’s surface. This phenomenon is commonly referred to as the “enhanced greenhouse effect” or “global warming”,⁴⁰ an effect characterized by the “*ability of the atmosphere to capture and recycle energy emitted by the Earth surface.*”⁴¹

While there are some who question the validity of human impacts on climate change, established scientific consensus, as documented in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC),⁴² is that global warming is taking place at a very rapid rate and that this is directly related to the emissions of CO₂ into the atmosphere, largely as a result of human activities, specifically the burning of fossil fuels for energy generation and for transportation, as well as the clearing of land for agriculture and urban development.

There are several scenarios for GHG emissions and global warming that have been described in the literature, but the current consensus is that “*human activities result in emissions of four long-lived GHGs: CO₂, methane (CH₄), nitrous oxide (N₂O) and halocarbons (a group of gases containing fluorine, chlorine or bromine). Atmospheric concentrations of GHGs increase when emissions are larger than removal processes... The largest growth in GHG emissions between 1970 and 2004 has come from energy supply, transport and industry, while residential and commercial buildings, forestry (including deforestation) and agriculture sectors have been growing at a lower rate.*”⁴³ Chart 3.8 illustrates these findings.

Chart 3.8: Share of different sectors in total anthropogenic GHG emissions in 2004, in terms of CO₂-eq.



Source: IPCC. (2007). p. 104.

Note: Forestry includes deforestation.

The most important increases in GHG emissions come from fossil fuel-related energy emissions, followed by emissions from land-use changes and then agriculture, where much of the releases are due to methane release and nitrous oxides escaping from the soil surface of cultivated land. Because most developing countries are less industrialized, they are not the most important contributors to emissions resulting from the use of fossil fuels. There are important exceptions to this rule, however. Emerging economies, such as China and India, are now the most important contributors to fossil fuel-based GHG emissions. According to the International Energy Agency (IEA), China overtook the United States as the world's largest energy user in 2009. IEA's *World Energy Outlook 2010* notes that oil demand continues to grow steadily; 100 per cent of the net growth in this demand comes from non-OECD countries, with Chinese demand representing almost half.⁴⁴

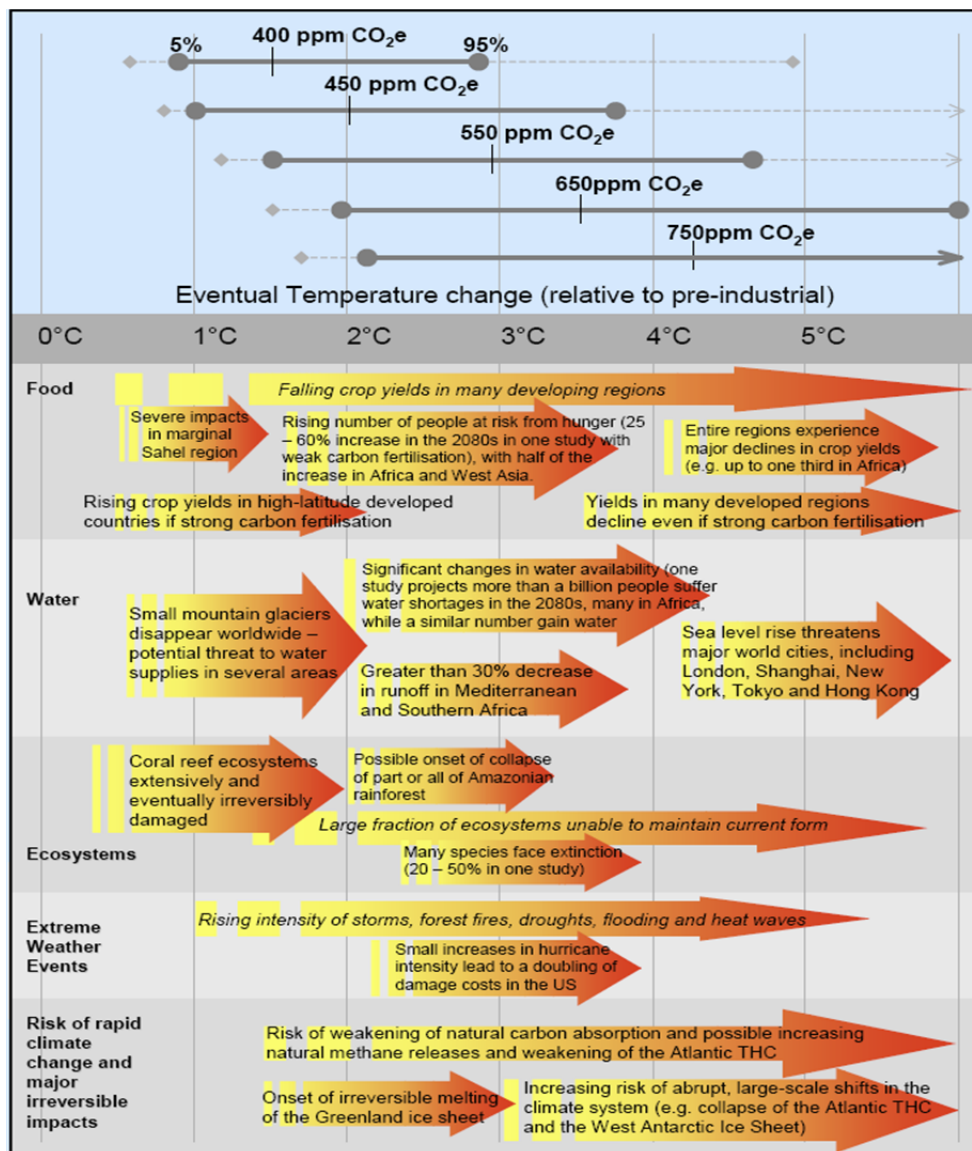
Of greatest consequence to the developing world and to least developed countries especially are GHG emissions related to land use and to energy generation and use, because the economies of these countries depend most on agriculture and the exploitation of natural resources. Naturally occurring terrestrial and coastal carbon sinks and sources – such as vegetation in general, forests, with their high carbon content in particular, coral reefs, and other natural systems that are influenced by human activity – are essential to regulating CO₂ content in the atmosphere.⁴⁵ But these sinks are at risk of emitting their massive stored carbon reserves as a result of human activity, including pollution, global warming, deforestation, land management practices such as the draining of peat bogs, and destructive harvesting techniques that may destroy coral reefs.

Similarly, activities that lead to deforestation, desertification and the destruction of coastal resources, such as mangrove forests, sea grass beds and coral reefs, could have serious and detrimental effects on the carbon balance of the planet and the level of CO₂ in the atmosphere.

The rate of fossil fuel emissions increase to date is tracking the worst-case scenario modelled by the IPCC back in 2000. If this trend towards rapid growth in fossil fuel consumption and GHG emissions continues, it could result in an increase in global temperatures that exceeds 2 degrees Centigrade over the coming 30 to 50 years, with possible catastrophic consequences.

While the IPCC predictions about the impact of climate change are restrained, those predicted by the Stern Review⁴⁶ are dire in their consequences and introduce the concept of irreversible and catastrophic changes to the key earth systems, such as global atmosphere circulation and key ocean currents. It is estimated that a rise of 2 degrees Celsius above pre-industrial levels could trigger significant melting of the Greenland ice sheet, while a rise of 3.5 degrees Celsius could lead to large scale and irreversible change, with negative results for Africa, West Asia, coastal areas and small islands.⁴⁷ Figure 3.1 below summarizes these changes.

Figure 3.1: Impacts from increasing GHGs levels in the atmosphere



Source: Stern, N. (2006).

Developmental impacts

Climate change is expected to exacerbate current stresses on water resources from population growth and economic and land-use change, including urbanisation. Increased flood risk also poses challenges to society, physical infrastructure and water quality. Overall, climate change will severely

impact human activities and specifically, human, economic and social development. Most of the impact will be negative.

While all countries will be affected by climate change, it is in the developing world that the impact will be felt most strongly and in the least developed countries especially. Developing countries are least able to deal with climate change for the same reasons they are the least able to deal with other development priorities and concerns: A lack of resources, infrastructure and trained staff. These problems are exacerbated in more remote locations, such as in the rural areas of Africa. Not surprisingly, the international community is focusing its efforts on helping the developing world adapt to the threat climate change poses, as this part of the world is most at risk from it.

Mitigating the impacts of climate change is largely related to enhancing energy use efficiency and reducing GHG emissions related to energy consumption. Energy consumption associated with GHG emissions is largely relegated to the more industrialized regions of the world. Adaptation activities, in contrast, have an impact in all regions of the world. In the poorer regions, adaptation to climate change is a greater priority, especially in LDCs, because the people in these regions are the least able to deal with the changes that a warming climate is bringing about, changes that in many cases directly affect their livelihood and could further impoverish and disenfranchise them.

Table 3.4 lists the countries most at risk from climate change. It is noteworthy that the countries most at risk are invariably developing countries and especially least developed ones. These are the countries most dependent on natural resources –agriculture, including forestry and fisheries– for their livelihoods.

Table 3.4: Countries most at risk from natural disasters related to climate change

Drought	Flood	Storm	Coastal (<1m) ^a	Coastal (<5m) ^a	Agriculture
Malawi	Bangladesh	Philippines	All low-lying island states	All low-lying island states	Sudan
Ethiopia	China	Bangladesh	Vietnam	Netherlands	Senegal
Zimbabwe	India	Madagascar	Egypt	Japan	Zimbabwe
India	Cambodia	Vietnam	Tunisia	Bangladesh	Mali
Mozambique	Mozambique	Moldova ^b	Indonesia	Philippines	Zambia
Niger	Lao PDR	Mongolia ^b	Mauritania	Egypt	Morocco
Mauritania	Pakistan	Haiti	China	Brazil	Niger
Eritrea	Sri Lanka	Samoa	Mexico	Venezuela	India
Sudan	Thailand	Tonga	Myanmar	Senegal	Malawi
Chad	Vietnam	China	Bangladesh	Fiji	Algeria
Kenya	Benin	Honduras	Senegal	Vietnam	Ethiopia
Iran	Rwanda	Fiji	Libya	Denmark	Pakistan

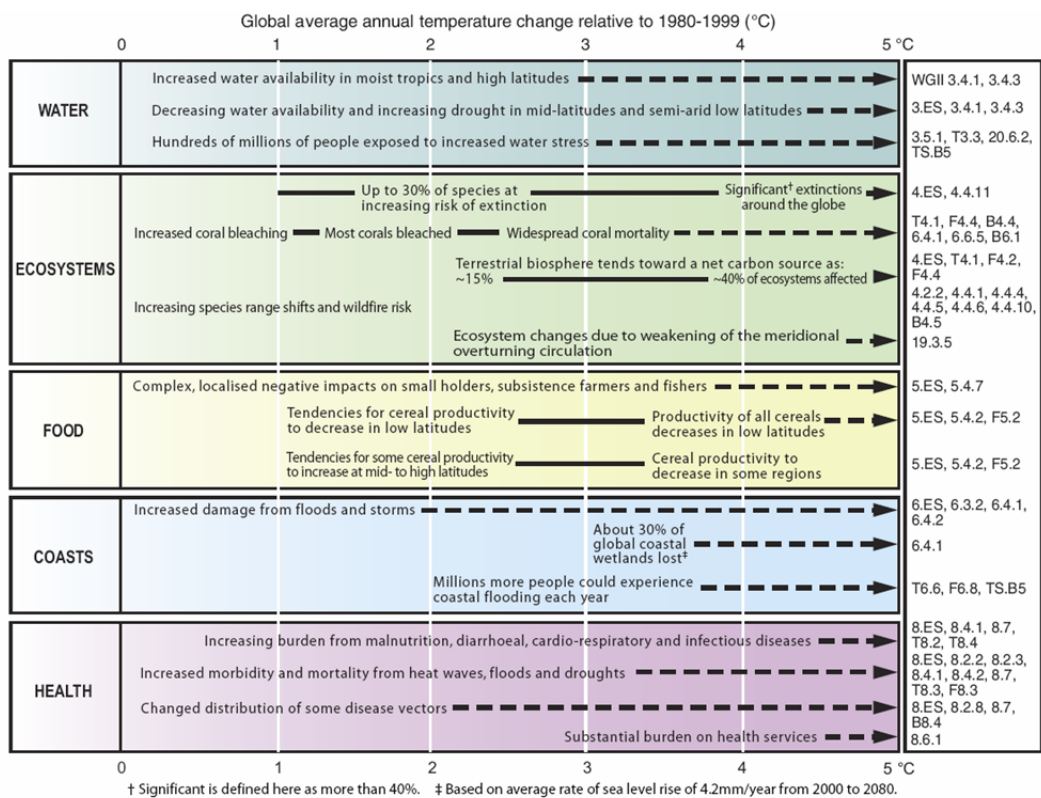
Notes: a. Metres above sea-level. B. Winter storms. Shaded countries are Least Developed Countries.

Source: World Bank, October 2007, IDA and climate change: Making climate action work for development.

Source: ITU. (2008). Ubiquitous Sensor Networks (USN). *ITU-T Technology Watch Briefing Report Series, No. 4.*

The Stern Review points out that developing countries are the most likely to suffer from the consequences of climate change. The IPCC 4th assessment report shows some of these impacts (Figure 3.2).

Figure 3.2: Examples of impacts associated with global average temperature change*



Source: IPCC. (2007). p. 104.

*Note: Impacts will vary by extent of adaptation, rate of temperature change and socio-economic pathway.

The following section is excerpted from the Fourth Assessment Report of the IPCC:

In the developing world, the following changes can be expected as a result of climate change. It can be expected that natural ecosystems as well as agricultural systems will be less resilient because rising temperature will alter the fitness of species that together define given ecosystems. Flooding, drought, wildfires, insect infestations and disease will increase. Crop productivity is projected to increase slightly at mid- to high latitudes. At lower latitudes, especially in seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1 to 2°C), which would increase the risk of hunger (medium confidence).

Impacts on food production

Globally, the potential for food production is projected to increase with rises in local average temperature over a range of 1 to 3°C, but above this temperature, it is projected to decrease (medium confidence). In coastal zones, there will be increased coastal erosion due to climate change and sea level rise. Increasing human-induced pressures on coastal areas will exacerbate this effect (very high confidence). By the 2080s, many millions more people than today are projected to experience floods every year due to sea level rise. The numbers affected will be largest in the densely populated and low-lying mega deltas of Asia and Africa, while small islands are especially vulnerable (very high confidence).

Impacts on industry, settlements and society

The impacts of climate change on industry, settlements and society located in coastal and river flood plains are expected to be considerable. Economies closely linked with climate-sensitive resources and those in areas prone to extreme weather events, especially where rapid urbanization is occurring, will be at risk also. Poor communities can be especially vulnerable, in particular those concentrated in high-risk areas.

Impact on health

According to the World Health Organization (WHO),⁴⁸ climate change raises new challenges in the fight against infectious disease. Many diseases are climate sensitive, including cholera and diarrhoea, as well as vector borne diseases such as malaria, dengue fever and schistosomiasis. Warmer temperatures, higher humidity and more places where water can collect generally favour malaria transmission.

There is evidence that in some sites in the highlands of East Africa, a warming trend over the last 30 years has created favourable conditions for mosquitoes to breed in, thus increasing the probability of malaria transmission and highland epidemics.⁴⁹ Similarly, dengue fever is increasing rapidly, especially in tropical cities in developing countries. Standing water arising from unplanned urbanization has created mosquito-breeding sites.

Higher temperatures and too much or too little water can each facilitate transmission of diarrheal diseases. "In countries with inadequate water and sanitation services, diarrhoea is much more common when temperatures are high. For example, rates of diarrheal disease in Lima, Peru, are 3 - 4 times higher in the summer than in the winter, increasing by 8% for every 1 °C increase in temperature".⁵⁰

The WHO report states that "[p]ressures on agriculture threaten to increase the burden of malnutrition. Undernutrition and related disease is currently the greatest contributor to the global burden of disease, killing over 3.5 million people per year, mostly children in developing countries. It is projected that climate change will boost agricultural production in the high latitudes of developed countries, but cause decreases in many tropical developing regions."

The following groups or regions are especially at risk:

- Small island developing states (sea level rise, increasingly severe tropical storms);
- Urban populations, especially those in tropical megacities (heat waves, floods, infectious diseases, air pollution);
- Mountain populations (water insecurity, floods and landslides, and infectious disease);
- Indigenous people in polar regions (melting snow and ice, affecting animal distributions and accessibility for hunting);
- Women and children in developing countries (death and illness following disasters).

According to the IPCC, increases in malnutrition, increased deaths, diseases and injury due to extreme weather events will be recorded. There will be an increased burden of diarrheal diseases; an increased frequency of cardio-respiratory diseases due to higher concentrations of ground-level ozone in urban areas related to climate change; and there will be an altered spatial distribution of

some infectious diseases. Climate change is projected to bring some benefits in temperate areas, such as fewer deaths from cold exposure, and some mixed effects such as changes in range and transmission potential of malaria in Africa.

Overall, IPCC expects that the negative health effects of rising temperatures, especially in developing countries, will outweigh the benefits. Critically important will be factors that directly shape the health of populations such as education, health care, public health initiatives, and infrastructure and economic development.

Impact on water use and availability

Mountain snow pack, glaciers and small ice caps play a crucial role in freshwater availability. Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century. This will reduce water availability, hydropower potential, and change the seasonality of flows in regions supplied by melt water from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives.

Moreover, changes in precipitation and temperature will lead to changes in runoff and water availability. Runoff is projected with high confidence to increase by 10 to 40 per cent by mid-century at higher latitudes and in some wet tropical areas, including populous areas in East and South-East Asia. In contrast, it is projected to decrease by 10 to 30 per cent over some dry regions at mid-latitudes and dry tropics, due to decreases in rainfall and higher rates of evapotranspiration.

There is also high confidence that many semi-arid areas (for instance, the Mediterranean Basin, western United States, southern Africa and north-eastern Brazil) will suffer a decrease in water resources due to climate change. Drought-affected areas are projected to increase in extent, with the potential for adverse impacts on multiple sectors, such as agriculture, water supply, energy production and health. Regionally, large increases in irrigation water demand are projected as a result of climate changes.

Researchers estimate with high confidence that the negative impacts of climate change on freshwater systems will outweigh its benefits. Areas in which runoff is projected to decline face a reduction in the value of the services provided by water resources (very high confidence). Meanwhile, the beneficial impacts of increased annual runoff in some areas are likely to be tempered by negative effects of increased precipitation variability and seasonal runoff shifts on water supply, water quality and flood risk.

Available research suggests a significant future increase in heavy rainfall events in many regions, including some in which the mean rainfall is projected to decrease. The resulting increased flood risk poses challenges to society, physical infrastructure and water quality. It is likely that up to 20 per cent of the world population will live in areas where river flood potential could increase by the 2080s. Increased temperatures will further affect the physical, chemical and biological properties of freshwater lakes and rivers, with predominantly adverse impacts on many individual freshwater species, community composition and water quality. In coastal areas, sea level rise will exacerbate water resource constraints due to increased salinization of groundwater supplies.

In Small Island Developing States (SIDS), a group of countries that include eleven LDCs,⁵¹ the following impacts are predicted:⁵²

- Sea level rise is expected to exacerbate inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities.
- Deterioration in coastal conditions, for example through erosion of beaches and coral bleaching, is expected to affect local resources.
- By mid-century, climate change is expected to reduce water resources in many small islands, for example in the Caribbean and Pacific, to the point where they become insufficient to meet demand during low-rainfall periods.
- With higher temperatures, increased invasion by non-native species is expected to occur, particularly on mid- and high-latitude islands.

In sum, climate change is already having a direct impact on the developing world. Weather events are increasing in number and frequency, and the developing countries are especially vulnerable. When poor and disenfranchised communities are at risk, it is even harder for them to overcome their low economic status, making progress in poverty reduction efforts almost impossible. As evidence of climate change and its negative impacts on the human communities most at risk keeps mounting, it becomes a priority to help LDCs, developing countries and communities most at risk adapt to climate change.

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4 Opportunities for LDCs

Least developed countries face multiple socio-economic, technological and environmental challenges, as discussed in Chapter 3; yet, there are also multiple opportunities available to assist them in their path to development. Some of these opportunities stem from their own classification as LDCs; others, from their human and natural resources, or from the adaptation of capital, technology and knowledge to the specific needs of the population. This chapter focuses on the opportunities that information and communication technologies can bring to LDCs, particularly mobile technologies and ICT applications. It also examines some of the global initiatives and financial aid that governments, international organizations, the industry and other agencies have put at the disposition of LDCs to support them in the adoption of ICTs for development.

4.1 The role of new technologies in addressing emerging challenges

Mobile technologies

The impact that mobile communications is having on economic and social development in Least Developed Countries is akin to that of other major enabling infrastructure like roads, ports and railways. All stimulate trade, create jobs, generate wealth and enhance social welfare. Mobile communications in particular are making a profound impact by:

- Delivering universal access: Mobile networks cover the vast majority of LDC citizens, and operators are investing substantial amounts in further network roll out;
- Delivering universal services: Mobile phones account for around 95 per cent of all telecoms connections in LDCs;
- Boosting GDP: Analysis by Deloitte shows that a 10 per cent increase in mobile penetration leads to a 1.2 per cent increase in GDP in the long-run across developing countries;¹ and
- Creating a sustainable infrastructure that can be leveraged to extend other vital development services to LDC citizens, such as e-banking and other financial services and easier access to health care, education and other government services.

The world's developing economies now account for almost 80 per cent of the world's total mobile connections, according to new Wireless Intelligence data. Based on Q3 2010 figures, developing markets accounted for 3.98 billion of the world's 5.15 billion total connections – almost four out of every five mobile connections are now made in the developing world, as handset and air time prices continue to fall.

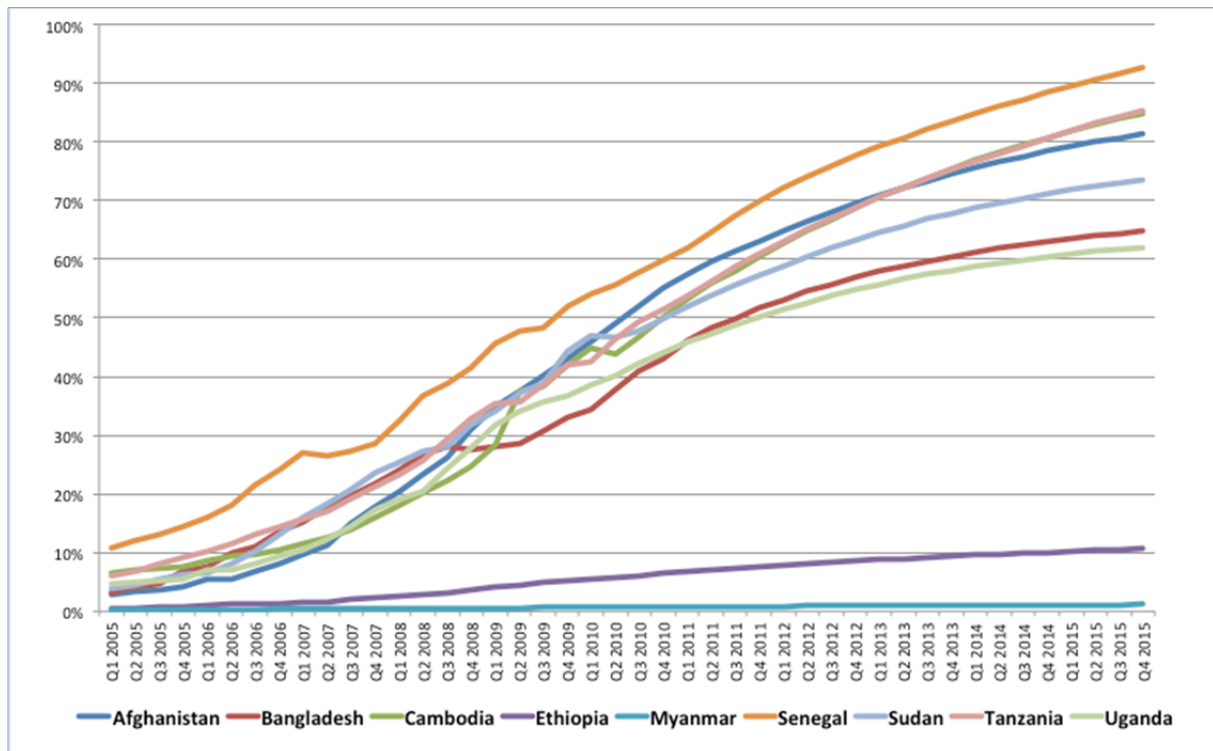
The majority of LDCs that have instituted market reform and licensed private mobile network operators are participating in this connectivity revolution. As Rwandan President Paul Kagame pointed out, “in ten short years, what was once an object of luxury and privilege, the mobile phone, has become a basic necessity in Africa.”²

Liberalisation and the promotion of competitive markets benefit consumers of mobile technologies and are also a positive generator of income and resources for the governments of LDCs. Examples of ways in which mobile technologies contribute to the public sector include the following:³

- The average ratio of tax payments to mobile operator revenues is significant, with the industry in Tanzania (40%), Madagascar (45%) and Zambia (53%) contributing substantially to governments' budgets;
- Mobile tax contributions to government total national tax revenue in Chad are 11 per cent, 10 per cent in Dem. Rep. of the Congo and 8 per cent in Tanzania; and
- The mobile industry is a substantial generator of GDP, contributing in 2006 3.5 per cent GDP in Tanzania, 3.8 per cent in Uganda, 4 per cent in Rwanda, and 4.1 per cent in Niger.

Chart 4.1, below, demonstrates the dramatic explosion of connectivity that occurs when LDC governments liberalise their markets and embrace market competition, thus enabling private capital to be used to serve pent up consumer demand.

Chart 4.1: Market penetration of mobile technologies, 2005-2014*



Source: GSMA.

Note: *2011-2014 estimates.

It is important to note that investing in mobile infrastructure is one of the most capital intensive, with long pay back times. When private capital faces regulatory uncertainty – where the rules of the game can change overnight – a risk premium is priced into the cost of capital. A higher cost of capital means that infrastructure investments on the margin are foregone, which is an increasingly important factor as mobile networks extend their reach into sparsely populated rural areas.

By doing all they can to ensure stability, LDC governments can help lower the cost of capital and render investments in rural infrastructure sustainable, thus promoting the goal of extending infrastructural access to the poorest of the poor. Investment responds to the implementation of a consistent and transparent regulatory policy that include a clear set of regulatory policy objectives

and targets, which, from the investors' perspective, minimize risk and support the development of a stable and predictable environment. As mentioned in Chapter 2, governments and national regulatory agencies have helped attract private sector investment into the telecom sector, through the establishment of national telecommunications acts that enshrine the principles of fair competition, regulatory independence and reflect long term policy goals, linked to national, social and economic development targets. Similarly useful have been conducting regular consultations with stakeholders, as well as the creation and maintenance of national strategic telecom plans and of an effective national regulatory authority, independent from both undue political and financial pressures, and staffed by appropriately trained professionals.

Mobile operators worldwide have called for governments to implement policies that minimise direct, mobile-specific taxation and, as a result, maximise the potential for investment by the private sector. Heavy regulation is more likely to be needed at the outset of liberalization rather than in the latter stages. When an incumbent monopoly is either privatized or required to open up to competition, there should be adequate *ex ante* protection. However, as competition evolves and more operators enter the market, market monitoring can help the regulator ensure that new entrants are allowed to operate unencumbered and unthreatened by any abuse of dominance. At that stage, clearly articulated and "lighter" *ex post* regulation might be a more adequate approach.

GSMA estimates that a stable regulatory environment would increase private sector investment by as much as 25 per cent and reduce costs of the total cost of owning and using a mobile phone by 10 per cent.⁴ For example, since sub-Saharan governments began liberalising their telecommunication sectors at the turn of the millennium, the mobile industry has invested USD 35 billion, providing more than 500 million people (67% of the population) in sub-Saharan Africa with mobile coverage. At the Connect Africa summit in 2007, the industry announced that the mobile industry plans to invest more than USD 50 billion in sub-Saharan Africa over the following five years to provide more than 90 per cent of the population with mobile coverage. The investment will be used to extend the reach of GSM mobile networks, enhanced with GPRS, EDGE and HSPA technologies, to provide a rich suite of mobile multimedia services, including Internet access. With a stable regulatory environment, sub-Saharan governments could see an incremental USD 21 billion private capital invested in mobile infrastructure over the same period.

With the right public private partnership, mobile technologies can provide a sustainable infrastructure that other important development related initiatives can build on, such as financial inclusion and greater access to health care and education, bringing new possibilities to LDCs. Across urban-rural and rich-poor divides, mobile technologies connect individuals to individuals, information, markets, and services. In Mali, residents of Timbuktu are able to call relatives living in the capital city of Bamako. In Senegal, near shore fisherman can send a text message to learn about fish prices in different locations and use the device as beacon of safety. In Niger, day labourers are able to call acquaintances in Benin to find out about job opportunities without making the USD 40 trip. In Malawi, those affected by HIV and AIDS can receive text messages daily, reminding them to take their medicines on schedule. Citizens in Mozambique are able to report violent confrontations via text message to a centralized server that is viewable, in real time, by the entire world. These effects can be particularly dramatic in rural areas, where in many places mobile phones have represented the first modern telecommunications infrastructure of any kind. Mobile phones have

greatly reduced communication costs, thereby allowing individuals and firms to send and to obtain information quickly and cheaply on a variety of economic, social and political topics.⁵

An emerging body of research shows that the reduction in communication costs associated with mobile phones has tangible economic benefits, improving agricultural and labour market efficiency and producer and consumer welfare in specific circumstances and countries.⁶ As telecommunication markets mature, mobile phones in LDCs are evolving from simple communication tools into service delivery platforms. This has shifted the development paradigm surrounding mobile phones from one that simply reduces communication and coordination costs to one that could transform lives through innovative applications and services.⁷

Regulators and policymakers should establish dialogue with their peers in other sectors, such as health, the environment, utilities, transport and finance, to create an enabling environment for the introduction of innovative commercial and public services in these sectors. Regulators and policymakers should also help to foster the introduction and adoption of new, innovative ICT applications by incorporating ICT into utility and infrastructure policies, and setting targets with other ministries (for example, health and education) to achieve efficiency and increase access to ICT services. A regional approach to regulatory issues should also be encouraged.

Long-term partnerships between governments, regulators, and Mobile Network Operators (MNOs), based on consultation, collaboration and sustainability, could maximise the significant benefits of mobile technologies to economies and societies.

ICT applications

At heart, the application of information and communication technologies in least developed countries is not substantially different from that in a developed country. Obviously, however, there are differences in the readiness of the environment and the organizations implementing ICT. Examples of the capabilities of LDCs are demonstrated by the ICT applications that have been developed in LDCs and other developing countries, such as Bangladesh and India, to service clients in the United States, Europe and Australasia. Yet, these applications are not deployed to service local clients, as the local clients do not have the sophisticated needs that demand such services.

This section looks at the benefits of ICT for LDCs generally, but in discussing applications the focus is on government administration, as this is one environment that is common to all LDCs and that has sophisticated demands that can be met by appropriate ICT applications. Further, the application of ICT in government can be a significant stimulus of wider use of ICT across an economy.

The benefits of ICT applications in LDCs

In the past it was thought that low-labour technologies such as ICT were not relevant in countries where manual labour was in abundant supply. For countries struggling with the basic needs of life, including water, electricity and literacy, raising standards of living seemed more crucial than the adoption of ICT.⁸ Disagreement existed over the priority given to ICT in relation to other development initiatives in a country. There is now wide consensus, however, that ICT provide opportunities to reduce social and economic disparity and to support the creation of efficient and transparent administration mechanisms.⁹

Better and faster information flow through ICT, such as mobile phones, telecentres and information kiosks in villages, are contributing significantly by empowering and educating people in remote and rural areas in relation to agriculture, farming and other life issues. A 2001 study by Accenture, the Markle Foundation and UNDP¹⁰ showed that a national ICT capacity focus helps developing countries to make the overall investment climate more attractive. It also helps to develop local technical capabilities, such as spare parts production, component supplier network and other linkages.

ICT also offers LDCs an opportunity to introduce improvements in health service delivery and meet broader developmental goals that have an impact on health. For example, the National Health Information System implementation in Tanzania and Mozambique (named MTUHA and SIS respectively) was designed to provide health data from the local community to the national level in support of the health reform agenda. The initiative also contributed to better management of various health issues, including HIV/AIDS and malaria.¹¹ In Kenya, the Blown telemedicine initiative provided an online network including medical tele-teaching amongst physicians and healthcare workers of all hospitals and health districts.¹²

Further, with the decreasing price of infrastructure and growing complexity of organisations, ICT is no longer considered as a luxury which only the rich can afford;¹³ rather it is increasingly becoming a tool for improving efficiency, reducing poverty and increasing economic growth.¹⁴ While there are apprehensions of an increasing “digital divide”, the issue of inequality also applies to many other basic needs such as education, health and food.¹⁵ Innovative and affordable applications of ICT can make a real difference with these needs; for example, the connection of a remote village to the outside world, with computers powered with solar cells, thus evading basic infrastructure problems.¹⁶

The use of ICT in LDCs’ public sector

ICT use in the public sector – here called eGovernment – is still in its infancy in LDCs,¹⁷ whereas the developed world is dealing with advanced stages of this transformation through eParticipation, eDemocracy and the use of Web 2.0.¹⁸ Only a few of the 49 LDCs are on the road to a transition economy and progress.¹⁹ Others are lagging far behind, particularly those located in sub-Saharan Africa and South Asia.²⁰ Despite initiatives at both international and national levels, eGovernment in LDCs is either failing or advancing at a slow pace. According to Heeks, 35 per cent of eGovernment initiatives in developing countries were total failures (eGovernment was not implemented or was implemented but immediately abandoned) and 50 per cent were partial failures (major goals were not attained and/or there were undesirable outcomes).²¹ This happened largely due to the failure to recognise the complexity of the underlying issues.²²

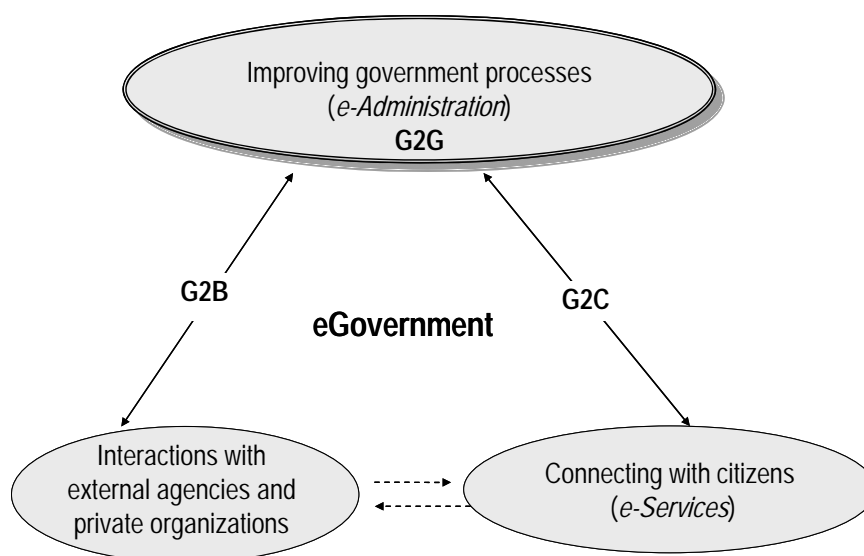
Nevertheless, the use of ICT in LDCs’ public sector opens up a number of opportunities, including efficiency gains, quality service delivery, transparency and accountability, and improved decision making. The public sector in an LDC is usually the largest user of IT systems and can play a leading role in ICT diffusion throughout the country. It can also exert influence through its policies and regulations.²³ Thus, ICT adoption in government has the potential to bridge the divide between citizens and bureaucrats, enhancing mutual trust and lessening the digital divide.²⁴

Adoption and implementation of eGovernment in LDCs is challenging, as the process involves not only transfer of machines, hardware, software, and skills, but also demands change in attitudes and

values.²⁵ Solutions designed for the West should not be applied to LDCs without adequate reengineering, as each country has a unique socio-cultural environment and different needs. Nevertheless, despite the complexities arising from different contextual conditions, a common set of themes may be identified for ICT adoption in the administrations of many LDCs, as they share some common characteristics.

eGovernment is typically categorized into three spheres (Figure 4.1): (1) *G2G*—government-to-government transactions and services, (2) *G2B*—services between government and businesses, agents and other private organizations, and (3) *G2C*—government-to-citizen services through direct access using ICT; taken as a whole these activities are referred as eGovernment.²⁶

Figure 4.1: The spheres of public sector ICT



Source: Based on Heeks (2004) and Backus (2001).

G2G is considered as the key step towards eGovernment in LDCs, the objective being to improve internal government processes and the capacity for government to deliver high quality and cost effective outcomes. The lack of computer access, poor education, and infrastructure are major hindrances for *G2C* implementation.²⁷ Connecting all citizens (*G2C*) in a country such as Bangladesh, where only 1.3 per cent household have internet access,²⁸ may not be feasible in the short term. The *G2C* focus in LDCs also raises apprehension of increasing the digital divide between those who have access and those who cannot gain access. The result could be a greater economic gap between the ICTs haves and have-nots,²⁹ as the *G2C* eGovernment services favour the economically advantaged and educated urban people.³⁰

In contrast, *G2G* and *G2B* have more potential to succeed and to begin the eGovernment process. *G2G* applications automate and improve government business processes, bringing substantial benefits in productivity, efficiency and transparency. These are the major ingredients for overall socio-economic development and good governance of the country. As a result, the citizens ultimately enjoy benefits even without using eGovernment services (*G2C*) directly. So, the primary concern at the early stage for LDCs should be to create an eGovernment environment in government organisations by automating official and business processes within the spectrum of *G2G* and *G2B*. A well-coordinated intergovernmental system and structure could prepare the ground for greater

service delivery through G2C for customers and citizens at a later stage. This does not imply that citizen access should be ignored; rather, it should continue to make progress side by side, until G2G structures are ready to deliver.

While there are no solutions that can be copied directly onto another nation's situation, the innovative ways in which some countries address these challenges may offer inspiration to other countries. Box 4.1 summarizes the experience of Bangladesh in implementing eGovernment applications to facilitate eParticipation.

Box 4.1: eGovernment application in Bangladesh

A success story of innovative eGovernment in an LDC is the implementation of the biometric electoral roll in Bangladesh in 2008. The project developed an electronic voter register and successfully registered over 81 million Bangladeshis in just under 12 months. Each enrolment included a photograph and fingerprint record, both of which were recorded on the national Voter Id cards issued during the project. The initiative required mobilization of national resources on a massive scale to create what is claimed to be one of the largest databases of registered voters in the world.

The project is a rare example of an achievement that many developed countries cannot yet claim. Although the primary driver was to ensure an accurate voter register for the December 2008 election, the project has opened up a number of opportunities for multi-purpose use of the national Voter Id database. The rapid and successful creation of biometric voter registrations, the issuing of Voter Ids and the creation of the supporting database, under extremely difficult circumstances, showed how careful planning and domestic and international partnerships can lead to success. The military in Bangladesh played a key role in the project and highlighted the bond and understanding between the military and the civil administration that could be drawn upon to accomplish an urgent national need.

The project showed that a LDC had the capability to undertake a large ICT-based people-oriented reform with far reaching governance implications. Customized ICT tailored to the socio-economic environment, a flexible approach and the motivation to get the job done to avert a national crisis accelerated the successful project completion.

Similar ICT-based reform initiatives could be undertaken by other LDCs who can combine innovative ideas and draw on strengths and relationships present in their own specific country. Examples of innovative strategies and initiatives, which led some developing countries to progress, can be found in Barbados, Chile, Kyrgyzstan, Malaysia, Mongolia, Uzbekistan and Venezuela.

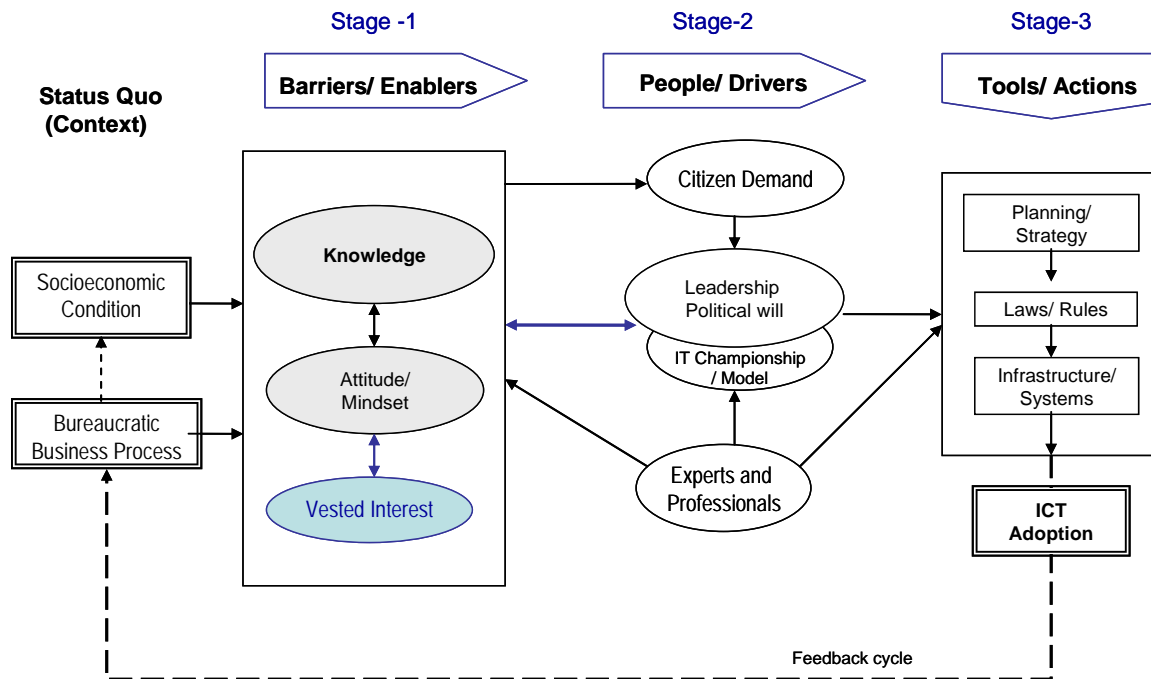
Sources: UN, 2005; 2008.

A final cautionary lesson

A study undertaken in Bangladesh showed that addressing knowledge and attitude issues among government officials was the key step to take on the path to eGovernment, rather than beginning by addressing other inhibitors in LDCs such as infrastructure and socio-economic conditions.³¹ Uncovering “knowledge” as an underlying root cause of other problems is significant and addressing

of this led to an ICT-adoption process view of change. From a practitioner’s perspective, the process model, illustrated in Figure 4.2 can help educate agents to understand the dynamics of the eGovernment adoption process and provide guidance on where and when to apply effort.

Figure 4.2: Process model for eGovernment adoption in LDCs



Source: Imran, 2010.

The institutionalization of ICT innovation through this cyclic process begins with ice-breaking knowledge-building actions that are needed to initiate successful eGovernment in the relatively rigid public sector area of a LDC. One study showed that extensive knowledge deployment initially has the potential to leverage other barriers by creating an environment conducive for eGovernment adoption.³² Careful planning and innovation remain critical for success in eGovernment, but the research suggests that a knowledge-building process, if acted upon first, could avoid failures that have been associated with more techno-centric approaches.

4.2 Global initiatives

Under the umbrella of the Millennium Development Goals (MDGs) and in response to the commitments of the World Summit on the Information Society (WSIS) to improve connectivity, create mechanisms to finance ICT for development and promote partnerships among diverse stakeholders, the last decade has seen the emergence of diverse global initiatives that focus on the coordination and mobilization of resources to support the deployment of ICT and the adoption of applications in developing and least developed countries. This section introduces two of those initiatives led by ITU in partnership with other organizations.

Connect the World initiative

The *Connect the World* initiative was launched in 2005 to help mobilize human, financial and technical resources for the implementation of the connectivity targets of the WSIS and the Regional

Initiatives adopted by Member States at the ITU World Telecommunication Development Conference (WTDC).

As part of the *Connect the World* initiative, ITU has organized a series of regional Connect summits³³ to stimulate ICT development partnerships with key global and regional institutions, including development banks and agencies and major industry players among others. Connect summits are being held in each region where Member States express an interest. So far, these summits have been held for the Africa and CIS regions.

Connect Africa Summit

The first in the series, the Connect Africa Summit took place in Kigali, Rwanda, 29-30 October 2007, and gathered 1,036 participants from 54 countries, including six Heads of State and Government. Forty-three countries in Africa were represented, including 23 at the ministerial level. Some 20 industrial leading companies also participated, along with development banks, international organizations and other stakeholders.

The summit – held under the patronage of the President of Rwanda and the Chairman of the African Union – was organized by ITU, the African Union, the World Bank Group and the United Nations Global Alliance for ICT and Development, in partnership with the African Development Bank (AfDB), the African Telecommunication Union, the UN Economic Commission for Africa (UNECA) and the Global Digital Solidarity Fund. Over the course of two days, delegates participated in a series of interactive sessions, debating issues related to broadband ICT networks, rural connectivity, capacity building, applications and services, and an enabling environment.

During the Connect Africa Summit, partners pledged USD 55 billion to implement the agreed goals. Considerable progress has been achieved in addressing the goals and commitments from this summit. As is discussed in the following section, partners have reported so far investments of over 21 billion in infrastructure and services.

ITU is actively playing its catalytic role by promoting the public and private partnerships. Projects being implemented by ITU with partners, some of whom build upon resources mobilized prior to the Summit, include:

- USD 6 million ITU/EU project on the Harmonization of ICT policies in sub-Saharan Africa (HIPSSA). The project, which focuses on sub-Saharan Africa, aims to create a harmonized ICT market in the region by supporting the African Union, the Regional Economic Communities (RECs) and their respective member countries (43 beneficiary countries) to develop and promote the use of harmonized ICT policies and regulatory frameworks in relation to ICT markets in the sub-region, and to provide human capacity building in the field of ICT through a range of knowledge transfer measures. The HIPSSA project supports the regional organizations to update or develop new regional guidelines, as well as technical assistance for national transposition.
- *West-Africa*: Activities include technical assistance in the transposition of the Additional Acts of the Economic Community of West African States (ECOWAS) and the Union Economique et Monétaire Ouest Africaine (UEMOA) Directives, including in Côte d'Ivoire, Guinea and Liberia; and sub-regional workshops on cybersecurity and undersea cable regulation for the

West Africa Telecommunications Regulators Assembly (WATRA), in collaboration with the German development agency, GTZ. In two related projects, GTZ and the French Ministry of Foreign Affairs funded projects to assist Burkina Faso, Benin, Senegal and Sierra Leone in the transposition into national legislation of the ECOWAS Supplementary Acts for ICT, as well as to provide capacity building.

- *Central Africa:* Technical assistance for the Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC). Ministers in charge of Telecommunications and ICT adopted five Directives in November 2008, with the financial support of the Organisation Internationale de la Francophonie and in coordination with the World Bank's Central African Backbone project (CAB). In addition, Ministers endorsed model laws for the region, including on cyber security, which build on regional best practices, such as the CEMAC and the ECOWAS Directives.
- *Southern Africa:* Update of the Southern Africa Development Community (SADC) Protocol on Transport, Communications and Meteorology and development of model legislation for a convergent environment. Activities included also the update of the SADC Policy Guidelines on universal service and development of a SADC cybersecurity framework.
- *East Africa:* Since the region is covered by the Common Market for Eastern and Southern Africa (COMESA), which has already developed a series of regional guidelines, the project is focusing on technical assistance and activities such as cost modelling in close collaboration with the East African Community (EAC).
- *USD 6.4 million Wireless Broadband Infrastructure project:* In partnership with the McCaw Foundation, this project aims to connect underserved populations in rural and remote areas, as well as to provide free or low-cost wireless broadband connectivity to public service providers such as hospitals, libraries, schools and universities. The first phase of the project is targeting six sub-Saharan African countries and will also develop ICT applications, train local experts on the operation of wireless communication networks and develop a national ICT broadband network plan for the beneficiary countries. Burundi is the first beneficiary country. The World Health Organization has joined in partnership to further support and achieve synergies for the deployment of health care applications at hospitals under this project.
- *ITU/UPU Rural Telecommunications, ICT Services and Entrepreneurship Development project:* This project, funded by the Government of South Africa, aims to promote rural telecommunication operators, including micro entrepreneurs operating telecentres. The project also aims to foster public-private partnerships for content development and dissemination in the areas of government, health, community-based content, learning, education and skill development. Work has begun to integrate telecommunications and ICT services in the Tanzania Post network to enable post offices to provide services to the general public. Similar business plans are under development in Malawi, Mozambique and Zambia.

- *ITU Multipurpose Community Telecentre (MCT) project*: This project is developing multipurpose community telecentres in rural areas in Malawi and Zambia, as well as centres targeting persons with disabilities in Burkina Faso and Ethiopia.
- *ITU/Africa Development Bank (AfDB) pre-investment study for backbone infrastructure*: The East Africa Community Broadband Infrastructure Network (EAC-BIN) study was completed in 2009.
- *ITU/UN Economic Commission for Africa projects*: The partners are jointly implementing an e-employment project in Dem. Rep. of the Congo, in addition to the Central African backbone project being implemented by ITU, the Central African States, AfDB and the World Bank.
- *ITU Academy Centres of Excellence*: ITU has continued to support and expand the African Centres of Excellence (CoE) network for English- and French-speaking countries, linking training providers on the continent to facilitate resource sharing in terms of facilities, expertise and training materials among institutions. This network was expanded from two to six institutional nodes in 2009. In addition, a Centres of Excellence network for Spanish- and Portuguese-speaking countries in Africa was established with funding from the governments of Spain and Portugal. Two new African CoE nodes for Spanish- and Portuguese-speaking countries are located in Angola and Mozambique.

Other regions

As the second regional event in the series, ITU organized the Connect CIS Summit with partners on 25-27 November 2009 in Minsk, Belarus. The summit gathered 353 participants from 18 Member States (10 from the CIS Region), including five Heads of State and Government. Efforts are now underway to implement various projects in the region.

Additional summits are being planned. ITU announced that the Arab States Summit would take place from 28-30 November 2011 in Doha, Qatar. Priorities established for the Arab Region include creating a policy and regulatory environment and establishing national strategies to support investment in broadband ICT networks and services; building trust and security in ICT networks; transitioning from analogue to digital broadcasting; improving software affordability and access for SMEs; and stimulating Arab digital content and developing local applications and services, among others. Expressions of interest have been received for other regions, with the details to be determined in the coming weeks and months.

Broadband Commission for Digital Development

As part of its commitment to support the deployment of high-speed, high-capacity broadband technology as a means to promote economic development and social progress worldwide, the ITU, jointly with the United Nations Educational, Scientific and Cultural Organization (UNESCO), launched the Broadband Commission for Digital Development on 10 May 2010. Jointly chaired by the H.E. Paul Kagame, President of Rwanda, and Carlos Slim Helu, Honorary Lifetime Chairman of Grupo Carso of Mexico, the Commission is composed of global leaders in government, business, civil society and international organizations. Its aim is to accelerate the achievement of the Millennium Development Goals (MDGs) as well as other priority development programmes, by facilitating practices, policies

and investment for the deployment of, and universal access to, broadband networks. To this end, the Commission, in cooperation with the private sector, will support the development of a strategic framework of action that will help identify effective and sustainable projects, and assist on the implementation of advocacy and outreach activities that would facilitate innovation, investment, partnership creation and respond to user needs.³⁴

As an initial outcome, the Commission delivered the report *A 2010 Leadership Imperative: The Future Built on Broadband* to the UN Secretary-General, Mr. Ban Ki-moon, immediately before the UN 2010 MDG Summit, which took place in New York in September 2010.³⁵ In this report, the Commissioners summarize the value of broadband technology as a uniquely valuable tool to meet the MDGs by the target date of 2015. They state their firm belief that “the models of the mobile and Internet revolutions can transform global development and have fundamentally thrived because they are bottom-up, market-led models. By forging a common vision and understanding of the needs and requirements for ubiquitous and higher capacity access to the Internet, governments have today an unprecedented opportunity to unleash the creativity and inventiveness of their citizens and industries to innovate and invest in health and education.”³⁶

In the *Leadership Imperative* report, the Commission calls on governments, the private sector and the international community to build a “Broadband Development Dynamic” by harnessing seven convergent and interdependent forces: policy, infrastructure, technology, content and applications, people, innovation and government. The report emphasizes the role of ICTs in general, and mobile and wired broadband in particular, as drivers for economic recovery from the recent financial crisis; it also invites policymakers to promote investment in high-speed backbone and access through the creation of an enabling policy environment that leads market forces in the deployment of broadband networks and in the introduction of innovative applications and services. In the report, the commissioners emphasize the significant role governments play in creating demand for an advanced national broadband network and providing incentives for network roll-out in rural and high cost areas. Moreover, the Commission calls for increased coordination within government, as well as between government, the industry and civil society to reach consensus on key issues surrounding access to and use of broadband networks, and to increase the stakeholders’ commitment to broadband inclusion for all.

Regarding the acceleration of the MDGs, the Broadband Commission report points out the need to (1) identify replicable lessons and key gaps for scaling up and fast-tracking joined-up implementation of projects; (2) prioritize broadband policies and plans, and (3) increase awareness of the critical role of ICT in hastening the delivery of the MDGs by providing statistical data on the development impact of these technologies in the areas of health, agriculture, education, the environment and women empowerment, as well as the real potential to scale up and replicate successful projects and practices.

Finally, the report proposes a plan of action that brings together the concept of “broadband inclusion for all” with the delivery of the MDGs. The plan includes ten actions points listed in Table 4.1 below.

Table 4.1: Plan of Action proposed by the Broadband Commission for Digital Development

Action Point
1. Connecting broadband with the MDGs and Knowledge Societies: Building global commitment to broadband inclusion for all by connecting broadband with the MDGs and knowledge society
2. Benefitting from transformational change: Maximizing social and economic stimulus with broadband inclusion for all via transformational change in healthcare, education, government and environmental sustainability.
3. Using transparent, fair, competitive, technology-neutral models: Addressing issues of convergent broadband networks toward transparent and fair, competitive, technology-neutral models, offering interconnection and interoperability at the national, regional and global levels.
4. Enabling content and applications creation: Developing the right conditions for broadband content and applications creation, diffusion and distribution via an enabling environment based on trust and confidence for economic and social stability and prosperity.
5. Employing broadband to help combat climate change: Utilizing broadband technology and innovation for energy conservation and improved efficiency, emergency disaster response, and monitoring, reporting and verification of climate change data.
6. Accelerating broadband access for women and girls: Accelerating infrastructure and services for women and girls, to promote gender equality and social and economic development.
7. Supporting wider broadband inclusion for all: Supporting wider broadband inclusion for all for least developed countries and countries in special need and extending broadband access to rural and remote areas and vulnerable and disadvantaged groups.
8. Broadband modelling, evaluation and monitoring: Modelling, evaluation and monitoring of relative targets and timelines for broadband inclusion, with the development of economic, social and usage indicators appropriate to the broadband environment.
9. Building a global partnership for broadband development: Building a global partnership for broadband development with concrete commitments, recognizing that the cross-sector and cross-cutting nature of broadband will take us beyond the MDG agenda.
10. Next steps for broadband partnerships and projects: Next steps for partnerships, with concrete coordination, including innovative and multi-stakeholder follow-up mechanisms at the national, regional and global levels, including national broadband committees.

Source: Broadband Commission (2010). pp. 55-65.

The second input document presented to the Commission meeting held in September 2010 was the executive summary of *Broadband: A Platform for Progress*, a comprehensive analytical report that will look at financing models, return on investment, technology choices, and strategies for deployment across a range of different types of economies. With the aim of sharing information and encouraging smart broadband policy and practice, the executive summary and a publicly-accessible repository of broadband-related materials, has been made available to all stakeholders through the Commission’s website.³⁷

4.3 Investment opportunities and multi-stakeholder partnerships

The impact of ICT as a driver of development is profound because it creates opportunities across all segments of the economy and society. Private investors transferred approximately USD 100 billion to governments in developing countries through privatization and license awards between 1997 and 2008. The ICT sector generates annual revenues equivalent to around four per cent of gross domestic product. When indirect and downstream benefits are included, the impact on GDP growth could exceed five per cent in some countries. For every 10 per cent increase in high-speed Internet connections, the increase in economic growth developing countries is even higher, at 1.4 per cent.³⁸

As a result of their rapid development in the last decade, emerging economies have turned to Africa in search of natural resources and investment opportunities. Improved political and economic stability in sub-Saharan countries has made them an attractive region for countries like China, India and the Gulf states to invest in infrastructural development. The magnitude of the financial resources flowing from these countries into Africa is estimated to be equivalent to that of official development assistance provided by the OECD.³⁹ Furthermore, the intensified south-south trade and investment relations between Asia, the Middle East and Africa is giving African least developed and developing countries an opportunity to establish a solid foundation for sustainable development and poverty reduction.

In the past years, China has become one of the major investors in the ICT sector of sub-Saharan Africa, financing 24 projects in LDCs, mostly through the Chinese Ex-Im Bank, the state-owned telecom equipment supply firm ZTE, and the Ministry of Commerce. During the 2001-2007 period, China financed ICT projects in 16 African LDCs,⁴⁰ with commitments estimated by the World Bank at USD 2.16 billion.⁴¹ Most of the Chinese involvement related to equipment sales, but in some cases, it involved intergovernmental financing of technology and equipment for incumbent state-owned telecom operators in the region. The financed initiatives ranged from GSM projects of diverse extension in Benin, Burundi, Ethiopia, Niger and Togo to the establishment or rehabilitation of fixed-line telecom networks in Eritrea and rural networks in Sierra Leone; and from building the e-government network in Senegal to the deployment of CDMA networks in Gambia and fibre transmission backbone in Ethiopia.⁴²

Among the African countries receiving Chinese funds, Ethiopia is at the top, due to a USD 1.5 billion project to deploy the national transmission backbone and roll out mobile coverage to rural areas with the support of ZTE, Huawei, and China International Telecommunication Construction Corporation. According to the World Bank, if completed, the project, agreed upon in 2006, is expected to “more than double the country’s optical fiber deployment, more than triple mobile network expansion capacity, double rural telecom coverage, and quadruple the length of the fixed telephone network.”⁴³

Box 4.2: ICT, a vehicle to ameliorate the development challenges faced by Haiti

Even before the devastating earthquake struck on January 12, 2010, Haiti had the distinction of being the poorest nation in the Americas. The population is about 9 million, and the GDP per capita is USD 689.⁴⁴ About one quarter of the country's gross domestic product comes from agriculture. The sector employs about two-thirds of the people. Though Haiti is the first country to gain independence in the Caribbean (1804), and the first "black republic", its development has been marked by political instability and economic stagnation.

Haiti has lagged behind that of the rest of the Caribbean in ICT development. The domestic fixed telephony is provided by state-run entity Teleco. In December 2009, it was announced that it would be privatised, with Vietnam's military-run Viettel set to buy 60 per cent shares of Teleco. The earthquake impacted the finalisation of the privatisation. However, Viettel has reaffirmed its commitment to the acquisition of the majority share in Teleco. The mobile market is liberalized with three providers. Digicel is the main service provider. There are several ISPs currently operating. ICT indicators, based on ITU statistics for 2009, indicate a fixed line penetration of 1.08 per 100 inhabitants, while the density of mobile cellular telephony is at 36.36 per 100 inhabitants. Internet penetration is low. The number of internet users is reported at about 1 million. The development of the sector has been impeded by lack of a modern legislative framework and supporting regulations. This has resulted in regulatory uncertainty, and numerous disputes among service providers.

After the earthquake, it was instructive to see the many and varied ways ICTs were put to use, including search and rescue, information dissemination, logistics and operations, communication, and even the collection of donations. Online information systems allowed various relief agencies to coordinate support efforts. Global positioning satellite (GPS) technology was used for mapping to target relief efforts. Search and rescue teams used SMS to communicate with quake victims. Social network media such as Facebook and Twitter provided a communication lifeline for family members to get information about loved ones and to support collecting donations.

Ironically the devastating earthquake could present an opportunity to address the development challenges facing Haiti. Some of the development challenges include,

- Economic stagnation,
- Political and social instability,
- The uneven distribution of economic activity, with 65 per cent centred in Port-au-Prince, while 60 per cent of the population live in scattered rural communities,
- Over centralization of basic services,
- Insufficient modern ICT infrastructure and access to the Internet.

Even before the earthquake there were various initiatives aimed at the development of the ICT sector. In 2007, the ITU provided consultancy support, including assistance to the National Telecommunication Board (CONATEL), in dealing with changes consequent on the liberalization of the mobile telecommunication. One key finding was the need to modernize the legislative and regulatory framework of the telecommunications sector. As a result of this intervention, the World Bank provided support for the development of the legislative framework. The earthquake has set back the pace of this work. .../...

Box 4.2 (end)

Since the earthquake, CONATEL has developed an ICT Strategy to support the redevelopment effort. This is based on the development of infrastructure for the deployment of access nodes across the country. These access nodes would be used to support services and content catering to local needs and development opportunities. This initiative would address the challenge of the over centralization of basic services and have the potential to spur entrepreneurship and economic activity.

Multi-lateral agencies, private corporations, NGOs and other governments have pledged support on various ICT projects. For example at a Round Table on the Reconstruction of Haiti, facilitated by the ITU in June 2010, commitments of support came from various institutions in the Caribbean. The Eastern Caribbean Telecommunications Authority and Telecommunications Authority of Trinidad & Tobago have pledged to assist with strengthening the legal and regulatory framework. The Caribbean Telecommunication Union (CTU) offered assistance with ICT capacity building. There is also a proposal from the University of the West Indies (UWI) to use distance education as one of the tools to train teachers in Haiti, in the hope of integrating Haiti into related programmes in the rest of the Caribbean. This could eventually be used to improve higher education using a distance education model. Progress on these and other issues await the results of the second round of presidential elections set for February 2011, at the earliest.

In the interim, some notable initiatives include the planned launch of a mobile money service, to be introduced by mobile operator, Digicel. Prior to the earthquake, only about 10 per cent of the Haitian population used the commercial banking system. With functionality to send, receive and store money, this could significantly impact the life of the average Haitian citizen. By leapfrogging the more conventional banking models, this could immediately disperse economic activity across the scattered rural communities. However, for sustainable political, economic and social development, these individual initiatives have to be supported by a coherent long-term ICT development plan as part of the wider development plan. This has to be backed by commitment and funding. The modernization of the legal and regulatory framework is a critical starting point.

Source: Opal Lawton, Expert ICT Policy & Regulations, Trinidad.

Other opportunities to support the deployment of ICT and telecom infrastructure in LDCs have come from more traditional sources of official development assistance. Increasingly, funding organisms, such as USAID, the World Bank, and regional banks, like the African and Asian Development Banks, are coordinating their activities with United Nations organisms, as well as with regional and international organizations to avoid duplication of efforts and make better use of limited financial resources. Following the WSIS call to harness the value of cooperation and partnership between governments and other stakeholders in ICT deployment, these organizations are promoting the use of multi-stakeholder partnerships to accomplish the goal of a more inclusive Information Society. The case of Haiti, the only LDC in the Americas, provides perhaps one of the best recent examples of how ICTs and the cooperation of multiple stakeholders can support an LDC through the challenges of development examined in Chapter 3.

Among the funding organisms, the Bank Group is the largest international donor in the field of ICT for development, currently supporting ICT activities in about 95 countries. Over the last decade, the World Bank has supported governments in promoting widespread access to affordable information and communication services. The Bank achieves this by providing advisory services on policy and regulatory resources for competitive telecom markets, as well as through catalytic financing of public-private partnerships to extend services to underserved areas and to accelerate the rollout of broadband networks. Since 2000, the World Bank has committed USD 1.8 billion for investment in ICT projects. A further USD 45 million was spent on analytical work and technical assistance in the ICT sector.⁴⁵ In addition, the World Bank supports IT components in lending projects across other sectors, such as education, health, and public sector management.

In Africa, the World Bank and the African Development Bank are using public-private partnerships to increase access to affordable high speed Internet in the continent through the on-going Eastern Africa Submarine System (EASSy). Both organisms are jointly implementing the Central Africa Backbone (CAB) Project by funding the first phase of a USD 215 million programme to connect countries in Central Africa, the third phase of a USD 424 million Regional Communications Infrastructure Programme (RCIP) for East and Southern Africa, and USD 900,000 for preparatory work on ECOWAS regional Broadband. The Bank has also established a network of mobile applications development labs in Africa, Asia and Eastern Europe, and has provided loans to support e-Government components in Benin, Ethiopia, Rwanda, and Tanzania.

The Bank's International Finance Corporation (IFC) provides long-term financing to private sector telecom and media projects, sustainable private enterprises that are expanding or modernizing, and state-owned enterprises that are on the path to privatization. IFC also invests in innovative business models that use ICT applications to help deliver public services, effectively operating as a venture capital or private equity group. In Africa, the IFC has contributed USD 32.7 million to fund EASSy; it has invested also USD 1.5 million in the Village Phone programme and is focusing significant resources under RCIP for rural connectivity.

AfDB, on its part, has mobilized USD 14.5 million for EASSy, USD 1.1 million for CAB preparatory work, USD 2 million for SATA, EAC, ECOWAS and Seychelles Fibre, and is mobilizing an additional USD 60 million for CAB lending. The Broadband ICT to Villages project received USD 50 million for the Regional African Satellite Communication organization (RASCOM) and USD 0.5 million for Lake Victoria Connectivity through AfDB.

By the same token, since the Connect Africa Summit took place, several partners of the series have invested in the African LDCs, either on their own or through multi-stakeholder partnerships. GSMA, for example, reports a USD 20 billion investment in wireless infrastructure and services across Africa since the Connect Africa Summit. Similarly, in its effort to connect all African countries by broadband optical fibre to minimize the cost of communications across Africa and to the rest of the world, the NEPAD e-Africa Commission is leading the development of a high-capacity submarine cable, UHURUNET, and the associated terrestrial network, UMOJANET, taking advantage of the Kigali Protocol, which came into effect in February 2008, and of Memoranda of Understanding to realize the investments needed. In 2009, a detailed feasibility study⁴⁶ on the terrestrial network, covering Eastern and Southern Africa found that 60 per cent of the required fibre was already in place and 30 per cent was at that time being planned or under construction. The study determined that the

UMOJANET could be started in the SADC region with an initial investment of less than USD 100 million, using leased networks.

As for the European Commission, after the successful completion of the ICT policy harmonization that led to the adoption of regulatory acts by ECOWAS, the Commission extended USD 6 million to cover other sub-Saharan African countries through the HIPSSA project. The EC has contributed also to the EASSy project, granting EUR 3.6 million and lending USD 15.6 million for the cable. Furthermore, the Commission is investigating the possibility of financing the AXIS project, which should provide better Internet connectivity and access in Africa. It will also finance the connection of the African National Research Networks to the European GEANT network, so that Academics and Scientists in Africa can communicate with their peers globally.

UNECA is supporting the idea of knowledge networks also. This UN organization implemented the "Knowledge networks through ICT access points for disadvantaged communities" project leading to the launch of the Africa Knowledge Network in July 2009. The Network involves over 20 community telecentres and national telecentre networks in six countries. Other projects include the development of National Information and Communication Infrastructure (NICI) policies, plans and strategies, a regional knowledge portal to train on knowledge sharing and networking to enable participation in regional and global knowledge networks. UNECA is also developing draft guidelines on cybersecurity and e-signatures/certification, as well as the online learning platform being extended to host eight modules of the "Academy of Information and Communication Technology (ICT) Essentials for Government Leaders in Africa."

The World Health Organisation, on its part, has completed a study with UNECA covering 17 African countries and 51 districts leading to the development of the Africa Health Infoway (AHI) Business Plan, which provides implementation details to assist African countries to strengthen health systems. The WHO is also working with ITU to align the AHI deployment activities with the ITU Broadband Wireless project in participating countries.

In the area of e-applications, the African Union Commission, jointly with the AfDB and NEPAD Secretariat, is pursuing the Programme for Infrastructure Development in Africa (PIDA) study and the Pan African e-Network project for Telemedicine and Tele Education. It is also involved in the HIPSSA project, which is in line with the content of the Reference Framework for Harmonization of Telecommunication/ICT Policies and Regulation in Africa, adopted in Cairo, Egypt, in May 2008, by African ICT Ministers.

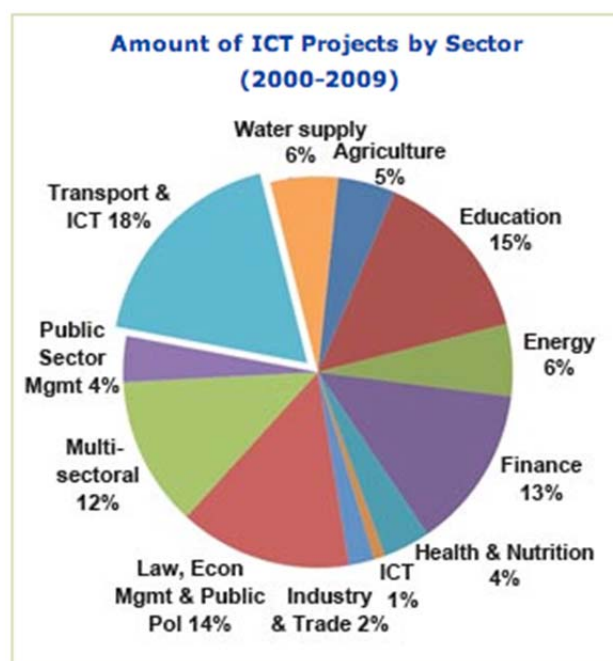
In Asia, the Asian Development Bank (ADB) has assisted its member countries, which include 14 of the 15 LDCs in Asia,⁴⁷ in using ICT for various sector programs. Regarding investment in ICTs, the Bank supports development in the region by providing loans, grants, technical assistance and private sector investment in hard components (ICT networks, infrastructure, applications, and equipment) and soft components (ICT policy, strategy, and capacity building). More recently, the ADB has extended its assistance to the "deployment" or integration of ICT into mainstream processes. In countries where war and conflict have delayed the deployment of ICT, such as Afghanistan and Timor-Leste, the ADB is providing funds to build their ICT infrastructure.

From 2000 to 2009, ADB provided USD 6.66 billion⁴⁸ to fund 245 ICT-supported projects across its members.⁴⁹ Projects supported by ICT-specific Funds, such as the e-Asia and Knowledge Partnership

Fund and the Japan Fund for Information and Communication Technology, and those focused on providing ICT infrastructure through other funding source reached a total amount of USD 299.68 million. The projects cover the implementation of ICT infrastructure and applications in diverse economic sectors and activities, as illustrated in Chart 4.2, with 43 per cent of the funding going to support the adoption of ICT in education, finance, energy, agriculture and health within the region.⁵⁰

The Bank has assisted also in the implementation of regional projects, such as the South Asia Subregional Economic Cooperation (SASEC) Information Highway, approved in 2007, which aims to “deliver and facilitate modern broadband information, communication, and knowledge services within and across borders to governments, businesses, research institutes, and rural and remote communities.”⁵¹ This project is being implemented with the support of the Asian Development Fund, the Republic of Korea’s e-Asia and Knowledge Partnership Fund and the Regional Cooperation and Integration Fund.

Chart 4.2: Asian Development Bank investments in ICT-related projects by sector (% - 2000-2009)



Source: ADB, at www.adb.org/ICT/proj-sector.asp.

As part of its regional initiatives, ITU is implementing several activities and country specific projects to promote the development of rural communications and infrastructure, policy and regulatory cooperation and NGN planning in the Asia-Pacific Region. Among other projects, the Union is collaborating with the Department of Broadband Communications and the Digital Economy (DBCDE) of the government of Australia to assist member countries in the region in addressing infrastructure and policy issues while considering also initiatives in the areas of cybersecurity, gender, youth and disabilities. The project also includes specific actions to respond to the unique telecommunication/ICT needs of Pacific Islands and Small Island Developing States (SIDS) through capacity building, workshops, and emergency disaster relief efforts.

The projects and resources examined in this chapter are just some of the multiple opportunities currently available to facilitate development in LDCs worldwide. From the perspective of the LDC

governments and their population, one of the most challenging tasks is perhaps developing the internal capacity and having the political leadership to evaluate these opportunities carefully, within the context of a national development strategy and a specific ICT/telecom strategy, so that the technologies deployed and projects implemented in their territories actually respond to identified national needs.

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5 Progress is possible: Case studies

5.1 Botswana

Figure 5.1: Botswana



Source: Republic of Botswana, *National Development Plan 10*, p. 6.

Botswana gained its independence from Britain in 1966 and was among the first countries classified by the UN General Assembly under the LDC status in 1971. In 1994, Botswana formally graduated from the LDC status to a developing country – one of the first countries to do so.

Four decades of uninterrupted civilian leadership, progressive social policies, and significant capital investment have created one of the most dynamic economies in Africa. Mineral extraction, principally diamond mining, dominates the economic activity, though agriculture and tourism are growing economic sectors thanks to the country's conservation practices and its extensive natural reserves. Today, Botswana has achieved an upper middle-income economy status,

following a path of wise economic policy and prudence. Economic growth has been supported by the nationwide deployment of ICT and the implementation of performance management systems in almost all facets of public activity and in the private sector. The people of Botswana follow the principle of “Botho.” Botho is an example of a social contract of mutual respect, responsibility and accountability that members of society have toward each other and defines a process for earning respect by first giving it, and to gain empowerment by empowering others.

Botswana’s development has been led by mineral wealth, channelled to finance planned growth in basic infrastructure, education, health and human capacity. The country has achieved consistent growth so far thanks to a democratic and open society and to structured planning expressed in ten National Development Plans (NDPs) and the country’s *National Vision 2016*.

Botswana is a landlocked country in Southern Africa, slightly smaller than Texas, which borders Namibia, Zimbabwe and South Africa. The climate is semiarid subtropical (hot and dry for most of the year) and there are frequent droughts. The Kalahari Desert covers more than three quarters of the country. Arable land accounts for 0.65 per cent of the area of the country; 21.1 per cent of the country is covered by forests, and 0.01 per cent of the land area is devoted to permanent crops. Gaborone is the capital, commercial centre and the largest city. English is the official language, used in government and for instruction for all subjects at primary and secondary school. Setswana is the “national” language and is spoken by 80 per cent of the population.

The President heads the executive branch of government and presides over the Cabinet. He/she must dissolve Parliament and hold a general election within five years of the previous election or sooner. The person who is elected President remains in office for a maximum of ten years or two five-year terms, whichever is earlier. The first national election was held in 1965; the Botswana

Democratic Party (BDP) won it and has returned to power on each subsequent election. The most recent general election was held in October 2009. The constituency directly elects the members of the National Assembly. The Presidential candidate of the party having the majority of directly elected members of Parliament assumes office. The President selects his Ministers from among the members of the National Assembly.

There is an Ntlo ya Dikgosi (House of Chiefs), comprising 35 traditional leaders, which advises on matters affecting custom and tradition, including reviewing draft bills before their consideration by Parliament. Although from independence to this day the BDP has retained absolute majority, the Botswana culture encourages debate and constructive criticism. Consequently, all major policy decisions are based on national consensus. In addition, corruption is not tolerated and there is a strong Directorate of Corruption and Economic Crimes. Freedom of press, expression, religion, speech and assembly are guaranteed by the constitution and generally respected. There is also judicious decentralization in terms of the national government, district city, town and tribal councils.

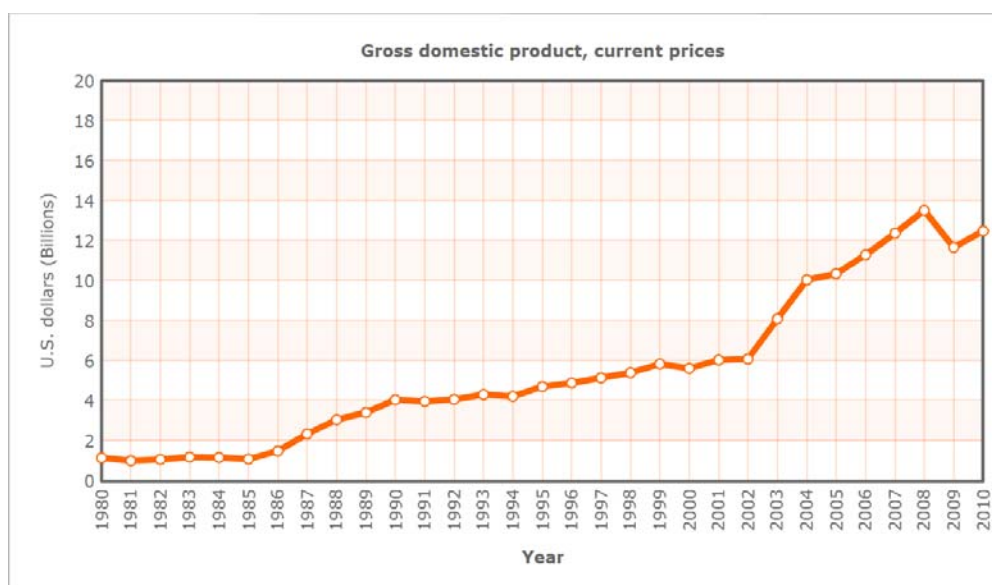
An independent judiciary with a High Court is presided over by the Chief Justice. Subordinate courts are Magistrates' Courts, which have original jurisdiction to try all offences except capital offences, such as murder and treason. Some cases are heard by local chiefs and headmen, or their representatives, and decided in accordance with customary law.

Botswana is a member of the United Nations, the World Bank, the International Monetary Fund (IMF), the World Trade Organization (WTO), the African Union (AU) and regional bodies, such as the Southern African Customs Union (SACU) and the Southern African Development Community (SADC). The headquarters of SADC is located in Gaborone, Botswana.

The economy

Botswana is an upper middle-income country with total GDP of USD 11.68 billion in 2010. The GDP per capita (purchasing power parity) is about USD 14,800.¹ The steady rise in GDP since 1980 is shown in Chart 5.1 below. The local currency, the Pula (P), is relatively stable, and on average, one US dollar is equivalent to seven Pula. Inflation is also stable, with challenges experienced in 2008 as a result of the high global food and fuel prices. Consequently, the average annual year-on-year inflation rate for 2008 was 12.6 per cent. Inflation has, however, been on a downward trend since the last quarter of 2008 and continuing in 2009, reaching 8.4 per cent in May 2009. The economy has grown at an average annual growth rate of over 8 per cent since independence in 1966. Mining plays a significant role in the economy, contributing, on average, about 40 per cent of GDP; government contributes over 15 per cent to total GDP. Botswana is a very open economy with exports representing a large proportion of the GDP. The economy has no exchange controls.

Chart 5.1: Botswana's GDP 1980-2010



Source: IMF (2010). *World Economic Outlook Database*, Botswana.

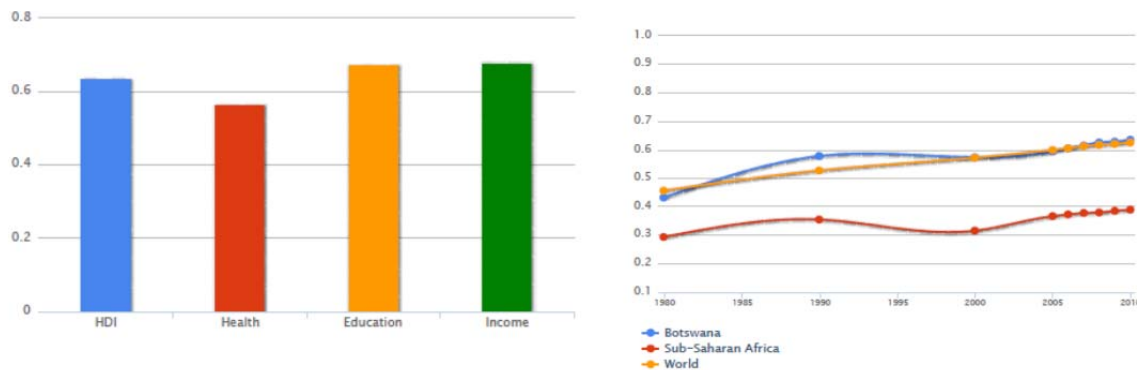
Demographics

The population of Botswana, as per the 2006 Census figures, was 1,773,240 and 59.6 per cent of it living in urban areas.² Age distribution shows that 35.4 per cent of the population is below the age of 15, while 59.5 per cent is aged between 15-64 years, and 5.2 per cent above 64 years. While 75.6 per cent of the population possesses an educational attainment of primary or secondary level, 22 per cent of the population has never attended school. In Botswana, 3.3 per cent of the population is foreign nationals. Among them, 78.9 per cent belong to SADC countries, 4.7 per cent come from other African countries and 16.4 per cent from other continents such as America, Asia, Europe and Australia. The majority of non-Batswana population (81%) belongs to the economically active age groups. More than half (56.9%) of the non-Batswana population are males. The current population is estimated to be 2,029,307 and it is expected to reach 2,425,000 by 2025, with a growth rate of 0.9 per cent.³

Botswana has one of the world's highest known rates of HIV/AIDS infection, with an HIV prevalence of 23.9 per cent in its adult population. Yet, the country has also one of Africa's most progressive and comprehensive programs for dealing with this challenge, both socially and medically, and has made progress in curbing the epidemic in the last years. Data shows that HIV prevalence among young people aged 15-24 years has been declining consistently since 2001. The country has also managed to tackle child mortality through expanded feeding programs for children under five, together with near universal coverage of services to prevent mother-to-child transmission of HIV. This achievement has been possible thanks to a judicious combination of medical research, intensive HIV-related education, nationwide awareness programs, and a social movement that has removed the taboo surrounding the disease and has promoted the acceptance of orphans and children with single parents.

Botswana's human development has improved steadily since 1980. In the 2010 UNDP Human Development Index (HDI), Botswana ranks 98 out of 169 countries, up from ranking 125th in 2009, and a 15 points improvement since 1980, the first year the HDI was calculated. The HDI also reports the striking progress Botswana has achieved in the Index' non-health measures, such as per capita income, education and access to basic services, including water and sanitation. Chart 5.2 below shows Botswana's HDI trends from 1980 to 2010 and the country's ranking in the areas of health, education and income, based on the 2009 HDI.

Chart 5.2: Botswana's Human Development Index: 2009 key indicators and 1980-2010 trends



Source: UNDP (2010). *Human Development Report*.

LDC status and factors contributing to graduation

Botswana was the first country to graduate from the LDC status in 1994. Key factors that have contributed to this positive growth were a prudent economic policy guided by political leadership and implemented through strict management principles. This development was also supported by the adoption of computers, which were later integrated into a nationwide telecommunications and ICT network, led by the Telecommunications and Information and the Broadcast Departments.

To lead the country's development, the political leadership has implemented National Development Plans (NDPs) since gaining its independence. These plans were complemented in 1996 with a national vision called *Vision 2016—Prosperity for all*. Each NDP outlines short and medium-term development strategies and programmes to be implemented over the plan period, defining expenses and priority investment areas. For instance, NDP 8, the plan in place for the 1997-2003 period, launched the long-term *Vision 2016* and put in place what President Sir Ketumile Masire defined as the foundations for "sustainable economic diversification," that is, for developing other economic sectors beyond mining. Similarly, NDP 9 (2003-2009) started integrating *Vision 2016* into the development planning process and contributed to the goal of increasing the country's competitiveness in global markets and promoting sustainable development under Mr. Mogae's presidency. Despite the severe resource constraints caused by the recent global economic crisis, the current plan NDP 10 – adopted in 2009 under the presidency of Lieutenant General Seretse Khama Ian Khama – aims at facilitating the achievement of the objectives of *Vision 2016* by or before the plan's deadline, guided by the underpinning principles of democracy, development, dignity, and discipline.

Also central to achieving consistent economic performance was the establishment of a prudent economic policy regime that has contributed to Botswana's growth. The development of the mining sector and the promotion of competitiveness in foreign trade were supported by growth-promoting policies that stimulated the country's monetary, fiscal and labour market. Mining policies established mutually profitable arrangements with foreign investors, and participation in one of the few successful international marketing arrangements. Trade policies have kept the economy open to competition from imports and maintained access to markets for some important non-mineral exports. Meanwhile, money and banking policies have provided stability to the macro economy and the financial sector. By the same token, exchange rate policies have accorded stability to the tradable sector and avoided the peril of an overvalued currency, commonly encountered following mineral discoveries.

The government long term development planning, overseen by the Finance and Development Planning Ministry, was crucial in channelling the wealth generated from mineral extraction and other economic activities into investments that promoted both growth and human development. It also helped maintain a disciplined fiscal and monetary policy that made possible for the Bank of Botswana, the independent central bank, to accumulate substantial foreign exchange reserves during the past four and a half decades. Fiscal and monetary discipline also helped keep the economy open and encouraged the emergence of non-traditional exports and import competing production.

The adoption of management principles was an important factor in the implementation of strict economic discipline. The establishment of a Performance Management System (PMS), designed to alter the way civil servants conduct business and deliver services to citizens, was key to the transformation of Botswana. The system, launched in 2000 and implemented throughout the public sector, improved governance efficiency and motivated civil service through the development of strategies, budgets, performance agreements and reporting. Botswana's accomplishments in this area have been evident, encouraging other African countries to seek the country's advice in establishing their own transformational policies and national development plans.

Another factor that contributed to Botswana's graduation from the LDC status was the early adoption of information and communication technology by the public sector. As early as 1966, mainframe computers were introduced in the Accountant General office to support payroll and accounting activities. Technology adoption has evolved since then into a government wide ICT network that helps manage the economy and other public administration functions. Moreover, national IT and ICT strategies facilitated the coordinated integration of applications in diverse Ministries, using a government wide IT framework. An example of these applications is the Government Accounting and Budgeting System that manages budgeting and accounting functions for all the central government revenue and expenditure. Similarly, Botswana has established a robust government data network that connects government offices countrywide. Yet, the country has seen limited progress so far in its goal of becoming a software and ICT-based service exporter, like Ireland, India and Indonesia, despite serious efforts in this respect.

Finally, medical research and public awareness campaigns, strongly supported by ICT, have been essential in the combat against the HIV AIDS pandemic in the country. Aggressive public awareness programmes and the effort of the Harvard Research Centre, sponsored by the Bill and Melinda Gates

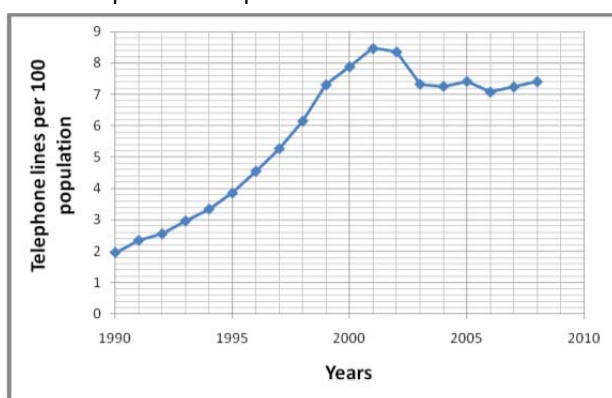
Foundation, have helped meet this challenge. Current efforts are focused on raising awareness about the large number of orphans caused by this tragedy and on initiating a social movement to look after these children, so that they are accepted by the mainstream of society.

Connectivity now and then

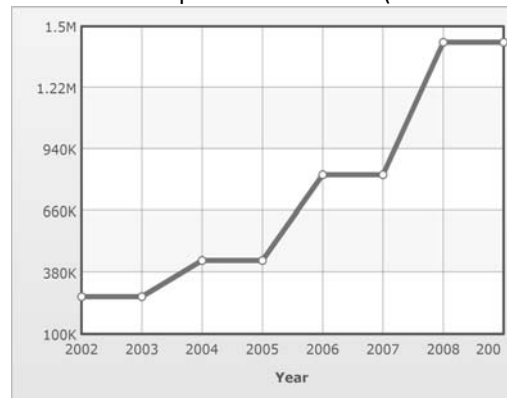
The penetration of urban and rural telecommunications, initially overseen by the Department of Posts and Telegraphs, progressed slowly in Botswana. The Botswana Telecommunications Corporation (BTC), the only fixed line operator in the country, initiated operations in 1980 with 6,500 landlines. By 1994, the penetration of telephones in the rural areas was still negligible due to low revenues; PC penetration had only reached 0.66 per cent and mobile cellular services had not entered the market yet. Today, Botswana has 145,000 landlines and rural coverage is being addressed, thanks to a rural telecommunication strategy adopted in 2008. The growth of landlines, mobile phones, Internet users, Internet hosts and PC penetration during the last decade has been impressive, particularly in urban areas. As illustrated in Chart 5.3 below, by 2009, the country had reached nearly 1.5 million mobile cellular subscriptions – almost one per inhabitant –, and had 80,000 Internet users, 6,000 Internet hosts and a PC penetration of 6.5 per cent. It must be pointed out, however, that these services remain expensive by international and African standards. International tariffs are still high and dependent on monopoly service providers in neighbouring countries.

Chart 5.3: Progress in Botswana’s telecommunication sector

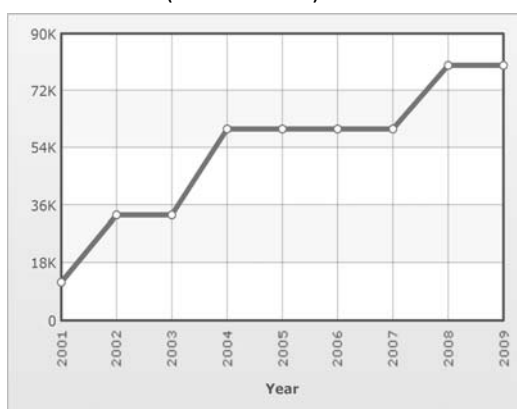
Fixed telephone lines per 100 inhabitants



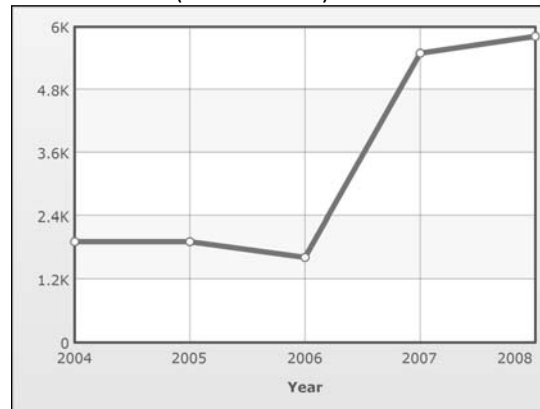
Mobile cellular phone subscribers (in thousands)



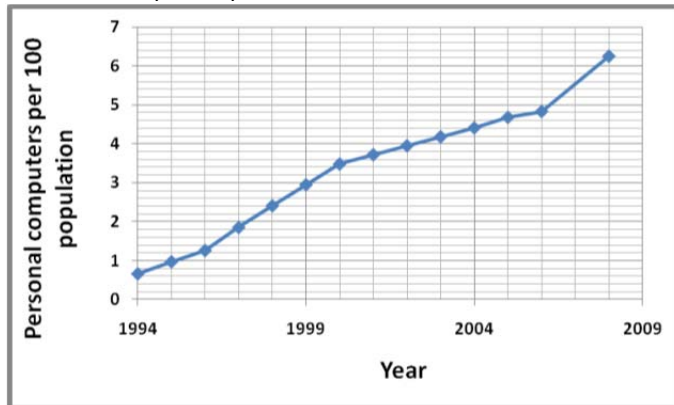
Internet users (in thousands)



Internet hosts (in thousands)



Personal computers per 100 inhabitants



Source: United Nations Statistics Division (<http://unstats.un.org/>).

Regulatory reform has turned the country into one of the most liberalised telecommunications markets in the region. The adoption of the Telecommunications Act in 1996 ended BTC's monopoly and established the Botswana Telecommunications Authority (BTA). Since its inception, BTA has improved the development and efficiency of the sector. During the 2000-2006 period, the government approved the Universal Access Policy, an ICT legislation project, ICT reticulation standards, frequency management and monitoring plans, and the parliament passed the Cyber Crime bill.

As part of its liberalisation process, Botswana adopted in 2006 a service-neutral licensing regime at the rural and district level that authorizes all licensees, including the incumbent BTC, to provide all telecommunications services including voice and data, irrespective of whether the service is transmitted via wireless or wireline networks. Currently, three operators serve in Botswana. Two new mobile service providers, Mascom Wireless, an affiliate of South Africa's MTN, and Orange Botswana obtained licenses in 1998. So far, BTC remains the only wireline operator in the country, using a network that combines all-digital microwave and fibre optic systems.⁴ BTC also entered the mobile market through its subsidiary BeMobile and has upgraded its national Management Data Network (MDN) and the Asymmetric Digital Subscriber Line (ADSL) for the provision of advanced services. The public sector is playing also a key role in rolling up private networks across Botswana. In 1983, the Botswana Police set up its private network based on multiple technologies. Similarly, other government departments and parastatal dependencies, such as the Botswana Defence forces, the Meteorological Department, Botswana Railways, Civil Aviation and Botswana Power Corporation have setup and are operating their private networks.

Regarding broadband services, the three licensed operators are currently competing to serve this underdeveloped market, using 3G mobile technology, WiMAX and ADSL.⁵ Starting in 2006, BTC launched broadband services in most parts of the Botswana, announcing also its commitment to use its network to support education, healthcare and other public sector needs.⁶ Also in 2006, BTC rolled out a fibre optic network initially reserved for the business sector. This was a deliberate move to create high capacity network to support existing services and launch new services, such as Ethernet. This initiative became the first commercial Multi-Protocol Label Switching (MPSL) deployment in Botswana.

Competition has had already positive effects on access, improving considerably the speed of connectivity since 1999. In 1980, when BTC was established, obtaining a landline connection in an urban area could take up to 12 months. By 1996, the waiting period had been reduced to up to 45 days and today, connection to a landline, cell phone, Internet or ISDN service is immediate. To further increase competition and quality of service, in June 2006, the Ministry of Communications, Science and Technology announced further liberalisation policies for the telecommunication sector, granting permission to value-added network service providers (VANS) and Internet Service Providers (ISPs) to provide VoIP service both nationally and internationally. The new policies also extended the benefits of service neutral licenses to ISPs and VANS. Encouraged by these changes, several ISPs are now rolling out their own wireless access infrastructure to compete in the broadband service market and 24 VANS had been licensed as of March 2008.

Moreover, the new rules allowed mobile operators to provide their own transmission links and build their own backbone infrastructure to carry their 'traffic'. The Ministry also announced the liberalization of the international voice gateway to allow other players to provide international switching and transmission of voice services, which were provided exclusively by BTC until then, as well as the establishment of the Universal Service Fund to subsidize the cost of rural telecommunication. The privatization of BTC, also announced in 2006, has been postponed due to the economic crisis, but it is expected to continue in the near future.

Connectivity as a driver of socio-economic development

The foundation of the ICT market in Botswana is based on the economic activity of its 1.9 million inhabitants, with an estimated GDP per capita of USD 14,800, that use ICT services for their daily activities, including education, entertainment, and communication. With a landline penetration of only 6 per cent and an unsatisfied market for personal computers, connectivity will still drive socio-economic development in Botswana for years to come.

While the mobile cellular market appears to be saturating, growth is expected to come from service demand in still underserved rural and metropolitan areas, as well as a result of needed improvements in land services across the country. The Botswana demand for information and platforms for public debate has created also an unsatisfied market for content, broadcasted via traditional media and the Internet, and value-added services. There is also increased demand for high-capacity data networks and faster Internet connections.

To support the nation's economic activity in sectors such as industry, health, mining, commerce, finance, tourism and agriculture, the government of Botswana has consistently invested in the ICT sector, as part of its NDP expenditures (Table 5.1). The NDP 10, for example, projects a total expenditure of about USD 10,660 million for the 2009-2016 period. Of this amount, 7 per cent or an average of USD 107 million per year will be invested in ICT to automate government administration processes.⁷ The ICT market generated by this investment has been estimated at USD 428 million per year, that is, four times the value of the government ICT market.⁸

Table 5.1: Growth of public expenditure in ICT applications – NDP 7 to NDP 10 (1991-2016)

National Development Plan (NDP)*	Total public ICT expenditure (Full NDP period)	ICT expenditure as % of total government expenditure (Same period)	Average annual ICT expenditure ⁹	Annual national ICT expenditure (All sectors)
NDP 7 (1991-1997)	USD 5.36 million	0.2%	USD 1 million	USD 4 million
NDP 8 (1997-2003)	USD 100 million	2.7%	USD 16.7 million	USD 66.7 million
NDP 9 (2003-2009) ¹⁰	USD 229 million	3.7%	USD 38 million	USD 152 million
NDP 10 (2009-2016) ¹¹	USD 750 million	7%	USD 107 million	USD 428 million

Sources: ICT Policy E Readiness report, NDP 9, and NDP 10.

* Note: NDP 7 and 8 reflect actual expenditures. Figures for NDP 9 and 10 are projected.

To retain within the country the revenues generated by the internal demand for telecommunication and ICT services, the National ICT Policy Maitlamo has stressed the urgency of improving Botswana’s human capacity. The policy emphasises the need to develop specialised ICT skills and on-the-job training to ensure that young graduates have a career path in Botswana’s emerging ICT sector. Developing internal human capacity would also reduce the sector’s dependency on expensive highly skilled consultancy and software development services hired from other African countries and from the UK. Currently, all ICT companies operating in Botswana are exporting software development and consultancy services to a limited extent.

Undoubtedly, the introduction and provision of telecommunication and ICT services have generated economic activity and employment in Botswana. Although the country imports most of its ICT hardware and software, employment and investment have increased in the areas of software application development, hardware and network system design, as well as in installation and maintenance services, which are supplied locally by citizens and companies registered and operating in Botswana. Other areas generating substantial demand for less qualified staff are those dedicated to the sale of airtime and the operation of sales tills and other kind of telecommunication services.

The contribution of the ICT sector to the economy is expected to increase also as the result of public subsidies dedicated to other initiatives, such as the outsourcing of business processes and the establishment of call centres, including the International Financial Services Centre and the Botswana Innovation Hub.

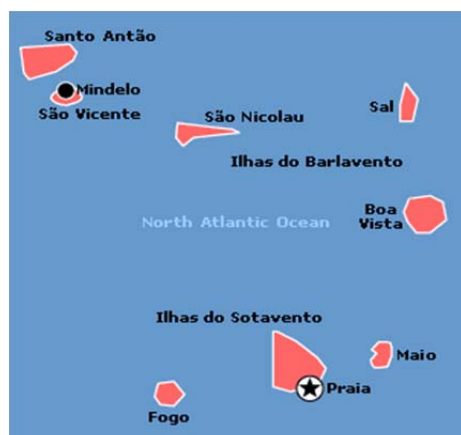
Lessons for other LDC’s

While other LDCs may not share Botswana’s natural resources wealth, the country’s practices in the areas of economic planning, performance management and governance by consensus, without corruption, may be even more essential for development wherever resources are scarce. One of Botswana’s best practices has been investing national resources to improve the country’s human capital, with the aim of enhancing equality and fairness to all sections of society.

Bridging internal divides in access to ICT services remains the biggest challenge for the telecommunication sector. Continued political commitment, investment and improved skills will be needed to ensure better and more affordable services for all the population.

5.2 Cape Verde

Figure 5.2: Cape Verde



Source: UN Statistics Division. *World Statistics Pocketbook*.

Located in the Mid-Atlantic Ocean, 455 kilometres off the west coast of Africa and west of Senegal, Cape Verde is an archipelago composed of ten islands and five islets and covers a land area of 4'033 square kilometres. Its capital, Praia, is in the Sao Tiago Island. Nine of the ten islands are inhabited. Cape Verde is classified as a Small Island Development State, and had an estimated population of 508,659 inhabitants, as of July 2010. Fifty-nine per cent of its population is in the economically active group age of 15 to 64 years old; most live in urban areas (61%) and have a level of literacy estimated at 77 per cent in 2008.¹²

After gaining independence from Portugal in 1975, the country became a republic and established a one-party system that remained in power until 1990, when multiparty elections took place for the first time. Presidential elections are held every five years and allow the President to be re-elected for a second 5-year term. Today, Cape Verde is considered one of the most stable democratic governments in Africa, with free and fair popular elections and representatives of three parties holding seats in the National Assembly.

Its strategic location near north-south sailing routes made Cape Verde an important trading and transatlantic shipping centre since the 16th century and remains so to this day. The country has a poor natural resource base, centred in salt, fish, limestone, kaolin, clay and gypsum; water resources are limited due to irregular rainfall, making the country vulnerable to prolonged droughts, desertification and food insecurity. It is estimated that about 90 per cent of the food consumed in the country is imported.

Only 11 per cent of the territory is arable land, which constrains the contribution of the agricultural sector to the GDP to only 9 per cent. The service sector – focused on commerce, transport and tourism – accounts for 75 per cent of the GDP and the remaining 16 per cent comes from industrial activities, such as salt mining, fish processing and ship repair. As a consequence of the economic and environmental vulnerability of the country, almost one million Cape Verdeans live abroad, having emigrated to the United States, Portugal, the Netherlands and Italy, among other nations. The country's trade deficit makes foreign aid and remittances from the large expatriate population crucial to the national economy. Remittances are estimated to supplement nearly 20 per cent of the GDP.¹³

LDC status and factors contributing to graduation

Cape Verde met the criteria for inclusion into the LDC status in 1977, and 30 years later it became the second country, after Botswana, to graduate from this category in December 2007. Before it was officially recommended for graduation in 2004, the country had surpassed in four previous occasions (1994, 1997, 2000 and 2003) the graduation thresholds set by the Committee for Development Policy (CDP) for gross national income per capita and the Human Assets Index. Yet, recognition by the CDP of Cape Verde's high economic vulnerability, due to its dependency on external financial resources for development, justified postponing the recommendation for graduation until 2004.

Being the first SIDS to graduate from the LDC status, the government of Cape Verde expressed concerns at the time about the cessation of preferential trade agreements after graduation, emphasizing the impact that such shock would have on achieving sustainable development. UNCTAD has recognized the heightened structural vulnerability of LDCs that are also SIDS in what it calls the "island paradox."¹⁴ As micro-states, the increased capital inflow that results from the LDC categorization tends to have rapid positive effects on a SIDS' socio-economic indicators of development, including its GNI per capita. Yet, improvement on this type of indicators does not necessarily reflect the SIDS' progress in establishing the economic foundations for sustainable development nor reductions in their vulnerability to adverse external shocks, such as those related to climate change.

As a consequence of the external aid received, SIDS under LDC status tend to easily meet or surpass the per capita income thresholds for graduation set by the CDP, while control over their economic vulnerability remains closely linked to having access to preferential trade agreements, Official Development Assistance (ODA) and special concessions. According to this paradox, Small Island LDCs have a higher risk than any other LDC of losing their LDC status before actual development takes place, as well as of seeing their economic progress seriously affected by environmental shocks. It is therefore not surprising that the efforts of the General Assembly to encourage the adoption of smooth transition strategies among the international trade community coincided with different steps in the graduation process of Cape Verde and Vanuatu, as well as with the postponement of Maldives' graduation due to the December 2004 tsunami in the Indian Ocean.

An essential factor that contributed to Cape Verde's LDC graduation was the leadership of the democratic government elected in 1991, which introduced institutional reforms to strengthen the economy, including privatization programmes, the adoption of market-oriented policies that eased the entry of foreign capital and the diversification of the economy.¹⁵ The development programme, launched in 1991 and revised in different occasions, set among its priorities poverty reduction to ameliorate the living conditions of one third of the population living under the poverty line, as well as the promotion of infrastructural development, particularly in the areas of energy, telecommunications and transport. The drive towards modernisation was enunciated in the 1997 development plan. One of the country's development goals is to generate 50 per cent of its energy from renewable sources by 2020, with the financial support of public-private investments.

Foreign direct investment in the amount of USD 407 million contributed to the growth of the tourism (58% of investments) and manufacturing industries (17%), in infrastructure (4%) and services (21%) from 1994 to 2000.¹⁶ Economic growth during the 2001-2006 period averaged 5.6 per cent in real terms. By the time of graduation in 2007, the country had made inroads in debt

reduction. It was also moving ahead with the implementation of growth and poverty reduction strategies to improve transparency and civil society participation in public administration, and to strengthen the education and health systems so as to meet the MDGs by 2015.¹⁷

After its graduation, Cape Verde was able to negotiate a three-year extension of preferential treatment from the European Union under the “everything but arms” initiative. A year later, Cape Verde also joined the WTO, thus improving its access to new markets. As of 2010, Cape Verde’s gross fixed investment, estimated in nearly 37 per cent of its GDP, is among the highest worldwide, just below those of China, Dem. Rep. of the Congo, Sao Tome & Principe and Ghana. Inflation is low (2.5%), just above that of Norway and Poland, and its GDP per capita is estimated at USD 3,700, a USD 200 per capita increase from 2008.¹⁸ In late 2010, the International Monetary Fund approved a 15-month Policy Support Instrument (PSI) to support Cape Verde’s poverty reduction strategy, helping it consolidate its macroeconomic stability and maintain fiscal discipline.

Connectivity now and then

The incumbent public telephone provider Empresa Publica dos Correios e Telecomunicações (CTT-EP), created after gaining independence from Portugal, was split in 1994. The postal and telecommunications businesses were separated and Cabo Verde Telecom (CVT), the telecommunications operator, was created. A year later, CVT was partially privatized with the entry of Portugal Telecom as the strategic partner.¹⁹ CVT’s Concession Title established universal service goals to be met by the operator and granted it a monopoly over landline services and international telephony for 25 years, with the possibility for renewal for a minimum of 15 years.²⁰ From 1996 to 2000, Cape Verde implemented an extensive modernization programme for the sector, establishing the foundations of its current telecommunication infrastructure.

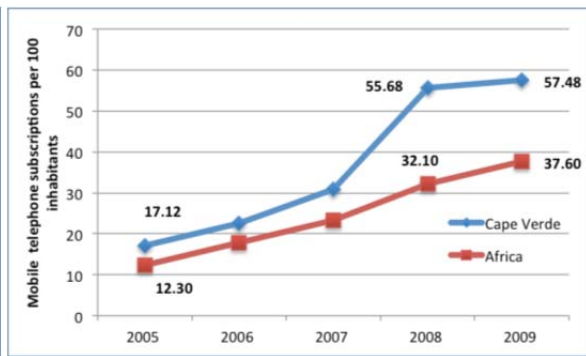
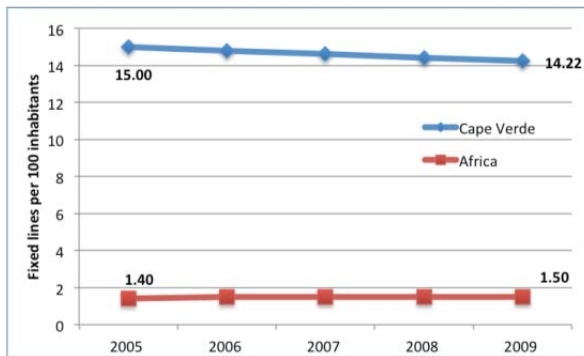
Following trends similar to those observed in other developing countries, Cape Verde’s penetration rate for fixed telephone lines is declining. Meanwhile, that for mobile cellular telephone service, introduced in 1998, has increased at an average rate of 33.6 per cent since 2005, receiving an additional boost in 2007 with market liberalisation and the introduction of partial competition.²¹ The GSM operators CVMovel S.A. – the mobile operator of CVT – and T+ Telecomunicações S.A currently serve the mobile cellular telephony sector. As a result of the entry of T+ into the mobile, Internet and cable TV services in 2007 service rates starting decreasing by 2008. As of 2009, more than half of the population of Cape Verde (57.5%) had a mobile cellular telephone subscription, a penetration rate well above that of the African region (Chart 5.4).

In addition to having access to international submarine cable facilities,²² the country completed in 2001 the deployment of its undersea fibre optic ring for the provision of Internet and ISDN services across the archipelago (Figure 5.3). Broadband services were launched in 2004 with CVT’s introduction of ADSL service, showing rapid uptake. Chart 5.4 shows a sharp increase in the number of Internet users during the 2005-2009 period, growing at a 48.7 per cent compound annual rate and reaching almost one third of the population (29.67 per cent) as of the end of 2009. This penetration rate is 237 per cent higher than that of the rest of Africa. The penetration of fixed broadband Internet subscriptions since 2005 is following a similar pattern, showing drastic jumps in uptake since 2006.

Chart 5.4: Comparison of key connectivity indicators, Cape Verde and Africa (aggregate), 2005-2009

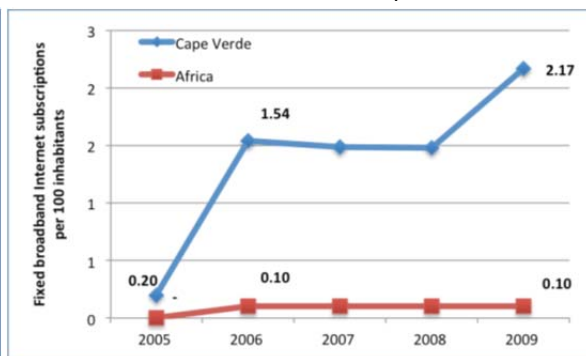
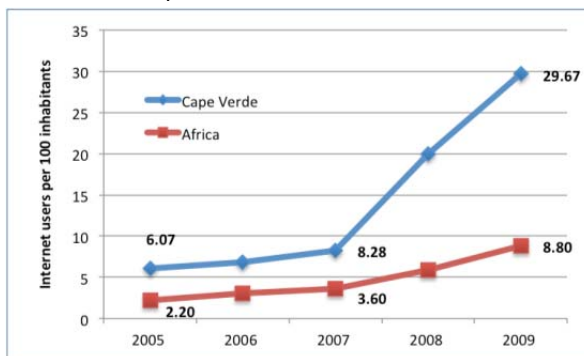
Main fixed telephone lines per 100 inhabitants

Mobile cellular telephone subscribers per 100 inhabitants



Internet users per 100 inhabitants

Total fixed broadband Internet subscribers per 100 inhabitants



Source: ITU World Telecommunication/ICT Indicators database.

Figure 5.3: Cape Verde's undersea fibre optic network



Source: Becker, J. & Höbermann, C. (2003). p. 7.²³

Cape Verde is also connected to the continental African countries through the Africa ONE optical cable network.²⁴ In September 2010, CVT announced its plans to join WACS (West Africa Cable System) project, the undersea fibre optic cable due to be operational in the first half of 2011, to increase broadband capacity throughout the archipelago. The new cable will allow also the expansion of the fibre optic network to the islands of Maio, Fogo and Brava, which remain

unconnected. This extension will require an estimated investment of 6.5 million euros and is scheduled to start operations in 2011.²⁵

To continue upgrading its infrastructure, Cape Verde established a commercial agreement with the Chinese multinational HUAWEI in 2007 for the development of Voice over IP and videoconferencing. The introduction of VoIP triple play is expected to increase competition and improve affordability. Moreover, in 2010, the telecom regulator launched a public tender to license a third mobile cellular operator, as well as three operators for the provision of 3G and 4G services, including mobile broadband Internet services.²⁶ WiMAX services will be introduced in the near future. In May 2010 the telecom regulator announced that Digicel, T+, CVNet, SGPM and CVWiFi were awarded frequency usage rights for the provision of broadband wireless services.²⁷

ICT policies

The Basic Telecommunications Law (Law No. 500), enacted in 1995, defines competencies, competition laws, development of new services, and technologies. The law regulates the planning and development of free markets, tariffs, and technical rules for the telecommunications sector.²⁸ Since the 1990s, the government has passed laws to regulate value-added and complementary telecom services (1995), tariffs (1996), and mobile service licensing (1997).²⁹

As the only fixed-line operator and an operator with significant market power, CVT has universal service obligations for the provision of fixed line private residential service, fixed line public payphone service, and emergency services. The current universal service policy does not include in its definition Internet and broadband services.³⁰

The development and implementation of the National Information and Communication Infrastructure (NICI) plan was coordinated by the Ministry of Infrastructure and Transport, with the assistance of UNECA and the International Development Research Centre of Canada. The 2002-2006 plan proposed strategies for the use of ICT for public reform and in the modernization and internationalization of the economy. It gave priority to the strategic implementation of e-policies to promote ICT use in education, health, eGovernment, regulation, environmental protection and public safety. The plan also delineated strategies for universal service and infrastructure development.³¹ In 2003, Resolution No. 15 complemented the NICI plan with goals for the creation of an Information Society in Cape Verde.³²

The Department of Communications (DGC) supported the Ministry of Infrastructure with the design, implementation, and execution of telecom policies; it also drafted laws and regulations on operations and technologies in the telecom sector. On its part, the Department of Social Communication in the Presidency was responsible for creating the legal and institutional framework for ICT, reducing cost of usage, and providing public access to ICT.

In 2005, the government liberalized the telecommunication sector. The new Electronic Communications Law (Legislative Decree No. 7/2005) required mobile sharing infrastructure and the unbundling of the local loop. It also created the independent telecommunications regulator, Agência Nacional de Comunicações (ANAC), which assumed responsibility for managing telecommunications, spectrum, the country's Internet domain name (.CV) and the postal service.³³ As of 2008, the markets for mobile cellular telephony, Internet and cable TV services were partially competitive,

while the provision of fixed wireless broadband and DSL services was opened to full competition.³⁴ Only the fixed line monopoly for Cabo Verde Telecom remained in place until 2010.

Connectivity as a driver of socio-economic development

The promotion of telecommunication and ICT services has been a constant in the development programme of Cape Verde since 1995. In 1997, the Ministry of Finance initiated the National Administrative and Financial Reform (RAFE) project to create an intranet that would support public administration activities. The administrative intranet connected ministries, municipal councils and state organs, facilitating the implementation of the government's decentralisation policy.

ICT has played also a crucial role in the Cape Verdean commitment to meet the Millennium Development Goals (MDG) literacy target of halving adult illiteracy rates by 2015. The 1990 basic law on the education system, revised in 1999, promoted the introduction of new educational technologies and emphasised technical and scientific training as the vehicle to enable students to participate in socio-economic development in order to promote the quality of work. As a result, ICTs were deployed in secondary schools, universities and used for adult education and capacity building.³⁵ With the assistance of ITU, the Cape Verdean Government has launched initiatives to boost ICT services, train personnel, and improve cybersecurity.³⁶

Lessons for other LDC's

Cape Verde is an example of successful integration of ICT policies into national development programmes. Advances in the deployment of telecom infrastructure, particularly since the liberalization of the sector in 2005, have already improved the penetration of key telecom services, boosting Cape Verde's penetration rates well beyond those of the African region. The political stability of the country and an enabling regulatory environment has consistently attracted investment into the sector, as illustrated by the recent tenders for WiMAX and 4G licenses. The early adoption of ICT to support the provision of public administration activities made the government an anchor for the deployment of these technologies in the education and health sectors and in the private sector. ICT have also supported Cape Verde's modernization process, strengthening its economy and helping it meet its international commitments, such as the MDGs.

Nonetheless, significant challenges remain, particularly in the provision of service to rural communities lacking electricity and in the diffusion of advanced services at affordable rates. As a service-based economy, it is essential for Cape Verde to have a secure and reliable ICT infrastructure, based on very high-speed technologies. An UNDP study points out that the adoption of technologies such as Fibre to the Home (FTTH) and Fibre to the Premises (FTTP) would be particularly useful in improving connectivity in rural areas because of they do not cause any signal degradation.³⁷ Similarly, availability of high-speed broadband networks would facilitate the provision of tourism, financial, banking and outsourcing services throughout the country, facilitating also transfer mechanisms for remittances from the Cape Verdean diaspora and the implementation of e-services. Finally, faster and more affordable Internet services would assist in maintaining Cape Verde's contact with the diaspora.

5.3 Maldives

Figure 5.4: Maldives



Source: UN Statistics Division. *World Statistics Pocketbook*.

Maldives is an archipelago in the Indian Ocean composed of 1,191 islands, covering an area of 298 square kilometres near Sri Lanka and India. About one third of the country's 314,000 inhabitants live in the capital island, Male; the remaining 62 per cent is scattered around the country's 200 inhabited islands and are considered rural population. Like Cape Verde, Maldives is a SIDS and was classified as an LDC until its graduation in early 2011. Economic growth has brought about significant social progress to the country, particularly in the area of education. Since 2002, Maldives' primary and lower secondary school enrolment rate has neared 100 per cent. Literacy rates are among the highest in the region, with 94 per cent of its population years 15 and older being able to read and write.

Maldives was governed as an Islamic sultanate under Dutch and then British protection until 1965, when it gained independence from Great Britain. In 1968, a new Constitution abolished the sultanate and established a republic. Ten years later, Maumoon Abdul Gayoom was elected President, remaining in power, after six consecutive re-elections, for the next 30 years. A democratization process, initiated by Gayoom in 2004, legalized opposition parties and revised the Constitution. In 2008, the first multi-party elections were held, bringing Mohamed Nasheed, a founder of the opposition Maldivian Democratic Party, into power. President Nasheed has expressed his commitment to public sector reform, regional development, decentralisation, and the elimination of corruption. On the social front, reducing the high levels of drug dependency among youths and ensuring freedom of speech and the press are considered high priorities.³⁸ Presidential efforts to reduce national debt and liberalise the economy through the privatisation of certain government industries have been resisted by parliament, where Gayoom's party holds the majority of seats.

As of 2009, the Maldives' GDP was estimated at USD 1.4 billion, or about USD 4,600 per capita, classifying it as a lower-middle income country. Its GDP has grown at an average annual rate of about six per cent during the 2000-2008 period, with the exception of 2005.³⁹ Maldives is a service-based economy; the sector contributes 77 per cent of the GDP, of which 27 per cent comes from tourism and related activities. Tourism drives the economy, bringing inflows of about USD 600 million a year.⁴⁰ Fishing, a traditional economic activity of the country, contributes 7 per cent of the GDP. The islands' scarce arable land and water shortages make the contribution of agriculture to the GDP minimal (2 per cent in 2009). In fact, most food staples have to be imported. An ambitious tourism expansion plan has fuelled construction and contributed to the deployment of telecommunication and transport infrastructure. Yet, the contribution of tourism to the GDP has declined since 2006 due, among other factors, to lower capital inflows that have delayed the

implementation of tourism projects and caused account deficits.⁴¹ This situation has emphasized the need for economic diversification.

Maldives' dependency on tourism makes its economy particularly vulnerable to the effects of climate change, especially to the rise of sea water levels. The low elevation of 1 metre or less above sea level in 80 per cent of the Maldives' area makes its territory naturally prone to floods. In 2004, a tsunami in the Indian Ocean devastated many islands, critically damaging the country's tourism, housing and fishing infrastructure. Not surprisingly, the government leadership has been active at international discussions on climate change and has successfully attracted financial aid from the United States and other development partners to help it adapt to and mitigate the consequences of global warming. The Alliance Manifesto, which guides Nasheed's administration, lists ICT and the environment as essential areas for achieving sustainable economic development.⁴² In 2010, the President's commitment to environmental protection was recognized by the United Nations with the "Champions of the Earth" environment award.

LDC status and factors contributing to graduation

Maldives was one of the 25 low-income economies recommended for inclusion to the LDC status when the category was established in 1971. In January 2011, it became the third and most recent graduate from the list. The road to graduation was not without obstacles. In 2004, just a few months after Maldives had received the Council's endorsement to graduate from the LDC status, scheduled by December 2007, the tsunami hit the islands. Acknowledging the devastation, the General Assembly recommended in 2005 to give Maldives additional time to recover from the economic impact of the tsunami, taking advantage of the ODA and preferential trade granted to it by the international community under the LDC status. Maldives' graduation was thus postponed for three additional years, until December 2010.

Maldives actively engaged in a period of reconstruction, using relief assistance provided by diverse development partners. Its tourism industry has made a remarkable recovery since 2005 and is expected to help the country ride out the external shock of the recent financial and economic crises, which reduced the country's flow of tourism and related investments, other net capital flows and exports.

As a result of the crisis, Maldives' economy shrunk by 3 per cent, and inflation rose to 4 per cent in 2009.⁴³ To deal with increasing trade deficit and fiscal imbalances in the country, in 2009 the International Monetary Fund approved a USD 93 million loan for Maldives. The macroeconomic policy framework proposed under the IMF programme recommended reducing public expenditures by eliminating certain subsidies and downsizing the public workforce. The government also committed to divesting several state-owned enterprises, including telecommunications, electricity, water and sewage, encouraging the private sector to grow. The IMF expects that proceeds from the privatisation of government shares in such enterprises will help finance the deficit in the short-term, while public finances recover. To supplement the IMF support, the World Bank has targeted investments to the tourism (72%), telecommunications (13%) and financial (15%) sectors of Maldives, under its Country Assistance Strategy, amounting to more than USD 103 million as of 2009.⁴⁴ The country has also ensured financial aid from the United States to address climate change issues and improve the economy.

In October 2009, the government announced that it would sell 7 per cent of its shares in Dhiraagu – the incumbent fixed telephone operator jointly owned by the government (55 per cent) and Cable and Wireless (C&W) of Great Britain (45 per cent). Cable and Wireless purchased the shares for USD 40 million, making it Dhiraagu’s mayor shareholder. The government had schedule to sell to the public and international investors another portion of its remaining 48 per cent stake in the company in 2010, as part of Dhiraagu’s initial public offering in the Maldives Stock Exchange and an international stock exchange.⁴⁵ With the exception of initial sell of a stake of the incumbent telephone operator, the efforts of the leadership to comply with other portions of the IMF programme have been coerced so far by the Maldives parliament.

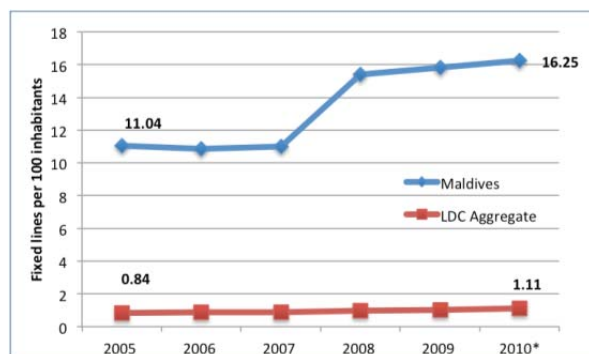
Connectivity now and then

As discussed in Chapter 2, Maldives success in improving connectivity has made it an outlier in the LDC group of countries. Chart 5.5 shows that since 2005, penetration and usage rates for telecommunication services in Maldives have surpassed average rates for all other LDCs. Yet, an analysis of compound annual growth rates for the 2005-2010 period shows the LDC aggregate having even better performance than that of Maldives in mobile cellular subscriptions (42.5 per cent against 16.5 per cent for Maldives) and fixed broadband Internet subscriptions per 100 inhabitants (74.1 per cent against 42.8 per cent for the Maldives). Based on this growth rates, it is not surprising that, by 2007, the penetration of mobile cellular subscriptions in Maldives had reached saturation and, just one year later, it had surpassed the 140 per cent penetration rate. This rapid growth has been largely influenced by the launch of pre-paid subscriptions in 2001, the introduction of free SMS connections and of competition in the sector in 2002 and 2004, respectively, and by improvements in the per capita income of the Maldivian population, among other factors. As of 2007, it was estimated that 90.7 per cent of the existing mobile cellular subscriptions in the Maldives were prepaid.⁴⁶

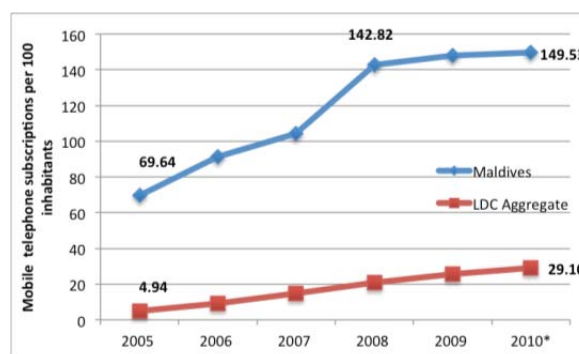
Reductions in the rates for mobile cellular services, due to increased competition in the market, have also played an essential role in enhancing penetration growth. According to the most recent ITU ICT Price Index, ICT services had become more affordable for all Maldivians by 2009, thanks to a 12 per cent drop – from 2.12 per cent in 2008 to 1.87 per cent in 2009 –, in the cost of these services as a percentage of the country’s GNI per capita. Similarly, prices for the mobile cellular service sub-basket as a percentage of GNI per capita showed a 10.24 per cent decline. Even the price sub-basket for fixed broadband services, the most expensive of the services included in the basket, showed a slight decrease from 2008.⁴⁷ This rate reduction trend has contributed also to the rapid increase in Internet users in Maldives; it is estimated that about one third of the population is now online. As of 2008, only users in the largest islands had access to a choice of broadband providers.⁴⁸ Although mobile broadband services are relatively new in the country, by 2007 this service had reached a penetration rate of 0.07 subscriptions per 100 inhabitants.⁴⁹

Chart 5.5: Comparison of key connectivity indicators, Maldives and LDC aggregate, 2005-2010*

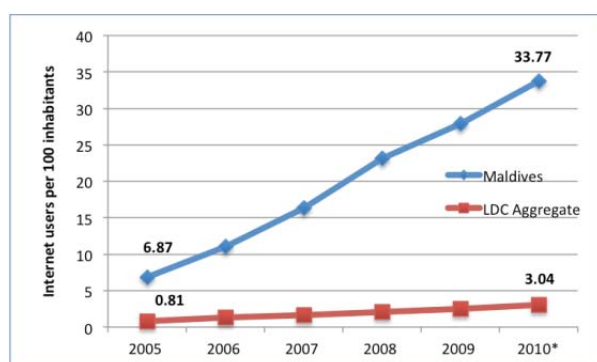
Main fixed telephone lines per 100 inhabitants



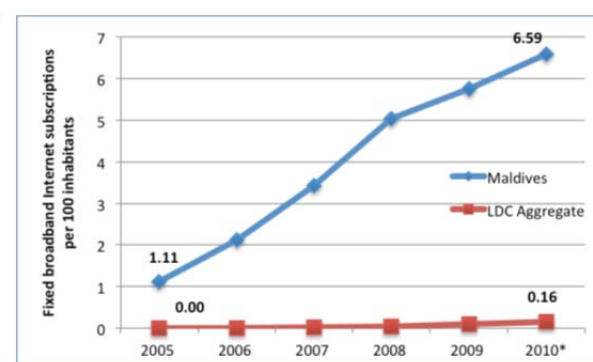
Mobile cellular telephone subscribers per 100 inhabitants



Internet users per 100 inhabitants



Total fixed broadband Internet subscribers per 100 inhabitants



*Estimates

Source: ITU World Telecommunication/ICT Indicators database.

Regarding the structure of the telecommunications market in Maldives, the government of Maldives and Cable & Wireless provided all telephony in the country through a fixed line network. C&W operated the international telephony network through a franchise of the government. In 1988, Dhivehi Raajjeyge Gulhun Private Limited (Dhiraagu), the current incumbent telecommunications provider, was established as a joint venture of the government and C&W. Dhiraagu's license granted it exclusivity over the provision of local fixed telephone service, as well as over national and international fixed long distance service through 2008. Over the last two decades, Dhiraagu has invested USD 155 million to develop the Maldives' network, employing more than 600 people, 99 per cent of whom are Maldivians.⁵⁰ Dhiraagu introduced mobile services under its subsidiary DhiMobile in 1997, using an AMPS (Advanced Mobile Phone System) network, but the system rapidly reached capacity. GSM-based mobile phone services were introduced in 1999, promoting growth in the mobile subscriber base.

Maldives first connected to the Internet in 1996 through a 64 kilobits per second (kbps) satellite connection. As of June 2003, Maldives had 16 mega bits per second (Mbps) of asymmetrical (9 incoming and 7 outgoing) international Internet connectivity, all through satellite.⁵¹ Internet access was the first market segment to be liberalised. Following a tender, Focus InfoCom entered the market as a second ISP in 2002, well ahead the projected 2008 liberalisation of the sector. In 2004, the mobile market was open to partial competition with the licensing of the mobile operator Wataniya Telecom, which started operations two years later, in 2006. By 2009, Wataniya had

grabbed 27 per cent of the market. Both operators are now competing also in the provision of 3G services.⁵² Dhiraagu was the only provider of leased line services until 2008, when Wataniya was granted permission to use its excess microwave capacity to provide leased line services.

Domestic connectivity across the atolls is provided via microwave and undersea cable links; meanwhile, international communications take advantage of Maldives' satellite links, the submarine cable Fiber-Optic Link Around the Globe (FLAG)⁵³ and the Dhiraagu-SLT submarine cable system, inaugurated in 2006 to link Maldives and Sri Lanka. The latter cable system represented an USD 20 million investment by Sri Lanka Telecom and Dhiraagu, aimed at enhancing economic growth through the provision of improved telecommunications in South Asia.⁵⁴

Although the country does not have a universal access policy per se, universal access obligations were imposed on the incumbent operator as part of its licensing renewal process in 1995. Dhiraagu had the obligation to provide universal access to telephone service in Maldives' 200 inhabited islands, understood as the installation of at least two payphones on each of these islands by 2000; this goal was met in 1999. Adoption of fixed telephone service beyond the major islands languished, mostly due to high installation rates and drastic rate differences compared to those offered in Male. Access was thus promoted through the subsidization of rates for fixed line telephone service. By the end of 2003, Maldives had a fixed line penetration rate of 10.5, which, while low, was the highest in the South Asian region and the second highest among LDCs.⁵⁵ The introduction of mobile cellular services has also improved access among the population, reaching universal access by 2007. Universal services obligations are funded through cross-subsidies between the operator's own services. The government has not established a specific universal access fund to support the advancement of universal access goals, but requires operators to provide mobile services and dial-up Internet connection for educational and health care activities at reduced rates.⁵⁶

Under the auspices of the Asian Development Bank, the Ministry of Communication, Science and Technology (MCST) announced in 2001 the Maldives Telecommunication Policy 2001-2005 to further promote universal access and the liberalisation of the telecommunications market. The Telecom Policy aimed to establish a regulatory body and liberalise value-added and non-basic services. This same year, the MCST, in collaboration with the UNDP, started also the development of a national ICT policy (NICT) called e-Maldives to develop a strategy for the transformation of Maldives into a "knowledge-based society". By the end of 2008, the NICT had not been released yet.

As a result of these initiatives, a separate regulatory body, the Telecom Authority of Maldives (TAM), was established in 2003. The regulatory authority was authorised to regulate the sector under the decree "Maldives Telecom Regulation of 2003." The TAM oversees licensing, interconnection rates, price regulation frequency allocation, spectrum monitoring and quality of service, among other functions. Since the envisioned law was not passed, the Maldives Telecommunications Regulation of 2003 currently regulates the sector. A major concern among stakeholders in the sector is that the broad mandates included in the 2003 regulation have not been complemented with a basic set of regulations defining the operators' and regulator's responsibilities and rights in key areas of regulatory purview, such as interconnection and frequency allocation. As a result, regulatory decisions tend to be made on an ad-hoc manner, without explicitly documented and publicized rationales. Stakeholders perceived the absolute discretion of the regulator under the 2003 regulation to be a risk, discouraging investment and potential new market entry.⁵⁷

In 2006, the Ministry of Transport and Communications, the new policymaker for the sector, introduced a new telecom policy to direct the sector activities until 2010. The 2006-2010 policy called for limiting Maldives' dependence on satellite connectivity, promoting connectivity through submarine cable and network development to provide broadband services throughout the country.⁵⁸ It also intended to give TAM autonomy through the passing of a new telecom act that had been drafted by 2007, but has not been approved yet.⁵⁹

As part of the political plan for his administration, President Nasheed listed as a priority for the telecommunication and ICT sector establishing “a national infrastructure capable of providing comprehensive telecommunication and ICT services throughout the country.”⁶⁰ Major goals for the sector include strengthening the regulatory framework, promoting private investment and the provision of services on a commercial basis, with greater participation from civil society; setting up affordable and non-discriminatory rates to encourage adoption of ICT in education, health and environmental protection; and establishing an eGovernance service platform for the provision of online services.⁶¹

Connectivity as a driver of socio-economic development

Promoting the adoption of ICT in government activities to improve service delivery has been a goal of the Maldives' National Development Plans for several years. The use of ICT within ministries is widespread and most government office workers have IT and Internet access. Most government agencies in Male are connected through a Local Area Network (LAN), which is being extended. Similarly, the government plans to connect all educational institutions in the atolls to a Wide Area Network (WAN). The Sixth National Development Plan (NDP) for the 2001-2005 period highlighted, for example, the need to expand and promote ICT in education, including the reduction of Internet charges and improved connectivity.⁶²

Moreover, the Maldives Information Technology Development Project (ITDP) seeks to implement eGovernment through the Government Network of Maldives (GNM), which will connect government and parastatal agencies in Male and 20 atolls, and is intended to eventually connect all the island administrations to a common network. The GNM was scheduled for completion by 2009. The ITDP envisions also the implementation of electronic government applications such as a government portal for service delivery and the establishment of public service kiosks in Male and the 20 atoll capitals.

Beyond education, healthcare and environmental protection are two other sectors where the adoption of ICT has become essential for the sustainable development of Maldives.⁶³ With the financial support of development partner, the country is currently working on the implementation of a national early warning system to help it mitigate the impact of environmental shocks, such as the 2004 tsunami.

The health sector has also benefited from increased connectivity by introducing telemedicine projects among the islands. In December 2010, Dhiraagu announced the donation of a telemedicine system to the Ministry of Health & Family that will facilitate the provision of telemedicine services between remote islands and the IGM central hospital in Male. The system, costing over Mrf. 2 million, will also be used for training medical personal in remote locations. To facilitate its use across

the country, Dhiraagu will cover the expense of technical support, software licensing fees and broadband connectivity charges for one year.⁶⁴

Lessons for other LDC's

As a graduated LDC, Maldives faces many challenges. Achieving sustainable development will depend largely on the country's ability to diversify the economy, reinforce the private sector and keep public finances on check, while continuing on the path of promoting increased social participation. These steps would help the country advance in its goal of reducing poverty among the 16 per cent of the population who now lives below the poverty line.

5.4 Pacific Islands⁶⁵

Figure 5.5: The Pacific Islands



Source: U.S. Department of State.

This case study examines the ICT developments of Kiribati, Samoa, Tuvalu and Vanuatu, the four LDCs in the Pacific Island region that had met, at one point in time, the CDP's eligibility criteria for graduation.⁶⁶ Of them, Samoa has been closest to graduation, which was originally scheduled to take place in January 2011. Yet, its vulnerability to natural and environmental shocks has deferred its graduation to 2014, as a consequence of a tsunami that hit the island in 2009.

These islands are also of interest as they exemplify the particular challenges faced by the ten SIDS currently included in the LDC category.

The case study focuses on the role that national ICT policies and regulatory frameworks, the liberalisation of the telecommunication market, universal access and services (UAS) policies, and ICT capacity building efforts have had in promoting socio-economic development in these four countries. Although this study seeks to identify some commonalities among the four LDCs, differences between these countries can be stark. Their populations, for example, vary from hundreds of thousands to tens of thousands. Their topologies vary significantly too, with some comprising numerous small islands and others only one or two islands. These divergences can have major implications for the type of infrastructure investment required and the optimal level of competition that can be introduced in the various ICT network and service market segments. Thus this case study focuses on providing an overview of ICT developments and processes, identifying best practices and remaining challenges.

Samoa

Located in the South Pacific Ocean, about halfway between Hawaii and New Zealand, Samoa is an archipelago with a total land area of 2,830 square kilometres. The country is comprised of two large islands, Upolu and Savaii, and eight smaller islands, five of which are uninhabited. Samoa has a population of 192,001 inhabitants (July 2010 est.), of which more than three-quarters live in Upolu.

The majority of the population are between the ages of 15 and 64 (56.7%); followed by 37.6 per cent in the 0-14 years of age bracket, and 5.7 per cent in the +64 and over group.

Samoa became independent from New Zealand's administered UN Trusteeship on 1 January 1962. Samoa has a parliamentary democracy with a unicameral legislative assembly (Fono). General elections are held every five years. The Human Rights Protection Party has been in power for an uninterrupted 28 years. Its legal system is based on English common law and local customs; judicial review of legislative acts with respect to fundamental rights of the citizen is ongoing, but has yet to accept compulsory International Court of Justice jurisdiction.

Traditionally, the country's economy has been dependent on agriculture and fishing; development aid and family remittances from overseas have increased their importance in more recent years. In 2009, Samoa's GDP was estimated at USD 584.4 million.⁶⁷ The service sector accounts for 75.3 per cent of it, thanks to the expanding tourism activity (25 per cent of GDP). The manufacturing sector (13.1 per cent of GDP) mainly processes agricultural products, but there is also some small-scale manufacturing, processing automotive components for export.

Samoa has successfully maintained its inflation low, a stable external debt and adequate foreign reserves. The flexibility of the country's labour market is considered an asset for economic progress. Economic priorities for the Samoan Government include fiscal discipline, attracting foreign investment and deregulating the financial sector.

The government has also given emphasis to the protection of the environment. Samoa is vulnerable to devastating natural disasters, such as hurricanes and tsunamis. In September 2009, an earthquake and the resulting tsunami severely damaged Samoa and nearby American Samoa, disrupting transportation and power generation, destroying some of its tourist infrastructure and resulting in about 200 deaths.

Progress towards LDC graduation

Samoa was one of the 25 countries recommended for inclusion when the UN General Assembly adopted the LDC category in 1971. Since then, the country had made significant progress towards LDC graduation, but this process has been interrupted several times by major natural disasters that have shocked its economy and damaged its infrastructure since the 1990s. Cyclones Ofa and Valerie hit the islands in 1990 and 1991, nearly destroying the whole economy and leaving Samoa financially crippled. These events were followed by an outbreak of a disease that affected the taro leaf crop, Samoa's main staple and largest agricultural export.

The assistance of donor countries and of Samoans all over the world helped the country on its road to recovery through the 1990s. More than ten years after the cyclones, and with the UN following the country's economic growth in the past years, it was decided that Samoa was ready to graduate from its LDC status in 2010. Donors hailed Samoa's economy as a model economy in the region. But the effects of the global financial crisis and the losses caused by the 2009 tsunami, estimated at USD 380 million, shocked the Samoan economy.⁶⁸ Estimating that this new set back would take another few years to recover from, the Samoan government requested the UN another extension on its LDC status, until the recovery is realized.

Connectivity now and then

Access

In 2002, there were only 2,378 mobile cellular subscribers, fixed lines stood at 11,000 and the number of Internet users reached only 3,600. The liberalisation of the mobile cellular telephony market in 2006 had a dramatic impact on service penetration. In 2002, only 1.5 per cent of the population were subscribed to mobile cellular service; by mid 2007, only 12 months after the new mobile operators entered the market, this number had increased to 46 per cent. Currently over half the population has mobile cellular service. The introduction of competition into the mobile service market was a direct result of the government institutional reform that unwound the monopoly, employing careful planning, consultations and a consensual approach as part of the reform. While there is not a competition law in Samoa, the issuance of licenses for the provision of mobile cellular services to more than two operators generated competition, enabling access to affordable mobile services from anywhere in the country.

Penetration was also encouraged by lower mobile calls charges. Competition has brought down the cost of calls from 1.9 per minute to a mere .35 sene per minute, with free net calls at certain times of the day. Similarly, the cost of international long distance calls dropped from over WST\$3 to less than a Tala. Competition has benefitted the population, even while the two operators continued fighting the interconnection rates, until the second appointed regulator resolved the dispute. Samoa's mobile prices are today among the cheapest in the region.

Internet access and usage is also on the rise, increasing the number of cyber cafes in urban areas since 2002. To promote connectivity in rural areas, 10 telecentres were established in small villages in 2005 using ITU funds, followed by two additional telecentres donated in 2006 by Via Technology of Taiwan, a solar powered telecentre, and the Pacific Island Chapter of the Internet Society (Pisoc). The introduction of telecentres in rural villages raised awareness about the Internet and its benefits for maintaining contact with relatives living overseas. In April 2009 Samoa launched its submarine cable, but information on the impact of this development on the number of broadband subscribers is not available.

ICT policy

The Government of Samoa established a National ICT Committee (NICT) in 2002 and since then, it has developed and implemented its national ICT strategy/policy. Samoa is currently reviewing the first policy and will develop a second one in the next five years, with the assistance of the ITU-EC project for the Pacific Island ACP member countries (ICB4PAC). The NICT committee is chaired by the Prime Minister himself and supported by a Secretariat provided by the Ministry of Communications and Information Technology (MCIT). In 2005, an ICT Secretariat was established as a semi autonomous body within the MCIT. The success achieved so far by the NICT committee is due to the existence of political will as well as to Samoa's ability to hire local resources who had experience working in the ICT sectors of New Zealand and Australia. In 2005, the Samoan Parliament passed the Telecommunication Act of 2005. The Act authorized the opening of the telecommunication sector to competition, which became effective in November 2006.

Universal access policies

Samoa started developing its Universal Access and Services (UAS) policy in 2009. While there is no specific legislation on universal access, Part 4 of the Telecommunications Act of 2005 deals with universal service. The Act provides for the establishment of a universal access policy by the Regulator, to be approved by the Minister. Once the universal access policy is established, the Minister may establish a Universal Access Fund, administered by the Regulator, to subsidise the net costs of providing universal access.

While mobile services currently cover 95 per cent of the territory, there are still remote areas not covered by the mobile operators. The UAS Policy, being drafted by the Office of the Regulator, will target currently underserved areas, providing guiding principles to ensure universal access to telecommunication services. The regulator is also expected to define the basic telecommunication services to be included in the universal access obligations, determine the cost of such obligations and set up provisions for the implementation of the UA Fund. Consistent with the Act and as amended, it is expected for all licensed providers to contribute to the UA Fund on a competitively neutral and market oriented basis, using a best practice that determines the requirements based on a certain levy on gross revenue per year.

The policy will also coordinate and harmonize new and existing ICT projects and use the UA Fund to achieve universal access by avoiding duplication of efforts, while addressing “market gaps with activities that would eventually become commercially viable and in the long term no longer require UA Fund support.” The draft UAS Policy underwent a consultation process during 2010 and is expected that the Samoa Cabinet will endorse it in early 2011.⁶⁹

Connectivity as a driver of socio-economic development

As part of Samoa’s National ICT policy, launched in March 2005, the government developed an eGovernment strategy, which has among its objectives ensuring that every government ministry and department, as well as state owned enterprises and corporations have a website. As part of the policy, the Education Department is currently implementing the Schoolnet project to ensure that every school in the country has Internet access. Furthermore, the One Laptop per child project and Rural Internet Community systems are being piloted in rural villages of the islands of Upolu and Savaii. Likewise, the Health Department and the Ministry of Environment are developing systems that will help with the implementation of electronic health records and climate change initiatives. Many businesses are now ordering their goods online using the Internet, while tourists can now make bookings online for most hotels.

Since 2007, Samoa has used ICT as an enabler of effective and efficient administrative processes. The Ministry of Finance, for instance, has introduced a government-wide financial management information system (FMIS), which the different ministries can access to post transactions and receive financial reports. Moreover, the Public Service Commission has added a Human Resource and Payroll module to complement the FMIS system used by the Ministry of Finance.

Currently, Samoa is negotiating a wide-ranging project for the implementation of an eGovernment system that will enable the achievement of government-to-government (G2G), government-to-business (G2B) and government-to-consumer (G2C) online services. It will not be long before the

people of Samoa can complete various forms online and send it to the relevant ministry by pressing a button.

Since launching and implementing the national ICT policy, the government has increased awareness among Samoan people on the benefits of ICTs. As a result, the demand for personal computers and laptops has increased, generating additional revenue to small companies dealing in software and hardware services and motivating the establishment of numerous privately owned cyber cafes that provide broadband services to local people and tourists.

In November 2009, Computer Services Limited (CSL), the largest Internet Service Provider and hardware retailer in Samoa introduced a deal whereby a customer could buy a laptop by paying a deposit and making monthly payments of WST\$160 per month for two years. As part of the deal, consumers could also get access to CSL's broadband services for free for 12 months. This offer proved so popular that the company ran out of laptops after only 3 months of introducing this deal. This initiative has helped many people afford a laptop and get access to broadband services. It is expected that after the free 12 months, customers will know the benefit of broadband access and will not mind paying for it. Now, SamoaTel and other ISPs are also offering the same promotion with cheaper options. It is only through competition that more and more people are now finding access to ICT affordable and the ability to access the Internet through Broadband free for 12 months.

Lessons and challenges

As the case of Samoa and other experiences around the world show, introducing competition and unwinding the monopolies can be achieved through an orderly consensual approach. The success of ICT development in Samoa is due in grand part to the political will of the government, which enabled the unwinding of the monopoly. Other contributing factors were the amendment of the old Post Office Act, and the participation of diverse stakeholders in the process through numerous consultations.

Kiribati

The Republic of Kiribati is composed of 32 atolls⁷⁰ and one raised coral island, dispersed over 3,500,000 square kilometres of the North Pacific Ocean. Approximately 50 per cent of Kiribati's 112,000 inhabitants live in South Tarawa, with an additional population centre in Kirimati (Christmas Island).

Progress towards LDC graduation

Kiribati joined the LDC list in 1986 and met the CDP's graduation thresholds for the first time in 2006. However, it has not been able to maintain the level of social and economic development required for an LDC to graduate. There are many challenges facing Kiribati, in particular, the tyranny of distance; its islands are scattered over 3.5 million square kilometres, yet less than one per cent of the country is land mass. Compared to its national GDP, estimated at USD 152 million in 2010, Kiribati's cost of living is very high.⁷¹ This disparity is caused by several factors, including the high costs of transportation and freight due to the great extension of its territorial area, the costs of adapting and mitigating climate change effects, and dependency on external qualified human, technical and policy resources. These factors make it unlikely for Kiribati to graduate from its current status any time soon. Yet, economic development is possible thanks to the inflow of technical

expertise and capital from UN agencies and other international organizations, willing to coordinate their work to help the country address the effects of climate change and development barriers.

Connectivity now and then

The provision and maintenance of telecommunications services in Kiribati is a challenging task. The large distances involved have limited most of the deployment of telecommunications infrastructure to the islands of Tarawa and Kirimati. The country's outer islands in particular are very isolated, connected only by infrequent shipping services. Not surprisingly, the development of telecommunications infrastructure is one of the objectives of the Kiribati National Development Plan (KDP) for the 2008-2011 period, which focuses on improving and expanding communications to the Outer Islands.

Kiribati's telecommunications sector is served by Telecom Services Kiribati Limited (TSKL), the incumbent operator, which provides fixed, mobile and international gateway services, and, in competition with Television Kiribati Limited (TKL), Internet services. The TSKL has developed also the DARMA system to connect the outer islands.

With the goal of opening the telecom sector to competition, in 2008 the government initiated negotiations with Digicel, a potential second mobile operator, but the negotiations broken off a year later. An interview with some senior government officials revealed concerns about the feasibility of having two mobile operators serving a country with a population of only tens of thousands of inhabitants. Opening the mobile sector to competition, as provided for in the Telecommunication Act of 2004, would benefit the people of Kiribati in terms of lower national and international call rates. After the recent elections of September 2010, there is hope that the new government will move ahead with the introduction of competition in the mobile telephony market by late 2011.

Kiribati's ICT penetration rates are low. According to ITU statistics, in 2009 Kiribati had a fixed line penetration rate of 4.14 per cent; its mobile penetration rate was 1.04 per cent, and Internet user penetration had only reached 2.07 per cent. While fixed connectivity growth has remained relatively flat since 2006, mobile cellular subscriptions for the 2005-2010 period showed a cumulative annual growth rate of 9 per cent, following trends of mobile adoption characteristic of other developing countries and LDCs. Similarly, the introduction of new services, such as VoIP, has improved the population's access to affordable, if not free, telecommunication services.

ICT policy

The Telecommunications Act of 2004 governs the provision of telecommunications services in Kiribati. This legislative framework establishes the bases for the efficient provision of telecommunications systems and services in a competitive environment, setting up licensing requirements and regulations for the interconnection of facilities. The Act also instituted the Telecommunications Authority of Kiribati (Authority hereafter) as an independent regulatory agency⁷² with a range of functions and powers, including granting licences for telecommunication systems and services; enforcing compliance with licensing conditions; promoting competition and facilitating market entry; and regulating interconnection, rates and charges levied by operators of telecommunication systems and services.⁷³ The Authority's decisions under the Act are final and conclusive on questions of fact, but aggrieved persons may appeal any of the Authority's decisions on matters of law to the High Court.

A general consensus among ministries and agencies on the importance of ICT led the Government of Kiribati to embark on the development of a national ICT policy. The government prepared a draft national ICT policy in 2005, opening the forum to consultations with key stakeholders in the sector, such as TSKL, the Attorney General's Chambers and other government departments. To improve the participation of civil society in the process, local communities, including those in the outer islands, were also consulted. The process of developing a national ICT policy for Kiribati has been faced with a number of challenges. At the forefront is the lack of internal financial resources and human resource capacity to carry out such a project successfully. These are barriers that the incumbent TSKL experiences also in implementing the 2004 Act. Due to these limitations, Kiribati has been unable to adopt the national ICT policy five years later, but steps are being made to assist Kiribati on these issues.

In response to a request for comprehensive assistance from the government of Kiribati, the World Bank has provided funds for a project to support the development of national ICT policies and strategies. The project, launched in April 2009, will assess the status and projected needs of Kiribati's ICT sector, examining both the infrastructure and the legal and regulatory environment. The project will also review the ICT law, develop model documents (i.e. tender documents, licenses, etc.) and propose an outer island ICT access plan. If necessary, Kiribati may also take advantage of the in-country assistance provided by ITU's ICB4PAC project to support the public consultation process for the national ICT policy.

Universal access policy

The Telecommunications Act of 2004 includes among its objectives the creation of a regulatory environment that will ensure universal service, defined in section 3(2) of the Act as the provision of basic telecommunication services, at affordable prices, to as many people as practicable in Kiribati. Section 16(2) of the Act authorizes the inclusion of universal service conditions in licences, such as requirements to provide service to disadvantaged persons and to rural or sparsely populated areas, as well as the payment of contributions by licensees towards any loss incurred by other operators in complying with universal service obligations.

Although Kiribati does not have a Universal Access policy per se, as part of its implementation of the Act, TSKL is promoting the roll out of mobile cellular services to the outer islands. To date, several government ministries and agencies have started the implementation of ICT projects in the absence of guidance from a national ICT policy or strategic plan for the sector. As a result, there is a risk that the absence of an overall ICT policy or plan may result in overlaps, inconsistencies or other inefficiencies in the adoption and development of ICTs in the country.

Lessons and challenges

The challenges facing Kiribati are common to other SIDS, mainly its geographical location, insufficient capital and the lack of skilled human resources to develop and implement ICT policies. Mustering political will and commitment from the country leadership is essential to address these issues. While there is a need for experts to help Kiribati build local capacity, there are also constraints on the capital available to implement and sustain initiatives identified in the draft national ICT policy. Access to loans and grants from developing partners and regional and international organizations

may be the only way for these small islands to move ahead and succeed in the deployment of ICT infrastructure.

Solomon Islands

Located in the South Pacific, the Solomon Islands is a country that consists of nearly one thousand islands. The distance between the westernmost and easternmost islands in the archipelago is about 1,500 kilometres. Most the population livelihood depends on agriculture, fishing and forestry, and manufactured goods and petroleum products must be imported. Similar to the case of Kiribati, the large distances between inhabited islands make it extremely difficult to deploy telecommunications infrastructure to connect its 510,000 population.

Progress towards LDC graduation

Socio-political instability in the Solomon Islands during the last decade makes it unlikely for the country to graduate from its LDC status in the near future. Riots occurring after the 2006 elections, with severe ethnic violence, forced many key businesses to close and emptied the government treasury, culminating in economic collapse. The Regional Assistance Mission to the Solomon Islands (RAMSI), a multinational police-centred force organized by Australia, arrived in the country in 2003 at the government's invitation to assist in restoring law and order and rebuilding the country's institutions. Since then, RAMSI has achieved modest economic growth. The opening of the telecommunication sector to competition is contributing also to the recovery process. The entry of a new service provider into the telecom market has improved employment and increased service affordability due to lower national and international call rates.

Connectivity now and then

Access

The country suffers from low penetration rates for fixed line, mobile cellular and Internet services. According to ITU statistics, in 2008, the Solomon Islands had a fixed line penetration rate of 1.57 per cent; its mobile cellular service penetration rate was 5.87 per cent and Internet user penetration reached only a 1.96 per cent rate. The broadband subscriber base was of approximately 1,500 users.

The telecommunications market in Solomon Islands was severely impacted by the period of political and economic instability between 2000 and 2005. During these years, many telecommunications facilities were destroyed or damaged and consequently many telecommunications projects and investments were placed on hold. The introduction of competition in the sector is expected to promote entry and bring necessary capital resources to the sector, thus improving access among the people of the Solomon Islands.

ICT policy

In February 2003, an ICT strategy-building workshop was held under the auspices of the UNDP e-Pacifika initiative as a first step towards the development of a national ICT policy and strategy for the country. The participation of a wide range of stakeholders in the workshop led to the identification and prioritisation of a broad list of ICT related development objectives. It also led to the creation of the Solomon Islands ICT Working Group with the purpose of advising the government on the development of a national ICT policy and strategy. The Minister of Planning endorsed the Terms of

Reference of the ICT Working Group in 2004 but the process did not continue because of other government priorities.

Despite the period of inactivity following the initial policy development effort, the Prime Minister's Office picked up the issue as a high priority objective in late 2010, and is driving the initiative. The Solomon Islands is currently re-looking at developing a national ICT policy framework with the assistance of the ITU ICB4PAC project - Capacity Building and ICT Policy, Regulation and Legislative Frameworks Support for Pacific Island Countries. The Director of ICT is liaising with other ministries to identify the way forward before they embark on developing this process. The draft policy and an implementation plan are expected to be released by August 2011.

In 2009, the new Telecommunication Act was passed to regulate the Solomon Islands' telecommunication sector. The Act repealed the previous Telecommunication Act and the Solomon Telekom (Limited Liability) Act, and established the Telecommunication Commission as an independent authority. Following the passage of the 2009 Act, the provision of telecommunications services was liberalised in April 2010 with the appointment of a new mobile entrant, Bee Mobile, a telecommunication company from Papua New Guinea that started operations in August 2010. A second mobile operator is expected to be licensed by mid 2011, to compete against the incumbent and Bee Mobile. So far, rate competition from Bee Mobile has motivated the former monopoly to adjust down its pricing structure.

Universal access policies

The new Telecommunications Commission is responsible for developing universal access policies. Part 4, Section 47(1)) of the 2009 Act requires the Commission to adopt a universal access plan (UAP) for telecommunications services that should be reviewed annually. To this end, the Commission has established a Universal Access Advisory Committee, chaired by the Commissioner, and integrated by a representative of the Ministry, service providers and others experts considered useful and appropriate.

The UAP will establish objectives for achieving universal access, including a definition of the services to be included under the access obligations and a method to select the providers such obligations will apply to. Based on the provisions of the Act, the UAP's definition of universal access shall require promoting the availability of fixed and mobile telephone services, emergency service with priority routing, disaster relief services, operator assistance service, and such other services as may reasonably be determined by the Commission.⁷⁴ The Act also establishes quality of service requirements under the UAP, including the continued provision of telecommunication services with reasonable quality and in a manner that minimises discrimination among users.

The regulator has stated that it is unlikely that the Commission will be able to develop the UAP before 2012 as interconnection and other issues resulting from the recent liberalisation of the mobile market are taking priority. In the mean time, the mobile operators have started providing service to remote communities and a tender for a third mobile operator license is expected to further promote the roll out of mobile phones services to other underserved rural areas in the country.

Lessons and challenges

Although the mobile market in the Solomon Islands just opened to competition in April 2010, access has improved already and the cost of mobile telephone calls has decreased by at least 40 per cent. For the first time, half of the country's population has access to communication services.

Tuvalu

Tuvalu is an archipelago consisting of nine islands, of which eight are inhabited. About a third of its 12,400 total inhabitants live on the island of Funafuti, its capital. Given its small population spread over eight islands, the deployment of ICT infrastructure has been challenging.

Progress towards LDC graduation

Tuvalu continues to be an LDC due to its overall socioeconomic development and the impact of climate change. The rising sea level is challenging the viability of the country to survive the next century. The country's environmental vulnerability has been discussed with many United Nations agencies and solutions are being proposed by various international bodies as well as neighbouring developed countries in the region. It is unlikely that Tuvalu will be able to graduate from the LDC status soon.

Connectivity Now and Then

Access

According to ITU statistics, in 2008 Tuvalu had a fixed line penetration rate of 15.17 per cent, a mobile penetration rate of 20.23 per cent and an Internet user penetration rate of 42.98 per cent. There were 400 broadband subscribers in the country. The number of Internet users, however, has seen a dramatic increase over the past few years. Services to the islands outside of the capital are mainly satellite-based.

The Tuvalu Telecommunications Corporation (TCC) is the sole provider of telecommunications services to the islands. TCC is currently in the process of deploying a 2.5G GSM mobile network, which should incite increased demand for mobile services in the future.

ICT policy

The Tuvalu Telecommunications Corporation was established under the Tuvalu Telecommunication Corporation Act 1993. Under the Act, the corporation has exclusive rights to install and provide all telecommunications services in Tuvalu. The Act also authorizes the Ministry to issue any regulations it deems necessary to give effect to the Act. To date, no regulations have been issued.

Encouraged by the regional focus on ICT development, Tuvalu started drafting a national ICT policy in 2003. After consultations with stakeholders, the initial draft, named "Information and Communication Technologies for every Tuvaluan Citizen", was prepared following guiding principles outlined in the Pacific Islands Information and Communication Technologies Policy and Strategic Plan (PIIPP). Yet, according to the Ministry of Communications, Transport and Tourism, the process stalled due to lack of resources and stakeholder commitment.

As part of its ICB4PAC project, the ITU is now assisting the Ministry of Communications, Transport and Tourism of Tuvalu in finalizing its national ICT policy and developing an UAS policy. The acting

Director of the Department of ICT is leading the effort, with additional assistance from the SOPAC secretariat working through the UN Asia-Pacific Centre for Information Communication Technology for Development (APCICT). The Secretariat of the Pacific Community is also assisting Tuvalu in the design and implementation of the national ICT policy as part of the Joint Country Strategy (2008 – 2012). The Secretariat will also support the development of relevant ICT legislation, including an Internet regulatory framework. The government has already held a stakeholder workshop and a draft policy has been submitted to the Ministry for approval.

Despite having the support of diverse regional organizations, it has taken Tuvalu nearly ten years to adopt a national ICT policy. This delay raises the issue of the lack of continuity and follow-up in the assistance provided by these organizations, so that it helps build internal capacity able to maintain the necessary momentum to move the policymaking process forward. Senior officials in Tuvalu, including the acting CEO for the Communication Division, have noted that the government needs experts to help it review the current national ICT policy draft, conduct public consultations, and move the policy forward for adoption. ITU has responded to this need by assisting during the public consultations process. Fundraising efforts are also taken place to ensure that Tuvalu is able to further develop its telecom infrastructure.

In June 2010, the Tuvaluan delegation to the ICT Ministerial meeting in Tonga encouraged the adoption of telecentres administered and run by women's groups in rural villages, following the model implemented in Samoa.

Universal access policy

Under Section 31 of the 1993 Act, the Tuvalu Telecommunications Corporation may request the government to create of subsidy grants, loans or to establish a subsidy scheme to develop, work and maintain “any telecommunication systems in the outer islands of Tuvalu and in areas where the provision of such service would be uneconomical; and defraying or contributing towards any expenses or losses incurred by the Corporation” in this regard.⁷⁵ Section 6(2) of the Act also provides that a licence may be granted to another operator to provide services outside the coverage area of the Corporation.

Lessons and challenges

The problems faced by Tuvalu in developing its national ICT policy emphasise the need for sustained capacity building efforts in the area of ICT policy and regulation. Continued assistance in this area would allow the country to finalize its national policy and develop the necessary capacity to implement it.

Vanuatu

Vanuatu is an archipelago consisting of approximately 82 relatively small islands. The country has a population of around 243,000 inhabitants. Vanuatu has an aggregate land area of 12,200 square kilometres.

Progress towards LDC graduation

Vanuatu continues to excel in developing its ICT sector to provide an environment conducive to economic growth. While there is no data available yet on the economic impact of the introduction of

competition in the telecommunications market, the people of Vanuatu are already reaping the benefits of lower mobile telephony rates both nationally and internationally. Lower telephone rates have reduced also the financial burden on the diaspora of receiving collect calls from relatives at home, resulting in increased remittances to Vanuatu.

The likelihood of Vanuatu's graduation from the LDC category will be improved should the country be accepted to join the WTO.

Connectivity now and then

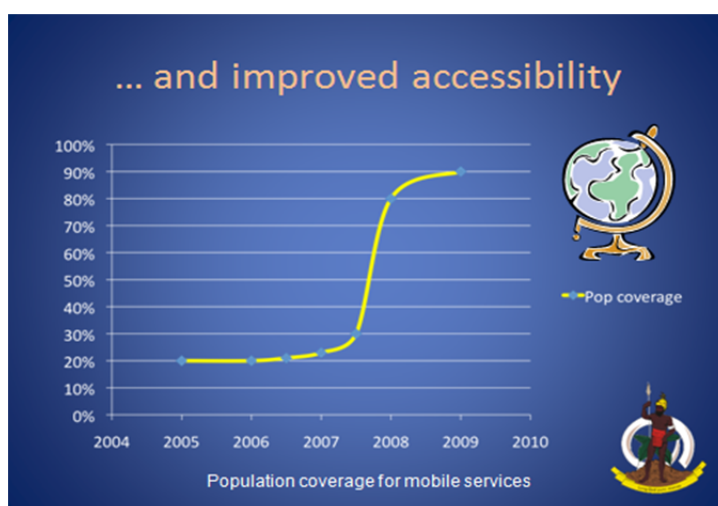
ICT adoption in Vanuatu is relatively low. Urban areas are well served by an advanced telecommunications network while rural areas remain underserved. According to ITU statistics, in 2008 Vanuatu had a fixed line penetration rate of 4.45 per cent, a mobile penetration rate of 15.39 per cent and an Internet user penetration rate of 7.27 per cent. There were around 200 broadband subscribers.

To a large extent, the adoption of ICT has been hindered by a combination of factors, such as the lack of supporting electrical infrastructure, large distances between rural population centres, limited ICT skilled manpower and, until recently, an inadequate telecommunication infrastructure.

Competition was introduced into the telecommunications sector in March 2008 when Digicel Pacific launched a GSM network. Telecom Vanuatu Ltd (TVL), the incumbent operator, provides a variety of services including fixed-line, mobile and Internet services. It also provides broadband services through both fixed-line ADSL and WiFi.

In 2009, the Telecommunication Regulator estimated a mobile penetration rate of 53 per cent and signal coverage of over 85 per cent of the population, as illustrated in Figure 5.6 below.

Figure 5.6: Increase in population coverage for mobile services in Vanuatu (2005-2009)



Source: Telecommunication Regulator, Vanuatu.⁷⁶

The rapid increase in the uptake of mobile telephony is expected to continue as mobile service operators install new towers in different parts of the main island and the outer islands. Moreover, mobile coverage is expected to grow another five per cent thanks to a government subsidy to be

awarded soon under the Universal Access Policy Fund. As has been the case in the other Pacific Islands that opened the sector to competition, rates for national and international mobile cellular phone calls have decreased in Vanuatu. Competition has sparked also an increase in the number of Internet Service Providers, improving Internet access.

ICT policy

In 2006, the Government of Vanuatu undertook a major reform of its infrastructure sector in collaboration with the World Bank. The reform program for the telecommunications sector included the development of new regulations, the establishment of an independent Utility Regulatory Authority, and the introduction of competition to the market.⁷⁷

A new telecommunications licensing policy was approved by the Council of Ministers in March 2009 and implemented later that year in anticipation of the new Telecommunication Act, with the issue of several new licenses for companies wishing to provide Internet services. In the telecommunications policy, the government recognised telecommunications infrastructure to be the foundation for the use of ICTs to create an Information Society. To that end, the policy sets out four guiding principles, which underpin its general objective of ensuring access to affordable and reliable telecommunication services: open and competitive markets; modern, independent and proportionate regulation; non-discrimination and technological neutrality; and optimal use of scarce resources. The government also sets out as part of its objectives the intention to become a member of the WTO.

Moreover, the policy sets out a statement of specific short, medium and long-term objectives. Key objectives include the review and promulgation of the new telecommunications legal and regulatory framework, creation of the Universal Access Policy Fund by 2009, and full liberalisation of service and infrastructure by 2011. These objectives have all been achieved, except for the ending of the mobile telephone duopoly, which is set down for March 2011. Key policy guidelines for the different aspects of regulation of the telecommunications sector (e.g. interconnection, infrastructure sharing, etc.) are also set out in the policy.

The adoption of the Telecommunications and Radiocommunications Act 2009 was a major achievement in terms of market reform principles. Effectively opening the telecommunications sector to competition, the Act includes provisions for licensing, universal-service policies and obligations, arbitration mechanisms, tariffs, consumer protection and competition policies. Pursuant to the Act, a number of regulations, policies and decisions have already been adopted or issued for consultation since its entry into force. They include the Universal Access Policy, the Telecommunications Licensing Regulations draft, the Radio Licensing Regulations draft and the National Radio Spectrum Plan.

With the support of the ITU-EC project for the Pacific Islands (ICB4PAC), Vanuatu will hold public consultations for its national ICT policy in 2011. An expert for this project has already started working on developing the Vanuatu National ICT Policy, together with an ICT Team in Vanuatu that includes the regulator, the Ministry of Communications and the Ministry of Finance. It is expected that the Vanuatu National ICT Policy will be adopted in early 2011.

Universal access policy

Vanuatu is the first country in the Pacific to adopt and implement its Universal Access Policy (UAP), with the appointment of the first contract in September 2010. While it is the Minister's role to "develop a policy for improving access to telecommunications service for locations which are not or not adequately served by existing services" (section 17(1)), it is the regulator who is responsible for developing the policy and implementing it on behalf of the minister. The policy must be approved by the Council of Ministers.

In developing the UAP, the minister is required to consult with the regulator, and hold consultations with interested parties. In June 2009, the Council of Ministers of the Government of Vanuatu announced its UAP by letter to the Telecommunications Regulator.⁷⁸ The regulator administers the UAP regime with relatively few restraints. The regulator, on behalf of the government, is to conclude contracts for the payment of subsidies in consideration of the provision of telecommunications services in accordance with the UAP. Funding of the UAP comes from donors and operator levies; as an exception, the first part of the implementation is using funding from AUSAID.

Once Vanuatu adopted its UAP in 2008, work began in its implementation. Regarding the application of the UAP Fund over the next two years, the government determined to subsidise the extension of mobile telephone services in areas where the two current mobile providers would not intend to provide service on a commercial basis. Accordingly, the government targeted as a priority the provision of service in seven communities in 2009 and three other locations in 2010. The tender process took 17 months from policy approval to contract signing. While the main criteria used in selecting the winning bid were the financial and operation capacity of the bidder, the process also took into consideration the soundness of the bidder's proposal regarding the allocation of subsidies per person and persons covered.

The UAP required the winning bidder to complete the work within eight months from the date the contract was signed. After a thorough evaluation of the bids, in September 2010 the regulator issued the contract to one operator with the minister's approval. Within a month, work in four areas was already completed. The speed of completion has raised concerns about the timing of the UAP tender and the designation of areas to be covered under the UAP, as it is possible that the operator had already planned to cover the areas included in the tender.

Connectivity as a driver of development

There is no doubt that connectivity is one of the key drivers for development. For Vanuatu, the roll out of mobile connectivity to its outer islands has increased from 20 per cent in 2005-2007 to 90 per cent since competition started in 2008. Increased connectivity facilitates business transactions throughout the country as well as social links among the population. As mentioned above, opening the mobile sector to competition has driven down the cost of telephone calls, improving service affordability.

Lessons and challenges

In light of the limitations of the initial effort to develop a national ICT policy, it will be important to maintain political momentum in the current effort by keeping ICT issues and the need for an overall national ICT policy in the public eye. Given the early stage of development and the increasing

amount of resources that will be demanded by the newly liberalised sector, it will be advisable to obtain sustained capacity building assistance for local ICT policy and regulatory staff.

Analysis of trends

Of the five Pacific Islands examined above, only Samoa had been recommended to graduate from the LDC status by 2009. Increased economic performance was facilitated by the liberalization of the Samoan telecommunication sector in 2006, which improved service penetration by over 80 per cent, boosted the development of ICT markets, including ISPs and software and hardware retailers, and enhanced social interaction with relatives overseas. However, the tsunami of 2009 that devastated the country led to the United Nations decision to postpone Samoa's graduation until 2014.

Tuvalu and Kiribati continue to lag behind Maldives, Samoa and Vanuatu in terms of penetration for fixed and mobile telephone services, as well as fixed and broadband Internet services and Internet users per 100 inhabitants, as depicted in Chart 5.6. A key difference between the islands is the fact that the mobile telephony market in Vanuatu and Samoa has been liberalized and opened to competition, while Tuvalu and Kiribati continue to operate this service under a monopoly regime. Charts 5.6 and 5.7 thus show the digital divide that exists even among LDCs in the Asian Pacific region facing similar challenges under their common condition as SIDS.

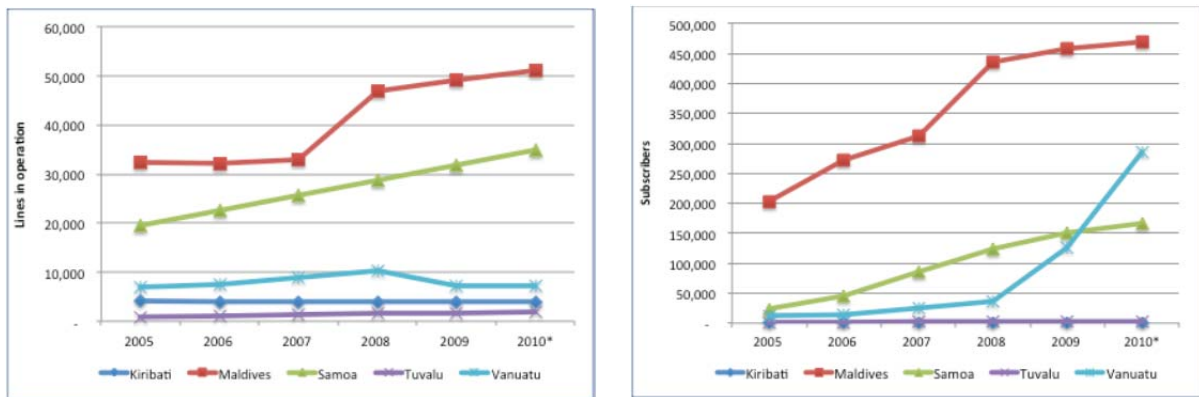
Following the path of Samoa, liberalization of the telecommunication market in Vanuatu and the implementation of its universal access policy have increased service penetration throughout the archipelago, providing strong signs of this country's development and progress towards graduation. In contrast, the many challenges facing Tuvalu, Kiribati and the Solomon Islands make it unlikely for them to graduate any time soon from the LDC status.

While the annual growth rate in the number of total fixed broadband Internet subscribers in Samoa since 2005 has been considerable (30.9 per cent), it pales before that of Maldives (44.7 per cent) and particularly of Vanuatu (90.9 per cent) for the same period. Chart 5.7 confirms the large gap with respect to broadband access and usage between the graduated Maldives and the Pacific Islands that continue under the LDC status.

In sum, the five LDC Pacific Island countries reviewed in this case study can be split into two groups, those that have liberalised their telecommunications sector and introduced enabling regulatory environments, and those that haven't. For the countries in the latter group, the single most important step they could take towards improving universal service would be to follow the example of Samoa and Maldives.

Liberalisation of the telecom sector would give rise to new market entry, stimulating competition, network coverage and penetration. Services currently accessible only in main urban areas would become available in rural and smaller cities. Universal access and service policies and projects would provide incentives for the provision of service where demand is insufficient to recover the cost of investment.

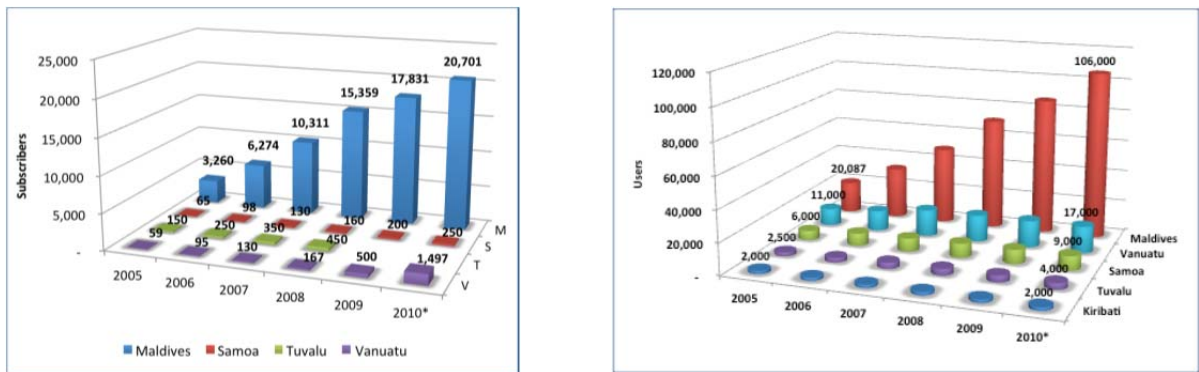
Chart 5.6: Main fixed telephone lines in operation and mobile cellular subscribers in selected Pacific Islands (2005-2010*)



* Estimates.

Source: ITU World Telecommunication/ICT Indicators database.

Chart 5.7: Comparison of total fixed broadband Internet subscribers and total Internet users for selected Pacific Islands (2005-2010*)



* Estimates.

Source: ITU World Telecommunication/ICT Indicators database.

The cases of the Pacific Islands also provide examples of good practices in establishing an enabling environment for the transparent implementation of universal access and service (UAS) projects. The adoption of national ICT policies and modern legislative frameworks, together with the establishment of an independent regulator to oversee the newly competitive sector, have played an important role in de-politicising universal service. These legislative frameworks have provided the basis for the creation of UAS funds, defining enforcement procedures and clear methods to allocate and fund the implementation of UAS obligations. Such frameworks have also been essential in helping bring about the necessary expertise to sort out issues that arise while administering UAS projects.

6 Missed understandings: How ICT might yet prompt change in development¹

‘Information and Communication Technologies’ and ‘Development’ are two domains of thought and practice. Each domain contains its own differences of opinion and each is understood and experienced in widely different ways, even by those who work within it. It is therefore not surprising that the domain seeking to bring these domains together, known as Information and Communication Technologies for Development (ICTD) or ICT4D, is riven with widely different assertions as to what needs to be done. Within these differences there may be some deep-seated conflicts of opinion or of interest, as is discussed in this chapter. However, these divergences may also relate to differences of understanding, of actual ignorance of other points of view and of approach, and consequently, of ignorance about some of the potential synergies between the many existing approaches.

The multitude of narratives as to what ICTD consists of and the competition and lack of understanding between them has led to confusion and an unbalanced approach to ICTD. The clamour of competing voices, the newness of many of the issues, and the speed of change have created problems for those developing policy, both with regard to technical infrastructure and regulation and still more, for guiding the previously little explored potential of the use of ICTs to promote sustainable development.

These problems have faced governments and policymakers across the world. Even the richest countries have experienced major difficulties in attempting to promote ‘e-inclusion’ across their own societies. Not surprisingly, it has proved still harder for policymakers in Least Developed Countries. Not only do they, by definition, have fewer technical and financial resources, but also they have been the recipients of conflicting advice, representing a range of not always explicit goals and interests placed within a confusing, contested and always changing discourse. First there was the ‘digital divide’, then the ‘information society’, subsequently various measures of ‘e-readiness’, each demanding attention and engagement and each seeming to offer, but seldom delivering, substantial additional donor support. Nor has the research community contributed as much as it could. There is a considerable body of writing that imagines various future scenarios of a world based on information, technology and/or knowledge. There is much product development work on how mobile phones or Internet platforms can be developed to deliver a particular purpose. There are many anecdotes, but examples of empirical work looking in detail at the informational changes in people’s lives, particularly in LDCs, are rare. Still rarer are examples of such empirical work having a strong influence on policy discussion.

One reason for the lack of clarity in this field, compared to more established development disciplines such as health or agriculture, is that the problem of harnessing the potential of ICTs to challenges of economic development and social cohesion exists everywhere. There is not a single country that can be sure of its ICT policies in their entirety. Furthermore, whilst many of the details of the challenges they face may be different, many of the dynamics of the processes of change and the issues faced as people try to use information in new ways are fairly universal. Thus, many of the issues discussed in this chapter, and the examples used to illustrate them, come from wherever they have been

researched and documented. What is particular to LCDs in this context, are not the issues themselves, but their scale and the range of options available for addressing them.

This chapter will attempt to bridge some of the mis-understandings within the ICTD domain by briefly describing and examining two significantly different approaches to ICTD. It will question whether one of the problems of the past decade is that various ICTD initiatives have been working towards different goals, without this fact being clearly recognised, or that the necessary discussions taking place about how work aimed at achieving one goal might either undermine or reinforce progress towards another. It will then look at the informational needs of the poorest and most marginalised communities, which, whilst existing everywhere, represent both a larger section of the population and a greater untapped potential for development in Least Developed Countries. In particular the chapter will consider the concept and nature of local “informational spaces” –that is, largely self-managed and autonomous, but overlapping, communities of interest– and consider their potential value to any approach to information and development that aims to support local processes of empowerment, innovation and change. It will also look at the uses of ICT within the development sector and at some of the influences, within the structure of the sector, which may be influencing the choices of what kinds of ICTD are supported. Finally, the chapter outlines some of the opportunities whereby the richness and complexity of the challenges of information and development could stimulate the necessary cutting edge innovations within the ICT field.

6.1 Development from outside: An exogenous approach to ICTD

One storyline of ICTD regards ICT as the essential technology of an increasingly fast paced and globalised economy. This approach is identified as the exogenous narrative because it comprises development from outside and it overshadows the endogenous narrative, described in more detail below.²

The exogenous narrative assumes that regions, countries or businesses will be unable to participate fully in the global economy unless they demonstrate competent use of ICTs. Without such participation, there will be little possibility of development. Implicitly, based on a large number of assumptions explored in more detail below, it assumes that the necessary technology already exists in the world, as does considerable experience of its use. Therefore, the development task is to encourage the acquisition and application of the technology, support training of its use and promote the type of regulatory changes, for example in import tariffs and telecoms legislation, which experience elsewhere may suggest is conducive to its adoption and use.

One feature of this approach is – despite various claims about ‘leapfrogging’ from economies based on primary extraction to knowledge societies – that it is based on traditional theories of modernisation, in which technologies are ‘transferred’ from ‘developed’ countries to less developed ones. Of course, as with previous transfers, such as steel production or vehicle manufacture, this process reshapes the industry concerned, in this case the ICT industry. Thus for certain regions, with advantages of one type or another, the continuing growth of the ICT industry itself creates considerable potential for economic development through opportunities in the production of hardware and software and the provision of support services.

ICTs, in this approach, require significant investment of a scale, which is accessible only to the private sector and governments. Large global corporations are the main suppliers of the infrastructure and the hardware and software required. Many of the applications used are designed to automate, reduce the costs and improve the efficiency of processes, which had previously been performed by different means. Typically these processes, and the work done to computerise them, have their origins in large organisations, public or private, with the economies of scale to justify investment in their automation. The attention to the detail of different needs as this technology has been adapted to the needs of small businesses or to the realities of developing countries has been variable. Often, however, it appears that the norm has been to adapt, as cheaply as possible, the type of information systems and other products originally designed for large organisations – governments and companies – in the global North, rather than to build new products based on a real analysis of local needs.

Supporting this approach is an argument that ICTD represents a series of “win-win” situations. For example, a project in which the Internet was going to enable a research institute in Europe to support local farmers in Ghana is presented simply as a mutually beneficial exchange of knowledge. The possibility that the European institute might end up gaining higher value knowledge than the farmers, or that it might use such knowledge to strategically reinforce its “expert” role at the expense of the local research institutes, which had been ignored in the process, did not appear to have crossed anyone’s mind. More significant, and more deliberate, has been the attitude of “more ICTD is good for everyone” to justify changes to international tariffs on telecommunications, intellectual property rights and the trade in services in a way which may or may not be beneficial on balance to developing countries and their economies, but which guarantee income streams and new legal protection to global business.³

This enthusiasm for ICT also underlies a number of development programmes and projects, with the assumptions underlying this approach being seen as normative. InfoDev, a global grant programme managed by the World Bank, for instance, *“helps developing countries and the international partners maximize the contribution and impact of the private sector through direct support for ICT-enabled innovation, new business and partnership models and toolkits.”*⁴ This, as many other development approaches, makes the assumption that ICTs – and a particular model of economic growth based on the private sector – are the answer.

Through this approach, some form of development takes place. ICTs are acquired and used; telecommunication infrastructures are improved and costs may decrease; connections to the outside world are made. However, the relative balance of advantage between ‘the developing’ or the ‘developed’ remains the same or even worsens, with the far from insignificant exception of those areas that are able to contribute directly to the growth of the ICT industry itself. This type of ICT investment does not allow countries to gain any significant competitive advantage. Generally speaking, countries in similar situations have similar statistics for ICT use, just as they may have also for energy consumption or quality of transport links. Indeed, as has been found in the past when other forms of sophisticated technology has been imported, ICT may be as much an additional cost as an opportunity when it comes to doing business with companies in more developed countries. For instance, early research on ICT usage in Senegalese companies found that the relative scarcity and cost of high quality technical support meant that firms were exposed to greater consequential loss from computer down time and computer security problems than firms in countries like France, with

a far greater pool of relevant technical and human resources.⁵ It would be interesting to know if this kind of problem persists and, if so, how widespread it is.

6.2 Development from the inside: An endogenous approach to ICTD

The endogenous approach is the antithesis to the exogenous approach because it comes from inside. It produces more complicated stories, concerned with the *“situated, internal and local nature of knowledge and meaning creation – in short, the endogeneity of the socio-economic processes of development, including the development of knowledge societies.”*⁶ This approach is based on an understanding that the most important changes related to ICT and their use are caused not by the technology, but by the new forms of informational behaviour they facilitate. These new behaviours enable new connections to be made, which may offer the potential of new value and transformative change to be created in the social, political, and cultural spheres, as well as in the economic.

This is the sort of process that Manuel Castells, in his ground breaking trilogy of *The Information Age*, calls the “Network Society” and Cees Hamelink, writing in the run up to the first World Summit on the Information Society, calls “informational developments”. These are taking place all over the world but, as an UNRISD workshop in the run up to the first global summit on the ‘Information Society’ (WSIS) concluded: *“it is a serious mistake to assume that they constitute a uniform process globally or share a common destination, rather than a variety of new processes each influencing and being influenced by the society in which they are taking place.”*⁷ Indeed Castell’s argument is that such developments do not even take place uniformly within a particular nation or society. Some groups within a society may change their informational behaviour and explore new connections and opportunities, whilst others do not.

Informational developments are based essentially on emergent properties, that is, new problems and opportunities that arise as, and out of, the changes taking place. This makes them inherently unpredictable. Even within the ICT industry, growth has arisen as much from unanticipated directions as from designed change. Microsoft, for example, built a dominant position in the market on the back of a demand for operating systems for personal computers, which the previously dominant company, IBM, had not foreseen. Microsoft itself was then taken by surprise by the growth and the significance of the World Wide Web. Subsequent innovations in search and social networking have led to new commercial giants, such as Google, Facebook or Tencent⁸ growing from nothing, whilst other seemingly strong contenders have faded away.

Such changes do not emerge only through commercial competition. Even SMS functions on mobile phones were envisaged originally as means of communicating with subscribers, rather than as services they might want to use.⁹ To the extent these developments have anything in common it is that they share an often unstable relationship between new users seeking new informational experiences, technology developers and the surrounding environment. Out of this instability have grown new models of social and commercial interaction as a function of developing this technology and, more importantly in terms of numbers, as a function of using it.

Another feature of this approach to innovation is that scale and, sometimes, profitability are secondary to the aim of finding a solution to the informational needs that present themselves. Tools, such as the Apache http Server, which runs almost 60 per cent of all web sites worldwide¹⁰ and is

developed as open source software by an open international community of developers, have been created because of their value to the developers (or to the financial supporters of the developers) as users, rather than as commercial products. The process involved may consist of vary large collaborations, inventing wholly new technology, or of small groups using 'bricolage', tinkering with or adapting existing technology until it meets their needs. It follows that, unlike the exogenous approach, which sees its main areas of application – such as accounts, data processing, and systems management – as being broadly similar wherever they are used, the endogenous approach may be applied to any informational challenge, of any scale, in any locality.

ICTD, therefore, in this approach is about finding solutions to the informational challenges faced in the process of development. There are two domains here: that of the societies in which development is taking place and that of all the organisations – donor governments, multilateral bodies, specialist institutes, non-governmental organisations (NGOs), ministries, local government – that aim to assist the process. The latter concerns the information and communications difficulties such organisations face as they seek the best mix of relevant information from a host of sources in order to develop ideas for development policy and practice. This is not an insignificant domain, especially in LDCs where international agencies and public bodies are together responsible for a significant proportion of the workforce and the tools that workforce uses, but is not the main focus of this chapter.

The core developmental challenge of ICTD is to encourage and support informational developments within the communities themselves. In this context, the term ICTD is in fact a misnomer. Instead, the process that should be being supported is one of societies building on their own informational resources to create 'informational spaces' or local 'information societies', which are meaningful to them and which allow them to engage in a more satisfying and productive manner with the outside world. This process may often involve the use of new technologies, but this use may not be the most important or innovative factor in the process. Indeed, this is one of the fundamental criticisms of much ICTD practice to date: the fixed perspective that development can be solved with ICT, when technology, or certainly technology by itself, may not be the answer. To illustrate this point, the number of printed manuals has decreased dramatically, as the possibilities offered by the Internet and new technologies for publication have tempted those publishing such materials to go online. As it is mentioned below with the case of international NGOs (iNGOs) in Kenya, putting publications on a website does not make them accessible to the communities to which iNGOs should be accountable.

6.3 Information, informational spaces and development

People need information in order to function. The lack of it, particularly the lack of information about issues that directly affect your own life, is profoundly disabling and alienating. Indeed, it has been suggested that finding out whether people in 'beneficiary communities' are or are not aware of information about projects designed to help them is the best and simplest method of evaluating the effectiveness of social development projects.¹¹ Indeed, such an analysis can also be applied to countries as a whole. LDCs, as states as well as their citizens, typically have fewer sources of information and fewer functioning links for the exchange of information than other countries.

The process of accessing and using information is one that can take place at many levels, involving a range of skills. Simply making information available does not make it accessible and usable to everyone. For example, in Bangalore, Southern India, information about land availability was made publicly available in a bid to help the poor as part of an eGovernment strategy, but was in fact accessed and used by middle class speculators at the expense of the poor.¹² For this reason, the notion of what Michael Gurstein calls “effective use” –that is, ensuring that recipients of information are able to make use of it– is vital.¹³

This notion has implications for policy and practice at several levels. The first involves the information providers doing their homework and making information available in a form and a language that will be accessible to the intended recipients. This is a massive issue for LDCs in that the majority of them are countries in which many languages are spoken and many have official languages that are not the first language of most of the population. Most development information, including that intended for dissemination to poor communities, is made available in English or one of the other recognised international languages, yet funds for translation and for adaptation of the information to fit local contexts are almost always in short supply. A second issue is that of format. LDCs are typically characterised by high levels of illiteracy. Information provided in written form is often of limited value and other channels, such as radio, therefore need to be used. ICTs, or the combination of ICTs with other media, can be effective both in creating more accessible channels and storing such information in ways where it can later be accessed on demand. Much information is of more value in the specific circumstances when it is needed, than it is when it is first read or listened to.

However, capacity for ‘effective use’ involves far more than a capacity to access information (see Box 6.1). Even in countries with a common language and high levels of literacy, such as the United Kingdom, there is much evidence that a combination of educational attainment, self-confidence and connections, mean that the middle classes are better able to find and to use the information on government services which is, officially, equally available to everyone. ICT may be ubiquitous but, as an assessment of women’s use of ICT in Mozambique concludes, ICTD cannot displace fundamental capabilities in the valuing and use of information: *“Literacy is key – without literacy there can be no empowerment, particularly for women and girls. We therefore strongly recommend the improvement of women’s literacy in rural areas. We believe that women’s literacy, combined with increased relevance of content, could result in computer-related ICT tools becoming an asset to women’s pursuit of the means for survival and for control of their lives.”*¹⁴

Thus investment in ICTD cannot be seen as an alternative to investment in literacy and in education more generally. The two are mutually complementary. However, it is widely recognised that developing universal education systems in LDCs, especially for the poorest communities, and particularly for women and girls, is a massive, long-term challenge. It is less recognised that although formal education is in all cases desirable, it is not the only route to building capacity for the effective use of information. What is required is a way of taking the vital step between seeing information as a commodity and seeing that same information as something that people feel capable of understanding enough to adapt and apply to their own circumstances. This is the step that makes information received into a factor for development and change.

Box 6.1: Moving towards digital inclusion in Mozambique

Mozambique launched a National IT Strategy in 2000. In 2009, it was reviewed by staff members of the University Eduardo Mondlane Informatics Centre, which itself has been an active force for ICTD in the country through its interest in both technological developments and involvement in research programmes at the level of community informatics. Their report, *Digital Inclusion in Mozambique: a challenge for all*,¹⁵ recognises the enormous progress made in the last ten years, but also highlights a lack of profound changes in attitude or in the use of ICTs to do things in new ways –in particular in relation to governance, to grass roots adoption, adaptation and use. The report uses the notion of digital inclusion as a means to analyse what has been done to date and to consider what needs doing in the future:

Digital inclusion is more than just making people “literate” in IT, placing computers in the communities and teaching them to use Windows and office software, though this is necessary too. The principal message we want to underline is therefore that making ICTs available is not enough to ensure that people have access; it is more important that ICTs are appropriated and used in a way that helps resolve daily concerns. Digital inclusion contributes to the socioeconomic development of society as a whole, and helps to reduce the division between rural and urban areas, by promoting equality of access to and use of information, education and learning, training, buying and selling goods and services, entertainment, intervening in the public domain, working and communicating more effectively. (p. vii)

The report’s conclusions reinforce the argument of this chapter that the fundamental issue is not that of technology but of the human and organisational issues surrounding its use:

In our view, the starting point for true digital inclusion would be three essential changes in attitudes and positions:

A modification in the government’s approach, to evolve towards a citizen-and service centred approach, beginning with a needs analysis: what are the needs, who for, how to produce solutions, where the services must be delivered and how they can be accessed.

The design of national strategies promoting increased levels of integration and collaboration among the various government actors and sectors, so that ministry or sectoral strategies not only ensure the internal mainstreaming of ICTs into their functioning and activities, but also ensure the mainstreaming and horizontal integration of strategy implementation as part of e-government: this will result in improved quality and quantity of the services supplied to citizens by government as a whole, the rational use and greater availability of resources, and the sharing/convergence/integration of channels for service provision.

Mechanisms to facilitate the proactive participation of citizens and their representatives in the governance of ICT policies and implementation, and at the same time the recognition by civil society organisations of their interests and responsibilities with regard to ICTs, and their leadership and advocacy role in the context of digital inclusion. (p. 49)

Formal education undoubtedly helps, but so can many other forms of human interaction. People need to be able to validate information and to think through if and how any of it may be useful to them. In this context, and whatever other mechanisms may be available to help the process, connections with other people are essential, not only as sources of information, but also as means of validation, reflection and action. This is true for everyone –from the fraternity clubs of elite US universities to networks of the most poor and marginalised. “Ki raflé du ki amul yeéré wayé moy ki amul nit”, as a Senegalese proverb has it, “the poor person is not the one without clothes but the one without anyone.”¹⁶

This point is central to any understanding of 'information poverty'. It is not simply a question of the lack of information, but the lack of the mechanisms to validate, adapt, respond to or use information, mechanisms that are essentially social processes. It could also be argued that this process is likely to be more powerful and effective if it is situated in a context where people and communities recognise and value their own capacity to guard and critically adapt their own traditional knowledge: To be producers of information as well as consumers. Such capacity to process and use information may be considered an essential capability that both individuals and social groups require to participate in processes such as development, as is discussed in Box 6.2 below.¹⁷

It can be suggested that, for any individual, this process of making sense of information takes place through belonging in one or several 'informational spaces'. The idea of informational spaces is of environments in which people are able not only to access relevant information through various means, but also to think through and articulate their own responses to what they hear, in the course of which they become information producers. The characteristics of an informational space will vary significantly depending on who occupies it; its thematic or social purpose; the physical distance between the participants; and the means they use to communicate with each other. Informational spaces include formal efforts to support development, such as the Community Information Resource Centres, discussed in Box 6.2, but they may be less formal spin-offs of other social interactions, like participation in faith groups or sporting activities. They may involve face-to face interaction or long distance communications.

Box 6.2: Linking knowledge to development, an interactive social process

The Horn of Africa Capacity Building Programme provides an example of how a development organisation can support a process of community validation of knowledge from multiple sources and link that knowledge to the development challenges facing the community. The Programme –run by Oxfam Canada, with the support of the Canadian International Development Agency (CIDA)– seeks to support a number of Community Information Centres in rural parts of Ethiopia. It made extensive use of ICTs, but its main aim was to support new informational behaviours that would lead to development. It also put great store in including local information and perspectives in the process in which external information was received and considered. The experience, and reflection on it, was written up in the book *Sharing Knowledge for Community Development and Transformation: A Handbook*, by the Tanzanian information specialist Professor Kingo Mchombu. These extracts suggest the theory of information and knowledge use that underlay the programme, and provide an example of how it can be translated into a development oriented discussion.

.../...

Box 6.2 (continued)

Scholars define information as a set of data, facts, and figures that have been processed in such a way that they become meaningful. They make sense. When information is applied to doing something and is globally applicable, it is said to have become knowledge. These definitions serve a useful purpose, when we consider information and knowledge from the point of view of formal education. Teachers ask school children to master a fixed body of knowledge, in order to pass examinations.

“Such definitions, however, have one major weakness. They indicate the self-evident nature of information and knowledge, based on an expert source. This process does not allow the community to tell its own stories and to arrive at its own sense of what is meant by a set of figures, facts and data. In discussing information and knowledge, it is useful to start by observing that both are human creations (or social constructs). They are designed to explain and meet some of the challenges that individuals or groups face at a particular time and place. No one fully can understand the meaning of knowledge and information without recognizing that they can be a double-edged sword. They can be used to empower the individual or the group. They can also be used to continue relations of power and control. When a ruling group uses information and knowledge to dominate or control people, those people are led to despair, powerlessness, and unsustainable lifestyles.

As human creations, people naturally use information and knowledge to organize their view of history and culture. These elements are grounded in their world view. When Community Information Resource Centres (CIRCs) become a tool for human development, community users of information are urged to cultivate and adopt a critical attitude towards the information.

By questioning the information source, they may evaluate, analyse and adapt information and knowledge to their own material, political and social conditions. This regular process of questioning forms the basis for changing and transforming the community. In other words, the development of knowledge becomes a process. In this case, the definition of knowledge as a process of questioning and reflection is different from knowledge as the finished product, ready to be taught, used and applied globally or in any situation. To become critical users of information and knowledge, community members will want to analyse critically both the knowledge that comes from outside the community, and their own inherited knowledge. The community will want to study, for example, how cultural and elitist definitions of gender, race, tribe, class, and poverty are developed as both historical and social constructs. In most cases, these definitions should be questioned and evaluated, so that citizens can add value to achieve more transformative knowledge and information for the community.”

“The community development process itself creates a large part of the information content needed by the community. Problem identification and learning (knowledge processing) are linked. Together they make up one process. This process is most effective, if it is a group effort rather than an individual undertaking. For example, some community members may discuss HIV/AIDS and how it is affecting everyone in their community. The discussion may raise the challenges of getting more accurate information about this disease and how it spreads, in order to counter rumours and superstitious explanations.

.../...

Box 6.2 (end)

After the information is gathered from different sources and shared by the group, the next step may include a programme of activities to fight against the spread of HIV/AIDS in the community. In the course of these activities, the community may learn more. For example, they may discover that the lack of financial security for young women leads them into sexually risky behaviour. This finding would lead to the need for further information gathering. In this case, the need for information on alternative economic activities for young women might lead to information seeking on micro-credit schemes, training opportunities, and empowerment programmes for women.

After this second round of action, people may identify the role of alcoholism in the community as the next line of attack. The community may see the need to be more informed on the harmful effects of alcohol and substance abuse on the human body. This will then be identified as the key information need, along with the role alcohol plays in the spread of the HIV/AIDS pandemic.

The community must identify and discuss their development problems, so that they express the need for further information. Then the group sets up an action programme. This linking of information needs with development activities allows the community to process and add value to the information and knowledge collected from different sources. The CIRC will be made up of information content coming from two sources: internal sources within the community and external sources, such as books, newspapers, audio-visual materials, the Internet, and the advice of health and extension workers.”

Source: Mchombu, K. (2004). Sharing knowledge for community development and transformation: a handbook. Oxfam, Canada. pp. 14 and 33. Downloaded on 18 December 2010 from www.oxfam.ca/news-and-publications/publications-and-reports/sharing-knowledge-handbook-2/.

All functioning spaces, however, are based on a shared understanding of an appropriate level of trust, safety and belonging. They will have tacit or explicit rules to govern their purpose, determine who is entitled to occupy the space, and the types of relationships and communications acceptable within the group. Whatever the rules or conventions, if these and the related trust break down, the space will cease to be effective. The details of these rules will depend on the purpose of the space and the culture of the people who occupy it. For instance, a space designed to be of value to victims of domestic violence as they attempt to rebuild their lives will probably have much stricter rules but allow much greater intimacy of communication than one set up for market traders to exchange commercial information. These rules or conventions will also probably include understandings of what types of external information is welcome, who is entitled to publish such information and through what forms of mediation. For example, an e-mail based discussion community may exclude any advertising or even attempts by members to sell services.

Most people live in a range of overlapping informational spaces, some geared to family matters and social obligations, others related to work and income, some perhaps related to politics and governance and to faith. To return to the Senegalese proverb, the more such spaces in which an individual is able to participate, the wealthier they are in terms of information.

For individuals in Least Developed Countries, some of the developmental advantages such participation can bring include:

- **Maintaining family or community connections at a time of mass migrations both within countries and beyond borders:** In Senegal, for example, audio-visual recordings of important events, such as weddings, are made and sent to former members of the village.¹⁸ More precise information about needs can be communicated with the result that remittances from émigrés can gain added value by arriving in the form of needed car parts, rather than in cash. The new communication environment has unplanned consequences in terms of social relations –new relationships blossom as the videos are watched in émigré communities. Back home, the fact that women may be entrusted as safer guardians of the new technology can strengthen their roles within the village information space.
- **Sharing knowledge:** The Arid Lands Information Network (ALIN) in sub-Saharan Africa (subsequently East Africa), supported its members, predominantly village level development workers, to network with each other to exchange news and views. This included exchanging their experience of trying to implement new ideas or techniques, which may have been promoted by one development initiative or another. Although subsequently (and currently) a pioneer of ICT use, ALIN originally used the national postal services to support its networking initiative. Interesting or more generally relevant findings from these efforts were published in the *Baobab*, a well-illustrated bilingual journal. The value of this initiative came foremost from the exchange of information within a community; the means used to accomplish this were, and should be secondary.
- **Enabling reflection and action:** People need not only to make sense of their situation, but also to think through what actions they may take to improve it. As the relatively powerless challenge existing power relations that prevent their development, such actions can sometimes prove disastrously and violently counter-productive. There is a need to proceed with great care, as evidenced in one piece of work developed by the Anandi organisation in rural Gujarat, in India.¹⁹ In this very poor and remote area, the stigmatisation of some women within the community as witches was perceived as undermining community solidarity and as a way of disempowering and controlling women. A group of members first wrote a play designed to demonstrate the issues involved and to stimulate discussion on what to do about them. The play was performed several times and each time discussed with the audience. Eventually the group was satisfied with their work and the final version was filmed and made available as a DVD. Even then, the play was not intended as any form of final product, but as the introduction to a discussion within the community, which it was hoped would lead to change.
- **Accountability and governance:** Having information about what is going on –or supposed to be going on in your immediate environment– is a precondition for any form of social participation and action. Beyond that, the conversations that take place within both local and thematic informational spaces can be an important way of holding authority to account and generate new information, which can help government –at whatever level– understand needs and plan services. The extent to which there is productive exchange between local informational spaces and government depends on a number of political, technical and process factors, all of which require attention for this conversation to work. The core issue is the nature of the relationships between government and citizens, and the quality and focus

of the information exchanges which take place. That said, the functional and communicative possibilities of ICT create opportunities for levels of responsiveness and effectiveness in government that did not exist previously. Whilst its ultimate impact on political processes is debatable, social media undoubtedly creates new opportunities for news and opinion to enter the public domain. For example, a study of digital activism in the media-controlled environments of the Middle East established that activism networks enable the negotiation of power and decrease isolation but, at the same time, the activists become more visible to repressive powers.²⁰

- **Accessing information:** Among many other purposes and roles, the function of informational spaces as points of access for information people can use –usually after discussions of how and why within the space– remains very important. Typically, this information relates to prices, economic opportunities, the time, location and availability of services or technical information of potential value to people's lives. How this is communicated, and especially the extent to which this allows local users of information to reflect on and communicate their information needs to potential providers, can greatly enhance the value of this role, as can the capacity, in practice very variable, of providers to listen to and respond to these needs.
- **Empowering people:** Ultimately, informational spaces are those in which people feel safe and confident to develop their ideas and their capacity to understand and to act. Whilst they may be highly informal, their creation and existence may also help negotiate new opportunities for participation that did not previously exist. For instance one study, looking at stimulating the social and economic development of poor women in Egypt, described one informational space as 'a place of learning', created by local NGO, which was *"a fusion between the domestic and the public sphere where women are exposed to education and paid work and their awareness of being able to shape their lives according to their aspirations is raised, while circumventing what would be deemed outright challenges to societal conventions."*²¹

It is not, for one moment, being suggested that creating or supporting such informational spaces is easy or that all communication within them takes place in an atmosphere of equity and trust. Much is correctly made of the ubiquity of the mobile phone in the developing world and the many ways it enables people to access and exchange information, often avoiding the time and cost of wasted travel in the process. However, there is also evidence that these potential gains do not automatically assist everyone equally. For example, as more and more essential communication takes place through mobile phones, so the risks of social exclusion rise. Very poor families in South Africa, for instance, can spend up to 20 per cent of their income on mobile telephony because they do not want to be excluded from their own family networks. In many places men will have first call on the family's mobile phone or on the money that could be used for communication. Even in women only networks, there can be substantial imbalances between who can afford to make calls or write texts and who cannot, even to the extent, where recipients also pay charges, of making continued membership of the network financially prohibitive to poor women.²² Such imbalances in who can fully participate in these new organisational forms inevitably affect their developmental function and value.

6.4 Some issues of ICT and the Development Sector

Although the most important aspect of ICTD is the extent to which it contributes to the development of local societies as a whole, the use of ICT within the development sector itself is far from insignificant. Virtually all development organisations at all levels use ICT to some extent. For many people, the use of ICT within the local offices of community organisations or NGOs will be their first exposure to such tools. In some countries, especially in LDCs, the usage of ICT by international and local development organisations will represent a significant part of the overall usage of and market demand for ICT within the country. Internationally, the investment in ICT by development organisations over the past twenty years could be estimated in the hundreds of millions of dollars. It is therefore very unfortunate that, in many cases, the areas where or ways in which these investments have been made address the immediate needs of the development organisation itself, rather than any longer term strategy linking those needs to broader developmental goals.

The cumulative impact of the failure to make these links is a lack of open source software modules, capable of adaptation and re-use by LDCs; the development of management information systems that prioritise central control over participatory approaches; and an information environment which, in terms of ease of publication and search, privileges voices from richer countries over those from LDCs. As has already been noted, the same period has also seen a lessening of investment in off-line information resources, resulting in fewer guides and manuals available in this format to development practitioners than there were 30 years ago.

Considering the informational developments achieved within the sector over this period, it could be concluded that these investments have contributed to making the information rich even richer and more powerful in relation to those they allegedly exist to help. Often, deployment of ICT within the sector apes other development communication initiatives by seeing communication as a one-way process between ‘those who know’ and those who don’t.

By failing to look for, learn from and acknowledge innovation in marginalised communities, in LDCs and elsewhere, the sector actively inhibits their contribution to finding solutions to either local or more general challenges facing development. This is not to argue that there is not much exogenous information, and ICT practice, that, if made available to people in an appropriate ways, can be extremely useful for them. However, knowing what information in which format would be most valued and used by any particular user group greatly enhances the value of the process; this involves listening, as well as telling. Such listening can also enable agencies to learn about the dynamics of local informational spaces and how they can be strengthened. Instead, a number of agencies participate in ICTD research projects to see how new devices, typically mobile phones, can be configured in ways that privilege the communication of ‘their’ development information, sometimes to the detriment of local choice. Aside from the ethical issues raised by prioritising their mission over the empowerment of local communities, such approaches risk becoming entirely ineffective by failing to recognise and engage with local informational dynamics.

Even where development agencies fund information work that offers local people a ‘voice’, there can be issues of editorial control in which voices are then selected and promoted through further dissemination or of whether the voices are then even listened to. Several studies²³ have found that NGOs make very little use at the national and international level of information generated by

participatory methodologies, which they themselves had adopted in their work with local communities. Furthermore, a Kenyan study commissioned by the Information and Knowledge Management (IKM) Emergent Research Programme showed that a combination of lack of document management and lack of support for channels of communication accessible to local people meant that this information was often not even accessible to the communities which had helped to produce it.

6.5 Policy issues for LDCs

ICTD, in fact like any ICT strategy for any domain in the current era, is often presented as a simple choice between whether to introduce new technologies or not, with the implication that the answer is obvious. What is hidden by such a simplistic formulation is the fact that there are a number of very significant choices to be made with regards to what technologies to adopt, how to do so and, in particular, how to link them to other aspects of national strategies for development.

All countries are facing these choices and, as argued above, all find them problematic. However the context in which the choices are made, and therefore the options that are realistically available, will differ significantly from place to place, including between individual LDCs. Nonetheless, LDCs are likely to find certain similarities between the situations in which they find themselves. Some of the internal characteristics they share –lack of resources, low educational attainment and levels of literacy, and multiple languages– have already been mentioned. Others may relate to a dependence on external sources of funding for new initiatives, which may, in turn, be dependent on following external advice that may not be disinterested. The relative size and influence of international development organisations of all types –as employers, as trainers and as development actors within their societies– may also be an issue. This is not intended as a general critique of the work of such organisations, only as a recognition that their own somewhat unimaginative use of ICTs and their own planning norms can influence the way in which new ideas –and requests to fund them– are received.

As policymakers in LDCs respond to the choices they face, they will need to consider a number of issues that influence ICTD policy and practice. The first is simple self-interest. Mansell argues that *“the exogenous model (and indeed some versions of the endogenous model), cloaks the interests of investors in the global ‘North’ whose principal ambition is profits from the sale of digital technologies and the content that is hosted on or circulated through them.”*²⁴ Beyond the realm of strategic interests, there can be practical dynamics, which means that buying ‘solutions’ from well known global companies is, in some sense, ‘safer’. In fact, the history of decisions on large ICT programmes in general is pretty undistinguished. Globally, in both business and government, there is repeated evidence of senior management lacking the knowledge or training to make informed investment decisions with disastrous results.

The tension caused by this process, inevitably favours those suppliers which, because of their size and international reputation, are believed to know what they are talking about, an advantage which such suppliers are, of course, unlikely to fail to promote. In the 1990s there was a US saying ‘no-one ever got fired for buying IBM’. This attitude persists and applies even to the types of ICT investment in which these large companies have no special knowledge, such as the needs, operating environments and informational dynamics of LDCs.

A more theoretical issue is that of relative advantage. Nearly all visions of 'development' see it as a process in which the gaps between the richest and poorest countries and communities in this world narrow. This implies that areas of relative advantage need to be found in which the poor can in some way progress further or faster than the rich. This is something that, historically, has tended to happen through combinations of political will and technical innovation. For most countries, what these areas of relative advantage consist of in relation to ICTD are still to be explored. What is clear though is that the current exogenous approach to ICTD appears to have abandoned any pretence of relative advantage, other than in those few if significant places where manufacturing, software or support capacities were readily adaptable. Thus, the institutions promoting ICT use are also undertaking e-readiness rankings that gauge the extent that a country has the ability to use ICTs to develop its economy. The logic behind this is that "[m]ore devices mean more access to the Internet, and all its productivity-enhancing benefits."²⁵ Within the rankings, which only cover the 'top' 70 countries, the developing world figures marginally and LDCs not at all. In the Wikipedia representation of the EIU data²⁶ most of Africa is grey, representing 'no data'. So ICTD is encouraging investment in ICTs for development in circumstances of e-readiness that are not conducive to their success, as identified by the proponents of the importance of ICT to economic growth. The process, originally promoted as leapfrogging, has once again been reduced to trying to catch up to others from a position of competitive disadvantage. The real challenge for LDCs is whether there are alternatives to participating in a fixed game of 'catch up' to be found through the creative development of information exchanges already taking place within their societies.²⁷

Seeking alternatives also means questioning some of the assumptions behind approaches to ICTD. Because so much of global economic growth in recent decades has taken place within the ICT industry, there is an assumption that ICTs represent some easy step to economic growth and to underestimate their wider social and cultural potential. Thus many ICTD initiatives are expected to become rapidly self-sustaining and profitable. Many do. However, just like public libraries which aim to provide knowledge to a community at a social cost in order to better enable the productive lives of their users, so ICTD initiatives can be judged by criteria of social value, of enabling value rather than the criteria of profitable enterprise. This is an argument that, for example, particularly applies to telecentres. Are they a social service or a local business opportunity? What use is being made of them? The best answer will vary case by case, but in some cases the potential developmental value of one approach will certainly outweigh the opportunities for an immediate profit.

There are also opportunities to manage support for local information initiatives in a more strategic manner. Many development organisations have remits for work, and related development communications, which are limited to specific fields or issues. Globally, organisations struggle to support networks and resource centres to work on specific issues such as HIV, disability, agriculture, water and sanitation. All struggle to fund the information and communication work they wish to see. The idea of inverting the picture so that local information capacity is developed to take in, use and feed back on all these issues simultaneously, whilst saving on costs, is not new but is an opportunity for both greater efficiency and greater local control, which has, as yet, been little exploited.

Another area for reflection concerns the role of agency. There have long been debates –influenced as much by politics and professional role as by dispassionate reflection– about whether development is something that is 'done' to, with or by the people who it is supposed to benefit. It is perhaps not surprising that a top-down approach has predominated, given the somewhat

technocratic bias of many involved with ICT and their institutions. The technical bureaucratic aspects of eGovernment, for example, may also have appeared less politically risky than the more interactive ones. However these biases are unfortunate and short sighted. As described above, much of the most innovative and profitable development of ICT in both the 'developed' and developing worlds has been endogenous in nature, with local users interacting with suppliers to explore new potential uses of technology and innovating.

Likewise, ICTD enables a potential for new conversations between governments and citizens that go far beyond improvement in bureaucratic systems, but this potential has seldom been tapped. For instance, Mozambique and Rwanda, both countries with a strong record of government commitment to development, have both developed national ICT strategies in recent years, with considerable external advice. Both strategies start with the computerisation of certain ministries in the capital cities, with subsequent top-down rollout to provincial and local level. So far, so good. However, it is not clear if or how a process which supports the administrative functions of governments can or will interact with the quite considerable experimentation with ICTs at local level, by both government agencies and civil society, in both countries. There are real risks that informational spaces, created by top down strategies, will be shaped by the bureaucratic requirements of the ministries concerned and will not therefore work well as spaces for peer-to-peer discussion or bottom up communication. Unless such interaction is stated as a strategic goal at the outset and specific measures taken to accommodate it, such strategies may not only miss the opportunity for governments to learn more about what is actually happening at local level in their own countries and to improve their conversations with all sections of their own populations, but threaten to distort the informational landscape for the future. At a time when there is an almost universal consensus (in the theory if not in the details) that better governance is a precondition of more effective development, the failure to distinguish between eGovernance and eGovernment is alarming, not least as it threatens to repeat itself in the emerging debates about open government data.

This chapter has contrasted an exogenous approach to ICTD with an endogenous one. There are many variants of each and there is no argument here that national policy should consist entirely of one approach or another. It is, however, very noticeable that, over the last twenty years, there has been considerably more prominence given to the exogenous model in general ICTD discourse. It is also the case that in privileging the exogenous, governments and their international advisers have given little thought to the impact of their policies on endogenous initiatives. The two do not have to be incompatible, but thought is needed as to how to make them support each other.

Finally, there is the issue of decision-making processes. The fear of making mistakes in ICT investment, mentioned above, combines with increasing aversion to risk within the development sector, an aversion that extends to the assessment of the programmes it may fund. In recent years, the sector has sought to protect and increase its large public budgets by providing ever-stronger assurances as to the certainty that development funding will have its desired impact. Planning and management tools have been developed in the attempt to ensure the promised outcomes by exercising maximum control over the process. Recent arguments have challenged this approach, arguing that it is based on wholly unrealistic assumptions of predictability and on an unwelcome hostility to the possible benefits of change inspired by participation, in-programme learning and other emergent factors.²⁸ However, with donors often demanding quantifiable results, it is not

surprising that the apparently certain benefits of assorted hardware investments seem more attractive to development planners than the construction of uncertain processes by the little known actors in endogenous processes. This is a fundamental policy issue that LDCs need to negotiate with donors.

By definition, their policies and investments are taking place in a higher risk environment than similar actions in better-resourced countries. In particular, the outcome of support for informational processes amongst marginalised or poor communities will always be unpredictable. Some have been and will be inspirational. Some will generate some value. Others will fail. In this, they are no worse than programmes that simply provide computers or some other hardware, which may never be used for the purpose intended. But what can be most easily counted is too often preferred over that which offers more scope for development.

However, these assorted biases do not in themselves constitute an argument against all exogenous ICTD approaches. There are strong arguments for some global standards or norms relating to travel, health and, why not, ICT that allow a level of international inter-operability. Whilst there may be heated debates about how it has been done and who has most benefited along the way, there need be no argument about the vision of ICTD, which seeks to help countries and organisations attain these standards. However, there is also no reason such a vision need be, in any way, incompatible with other approaches. Indeed it is unclear if any real debate between the two approaches has taken place.²⁹ Nonetheless, there is a highly unbalanced outcome where the biases described above have ensured that exogenous approaches have been prioritised, whilst support for endogenous approaches has been inconsistent, lacklustre and feeble. As importantly, lessons from endogenous experience are poorly documented and seldom listened to or learnt from by those making the decisions. This, particularly for LDCs, could be a serious mistake as it excludes their most likely sources of innovation and of relative advantage. By concentrating so much on integration into the global economy, the exogenous approach ignores the potential contribution of ICTD to local economic exchanges as well as to the social, political and cultural domains. By insisting on the top-down to the exclusion of the bottom-up or the middle-out it proposes to exclude people from agency in the process of their own development. This is not just profoundly undemocratic. From any developmental perspective, it guarantees failure.

6.6 Some challenges ahead

This chapter proposes not simply more balanced policy and funding arrangements, with much greater and more sustainable support for endogenous approaches, but a continuing research interest in learning from that experience and elaborating more creative ideas for future development as a result. If this happens well, we will not only see the imaginative and creative adaptations of existing technologies, as we have seen with the mobile phone, but may also see a demand for some very cutting edge technology, a demand which may well keep software developers on their toes for years to come.

What this will consist of is beyond the capacity of this chapter to imagine, but some immediate challenges can be foreseen. As much to the point is how such work is carried out.

In this context, it is illuminating to consider the experience of the University of Cape Town in designing computer technology for local communities. According to Gary Marsden, professor of computer science at this university, 'they always got it wrong.'³⁰ Instead, they developed an approach that identified intermediaries able to 'translate' between the perceptions and ideas of computer scientists and the needs and practices of the communities. Thus, a coming together of knowledge from user-centred development and human-computer interaction streams of the ICT world, with long established methods for participatory development work, is likely to be a precondition of effective and locally accountable ICTD.

In thinking of informational spaces, we think of creating spaces of trust and safety, where the most marginalised and exploited can start to work with information and use it to their advantage. We also think of how to make such spaces more powerful by creating overlaps with other informational spaces, including perhaps those inhabited by those who have previously been seen as hostile to them. Here we are discussing the principally social issues of the rights, privacy and trust necessary if these spaces are to work. However, if these social issues can be resolved, there will be many technical challenges in building information architecture in which overlapping informational spaces can be linked, can access what they need, and can share what they want to. Here, as we try to link information across languages, skill sets, gender and social class, we will address some of the fundamental challenges of building a semantic web.

The textbooks already talk of dynamic and heterogeneous ontologies. Development workers – and their technical colleagues – face them in their daily life. Wallack and Srinivasan, for example, describe attempts to reconcile mismatched ontologies and development information systems by looking at evidence about water logging in the Karnataka state of India. According to the authors, *"[b]us stop conversations about water logging, and reported complaints about pipes and drains refer to the same occurrence. Yet the community understands of the situation and the Karnataka government record of the event label, catalogue and interpret the event in divergent manners."* This, they argue, *"illustrates a key aspect of the digital divide, as mismatched ontology impeded the community's ability to impart information as well as the State's ability to understand the state they govern."*³¹

Similar issues exist across the world of development, not least within the informational spaces of the development sector profession itself. The potential of using linked open information as a building block for connected, overlapping spaces is enormous, but only if such work includes, listens to and informs local information societies.

This is a process that needs to accept and adapt to cultural and linguistic diversity in the forms people choose to structure and express their knowledge. This will raise a host of issues in a development sector that is increasingly monolingual, text-based and, even when it begins to explore new communications ideas such as the visualisation of information, tends to use a very limited pallet of visual languages. One very real option is to massively increase the use of oral records in the development process. It is already possible, in English at least, to make oral records that are almost as accessible and searchable as written records. The extension of this facility to other languages, especially international languages like Wolof and Quechua, which have always been linked to a wider oral culture, is now entirely possible.³² This has a wide range of potential applications, including the possibility of development agencies employing staff on the basis of their knowledge of

and legitimacy in local communities, rather than on requirements for written competence in what is usually a second language.

The ideas proposed above have as a common thread their identification of development-related information needs and inspiring the innovation necessary to address them, rather than thinking first of existing technology and what can be done with it. Their impact, as anticipated in the examples given here, could be to revolutionise the development information environment, to not just provide information, but also use it to change how, and by whom, development is done.

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Annex table 1. Access indicators

	Fixed telephone lines per 100 inhabitants		Mobile cellular subscriptions per 100 inhabitants		International Internet bandwidth Bits/s per Internet user		Proportion of households with computer		Proportion of households with Internet	
	2004	2009	2004	2009	2004	2009	2004	2009	2004	2009
1 Afghanistan	0.2	0.5	2.5	42.6	...	16,395	0.6	...	0.6	...
2 Angola	0.6	1.6	4.6	43.8	93	...	3	...	1	...
3 Bangladesh	0.6	0.9	1.8	32.3	200	...	1.2	...	0.2	...
4 Benin	1	1.4	6	56.3	522	1,024	1.4	...	-	...
5 Bhutan	4.8	3.8	3	48.6	300	3,100	2.2	...	1.2	...
6 Burkina Faso	0.6	1	3	24.3	1,203	2,803	0.6	...	...	...
7 Burundi	0.4	0.4	1.4	10.1	160	98	...	...	...	...
8 Cambodia	0.2	0.4	6.3	42.3	439	...	1.4	...	...	...
9 Central African Rep.	0.2	0.3	1.5	13.6	171	...	...	...	...	...
10 Chad	0.1	0.5	1.3	20.4	100	114	0.7	...	0.7	...
11 Comoros	2.5	4.6	1.4	18.1	32	617	2.5	...	0.5	...
12 Congo (Dem. Rep.)	-	0.1	3.5	14.3	44	...	0.2	...	0.1	...
13 Djibouti	1.4	1.9	4.4	14.9	7,283	29,893	6.2	12.1	0.4	1.7
14 Equatorial Guinea	1.8	1.5	10.4	29.6	1,680	...	...	...	...	...
15 Eritrea	0.9	1	0.5	2.8	120	...	0.2	...	0.1	...
16 Ethiopia	0.7	1.1	0.2	4.9	372	...	...	...	-	...
17 Gambia	2.9	2.9	11.8	84	42	...	2.4	...	0.8	...
18 Guinea	0.3	0.2	1.7	34.7	43	...	2	...	0.8	...
19 Guinea-Bissau	0.7	0.3	2.7	34.8	2	54	1.5	...	0.6	...
20 Haiti	1.5	1.1	4.3	36.4	226	...	1.4	...	0.8	...
21 Kiribati	4.8	4.1	0.7	1	...	...	...	...	...	...
22 Lao P.D.R.	1.3	2.1	3.5	51.2	670	3,331	1.1	...	0.8	...
23 Lesotho	1.9	1.9	9.9	32	61	...	2	...	0.5	...
24 Liberia	...	0.1	2.9	21.3	...	...	...	1	...	...
25 Madagascar	0.3	0.9	1.9	32	378	719	2	...	0.6	...
26 Malawi	0.7	1.1	1.7	15.7	100	...	0.5	...	0.4	...
27 Maldives	10.9	15.8	39.3	147.9	789	10,842	24.7	...	6	...
28 Mali	0.6	0.7	3.5	34.2	360	2,482	0.7	...	0.6	...
29 Mauritania	1.3	2.3	18	66.3	1,929	...	1.1	...	0.5	...
30 Mozambique	0.3	0.3	3.5	26.1	134	2,086	0.4	...	0.6	...
31 Myanmar	0.9	1.1	0.2	1	5,222	...	0.7	...	0.4	...
32 Nepal	1.6	2.8	0.4	19.1	249	...	...	...	0.6	...
33 Niger	0.2	0.4	1.4	17	83	...	-	...	-	...
34 Rwanda	0.3	0.3	1.6	24.3	1,184	780	0.2	...	0.1	...
35 S. Tomé & Príncipe	4.7	4.8	5.2	39.3	100	...	...	...	...	...
36 Samoa	9.2	17.8	8.9	84.4	1,091	...	...	...	...	...
37 Senegal	2.2	2.2	10.2	55.1	965	2,564	2.4	11.5	0.6	4
38 Sierra Leone	0.5	0.6	...	20.4	...	...	...	...	...	...
39 Solomon Islands	1.5	1.6	0.6	5.7	1,533	...	...	...	...	...
40 Somalia	1.2	1.1	6.1	7	35	...	...	...	...	...
41 Sudan	2.7	0.9	2.8	36.3	673	...	2.5	...	0.6	...
42 Tanzania	0.4	0.4	5.1	39.9	48	...	2	...	0.3	...
43 Timor-Leste	0.2	0.2	2.7	29.1	...	...	...	...	...	...
44 Togo	1.1	2.7	5.7	33	65	435	1.2	...	0.7	...
45 Tuvalu	7.7	17.1	5.1	20.1	...	...	...	...	...	...
46 Uganda	0.3	0.7	4.2	28.7	303	366	0.6	...	0.1	...
47 Vanuatu	3.2	3	5	52.7	250	3,118	4	...	...	...
48 Yemen	3.9	4.2	7.2	35.3	33	639	1.6	...	1.2	...
49 Zambia	0.8	0.7	4	34.1	95	558	1.2	...	...	...

Source: ITU World Telecommunication/ICT indicators database.

Annex table 2. LDCs with full liberalization of fixed sub-markets (2009)

	Fixed-line	International	Mobile	Internet
Countries with full liberalization	Bangladesh Burkina Faso Burundi Cambodia Dem. Rep. of the Congo Equatorial Guinea Lao P.D.R. Malawi Mali Mauritania Mozambique ¹ Nepal Senegal ¹ Somalia Sudan Tanzania Uganda	Angola Dem. Rep. of the Congo Equatorial Guinea Guinea Haiti Kiribati Lao P.D.R. Liberia Malawi Mali Mauritania Mozambique Nepal Somalia Sudan Tanzania Uganda	Angola Bangladesh Benin Bhutan Burkina Faso Burundi Cambodia Central African Rep. Chad Dem. Rep. of the Congo Equatorial Guinea Gambia Guinea Lesotho Madagascar Malawi Mauritania Mozambique Nepal Niger Somalia Tanzania Togo Uganda Vanuatu Yemen Zambia	Angola Bangladesh Benin Burkina Faso Burundi Cambodia Central African Rep. Chad Dem. Rep. of the Congo Equatorial Guinea Gambia Guinea Guinea-Bissau Haiti Kiribati Lao P.D.R. Lesotho Liberia Madagascar Malawi Mali Mauritania Mozambique Nepal Rwanda Samoa Somalia Sudan Tanzania Togo Uganda Yemen Zambia
Total	17	17	27	33

Notes: ¹ Liberalized, but dominated.

Source: ITU Regulatory Database.

Annex table 3. LDCs that regulate mobile prices (2009)

	Access to mobile network	National voice roaming	SMS	Mobile retail prices	Mobile Internet access
Countries	Burkina Faso Comoros Djibouti Equatorial Guinea Gambia Lesotho Mali Nepal Senegal	Burkina Faso Comoros Equatorial Guinea Lesotho Nepal	Burkina Faso Comoros Dem. Rep. of the Congo Lesotho Mali Mozambique Nepal	Burkina Faso Comoros Dem. Rep. of the Congo Equatorial Guinea Lesotho Mali Mozambique Nepal	Comoros Djibouti Equatorial Guinea Nepal
Total	9	5	7	8	4

Source: ITU Regulatory Database.

Annex table 4. LDCs supporting universal service (2009)

	Countries indicating definitions of basic or other universal service		Countries supporting Internet services
Countries	Afghanistan	Madagascar	Angola
	Angola	Malawi	Bhutan
	Bangladesh	Maldives	Burkina Faso
	Bhutan	Mali	Dem. Rep. of the Congo
	Burkina Faso	Mauritania	Guinea
	Burundi	Myanmar	Lesotho
	Chad	Nepal	Madagascar
	Comoros	Niger	Malawi
	Dem. Rep. of the Congo	Rwanda	Mauritania
	Djibouti	Sao Tome & Principe	Nepal
	Ethiopia	Samoa	Sao Tome & Principe
	Gambia	Senegal	Samoa
	Guinea	Sierra Leone	Senegal
	Guinea-Bissau	Sudan	Sierra Leone
	Haiti	Tanzania	Sudan
	Kiribati	Togo	Togo
	Lao P.D.R	Uganda	Uganda
	Lesotho	Yemen	
	Liberia	Zambia	
Total	38		17

Source: ITU Regulatory Database.

Notes

Chapter 1

- ¹ UNOHRLLS. (2010). *LDCs: Facts and Figures*. Retrieved February 21, 2011 from www.unohrlls.org/UserFiles/File/Elle%20Wang%20U`ploads/UN_LDC_Factsheet_061610.pdf.
- ² As of January 2011, the 16 LLDCs are: Afghanistan, Bhutan, Burkina Faso, Burundi, Central African Republic, Chad, Ethiopia, Lao People's Democratic Republic, Lesotho, Malawi, Mali, Nepal, Niger, Rwanda, Uganda and Zambia. The ten SIDS include: Comoros, Guinea-Bissau, Haiti, Kiribati, Samoa, Sao Tome & Principe, Solomon Islands, Timor-Leste, Tuvalu and Vanuatu. Maldives –also a SIDS– graduated from the LDC status in January 2011.
- ³ Committee for Development Policy & United Nations Department of Economic and Social Affairs (UN DESA). (2008). *Handbook on the Least Developed Country Category: Inclusion, Graduation and Special Support Measures*. p. 1. See also, UN-OHRLLS (N.D.). *About the LDCs*. Retrieved 29 January, 2011, from www.unohrlls.org/en/ldc/25/.
- ⁴ The original LDCs included Afghanistan, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Chad, Ethiopia, Guinea, Haiti, Lao People's Democratic Republic, Lesotho, Malawi, Maldives, Mali, Nepal, Niger, Rwanda, Samoa, Sikkim (a protectorate of India in 1971), Somalia, Sudan, Uganda, United Republic of Tanzania and Yemen.
- ⁵ CDP & UN DESA. (2008). pp. v, 3.
- ⁶ United Nations Conference on Trade and Development (UNCTAD). (2010). *The Least Developed Countries Report 2010: Towards a New International Development Architecture for LDCs*. p. ii.
- ⁷ *Idem*, pp. 7-9.
- ⁸ UN-OHRLLS (N.D.). *Least Developed Countries: Criteria for Identification of LDCs*. Retrieved on 24 January, 2011, from www.unohrlls.org/en/ldc/related/59/.
- ⁹ UNCTAD (2010). p.ii.
- ¹⁰ Guillaumont, P. (2010, October). From inclusion to graduation: Why the least developed countries were «caught in a trap» and should move «out of the trap». Presentation at the Second Committee Special Event Organized by UN-OHRLLS as part of the preparatory process for the 4th UN Conference on the LDCs. Available at www.un.org/wcm/webdav/site/ldc/shared/From%20inclusion%20to%20graduation%20RR.pdf.
- ¹¹ See General Assembly resolutions 46/206 (1991) and 59/209 (2004).
- ¹² UNCTAD (2010), p.ii.
- ¹³ MMD Newswire (2011, January 12). *Delegates in Preparatory Meeting Express Concern about Shortage of Countries 'Graduating' from Least-Developed Status over Last Decade*. Retrieved on February 21, 2011 from www.mmdnewswire.com/delegates-in-preparatory-meeting-express-concern-about-shortage-of-countries-graduating-from-least-developed-status-over-last-decade-16845.html.

Chapter 2

- ¹ See Bauer (2010). Regulation, Public Policy, and Investment in Communications Infrastructure. *Telecommunications Policy*, 34(1-2), 65-79.
- ² See, for example, Falch, M., & Henten, A. (2010). Public-private Partnerships as a Tool for Stimulating Investments in Broadband. *Telecommunications Policy*, 34(9), 496-504.
- ³ Bauer, J. (2005). Regulation and State Ownership: Conflicts and Complementarities in EU Telecommunications. *Annals of Public and Cooperative Economics*, 76(2), 151-177; Edwards, G., & Waverman, L. (2006). The Effects of Public Ownership and Independence on Regulatory Outcomes. *Journal of Regulatory Economics*, 29(1), 23-67.
- ⁴ Cave, M. (2010). Snakes and Ladders: Unbundling in a Next Generation World. *Telecommunications Policy*, 34(1-2), 80-85; Bacache, M., Bourreau, M., & Gaudin, G. (2010). *The Ladder of Investment Approach and the Development of New Access Infrastructures: Which Empirical Evidence?* Paper presented at the 18th Biennial Conference of the International Telecommunications Society, Tokyo, June 28-30, 2010.
- ⁵ According to the ITU Regulatory Database, in 2009, the following countries permitted VoIP: Bhutan, Cambodia, Dem. Rep. of the Congo, Gambia, Guinea, Kiribati, Liberia, Madagascar, Malawi, Maldives, Myanmar, Nepal, Rwanda, S. Tome & Principe, Samoa, Senegal, Sudan, and Togo.
- ⁶ These countries are Benin, Burkina Faso, Dem. Rep. of the Congo, Djibouti, Gambia, Lesotho, Mali, Mozambique, Niger, Senegal, Tanzania, Uganda, and Zambia.
- ⁷ Countries regulating fixed origination are Benin, Burkina Faso, Dem. Rep. of the Congo, Djibouti, Gambia, Lesotho, Mozambique, Niger, Senegal, Tanzania, and Uganda.
- ⁸ See, for example, the survey by Cambini and Jiang (2009).
- ⁹ Of the countries reporting, only Djibouti, Lesotho, Niger, Senegal and Uganda indicated regulation of wholesale broadband access.
- ¹⁰ The nine countries with price controls for access to fixed networks are Burkina Faso, Comoros, Djibouti, Equatorial Guinea, Gambia, Lesotho, Mali, Nepal, and Senegal.
- ¹¹ Retail fixed voice prices were controlled by Benin, Burkina Faso, Comoros, Gambia, Lesotho, Mali, Mozambique, Nepal, and Senegal.
- ¹² These were Comoros, Equatorial Guinea, Lesotho, Nepal, Niger, and Senegal.
- ¹³ Countries with partial competition in mobile voice services (in most cases competition limited to certain regions) as of 2009 are Afghanistan, Eritrea, Guinea-Bissau, Haiti, Kiribati, Lao PDR, Liberia, Maldives, Mali, Rwanda, Samoa, Senegal, Sierra Leone, and Sudan.
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Chapter 3

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Chapter 5

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Chapter 6

- ¹ The contributors to this chapter are development practitioner-researchers who have dealt with the implications of the ICT for development for the past 17 years. They work for the Information and Knowledge Management (IKM) Emergent Research Programme, which explores information and knowledge processes within the international development sector. The programme is based on a critique of current practice, researches the development implications of cultural, economic and technical changes in the handling, use and exchange of information –known as informational developments– taking place in societies both North and South. This chapter fits within the IKM perspective and makes use of much material developed within the programme. For information about IKM see <http://ikmemergent.net>.
- ² This discussion of the endogenous and exogenous narratives is based on R. Mansell (2010). *Power and interests in developing knowledge societies: exogenous and endogenous discourses in contention*. IKM Working Paper No. 11.
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