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Internet broadband for an inclusive digital society

Report of the Secretary-General

Executive summary

This report provides an overview of key issues relating to broadband information and communications technologies (ICTs) and summarizes recent research, evidence, policy developments and practices. It reviews the impacts and benefits of broadband for development, and offers a set of policy incentives that can form part of national broadband policy frameworks aimed at promoting broadband development for an inclusive digital society in developing countries.

Contents

Introduction

1.   The Commission on Science and Technology for Development and the Economic and Social Council have repeatedly called attention to the growing digital divide in broadband connectivity, between and within countries, and the need to narrow this divide. The Council, in its resolution 2012/5, urged all stakeholders to "prioritize the development of innovative approaches that will stimulate the provision of universal access to affordable broadband infrastructure for developing countries and the use of relevant broadband services".

2.   At its fifteenth session. the Commission held a special panel on extending rural access to broadband and decided to examine the priority theme "Internet broadband for an inclusive digital society" for its next session. To contribute to further understanding of the issue, and to assist the Commission in its deliberations at its sixteenth session, the UNCTAD secretariat convened an intersessional panel meeting in Lima, Peru, from 7 to 9 January 2013. The present report, requested by Council decision 2012/228, is based on the findings of the panel, national reports contributed by Commission members and other relevant literature.[1] It reviews the international status of broadband and proposes a set of policies to promote broadband development for an inclusive digital society in developing countries.

I.   Status and importance of broadband

A.   The broadband divide

3.   The recent emphasis on broadband in the ICT development field arises from the emerging recognition that the nature and scope of interactive communications that can be accomplished by high-capacity data transmission and processing is fundamentally different from and exponentially more valuable than what was possible with older-generation voice and low-speed data connections.

4.   For developed countries and affluent segments of the developing world, these advantages of broadband are well known. Apart from social networking, these include smart phones, tablets and an ever-growing cyber presence. However, for most people in the world, they remain unknown or unavailable. The mobile telephone revolution has dramatically expanded access to basic voice telephone service across the world. Similarly, lower-speed Internet access (dial-up and second-generation (2G) mobile telephone technology) has made significant inroads among many lower- to middle-income populations. Nevertheless, the parallel explosive growth of the broadband universe has not yet sufficiently penetrated developing countries.

5.   This gap between telephony and broadband, and even narrowband or low-speed data and true broadband Internet, is perhaps far more significant in terms of potential socio-economic impacts, than earlier technological leaps. The digital divide is increasingly becoming a knowledge divide. The scope of information and of technical and socioeconomic know-how of educational, scientific, health and political resources available to one segment of society is virtually infinite, while the remainder of the population remains excluded from the information society.

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6.   In many ways, the broadband divide represents a specific intensification of the existing digital divide. Countries and people that are excluded from broadband risk not having access to an entire range of applications and benefits that the Internet provides.

7.   Inclusiveness in the context of broadband development is manifested at several levels. At the global level, the issue is one of promoting equitable broadband development and related opportunities in all countries. The broadband divide exists at yet another level within countries – between the urban and rural regions – which is widely prevalent not only in developing countries, but in developed countries as well. A lack of infrastructure and the slow expansion of high-speed networks to upgrade legacy services is leaving many rural areas further behind the wealthier, more densely populated urban and peri-urban communities, often compounding the dearth of other resources available in those areas. For development initiatives, the absence of broadband access makes delivering much-needed assistance more difficult, as programmes with digital components and communication are increasingly becoming essential elements of national and international support practices.

8.   This report addresses the imperative of inclusive broadband development at both these levels – globally and within countries. Efforts to promote access to broadband may often result in enhancing physical installation of broadband services, but do not necessarily translate into durable, reliable and long-lasting broadband access, which is essential if the benefits of broadband are to accrue.

B.   Status of broadband development

9.   Measurement of the status of broadband-related deployments, usage and activities, and research into the benefits and impacts of broadband for developing countries are very much a new field. Many governments in developing countries still do not closely track indicators of broadband, as opposed to traditional telephony and mobile phone penetration. However, more reliable and detailed data are increasingly becoming available. More recently, the Broadband Commission for Digital Development,[2] under the sponsorship of the International Telecommunication Union (ITU) and the United Nations Educational Scientific and Cultural Organization (UNESCO), has compiled some of the most complete and useful data on broadband and Internet penetration throughout the world.

10.   A number of academic and international institutions such as ITU have begun to formulate methods for comparative analysis of the role of the Internet and the digital economy in macro- and micro-level economic and social outcomes. Among the many challenges of studying the economic impacts of access to broadband, two stand out:

        (a)   Reliable empirical data is hard to find, since broadband is relatively new and only some developing countries have been fully exposed to it;

        (b)   Where some experience with broadband and development can be documented, the impacts are very difficult to separate from those of other, concurrent initiatives and investments.

11.   Available data suggest a significant growth in broadband penetration generally, over the past decade, and a rapid increase in mobile broadband in particular since 2007.[3] The combined aggregate penetration levels are now above 25 per cent of the world's population.

12.   To date, the rapid, substantial growth in broadband has not translated into significant increases in Internet access in least developed countries (LDCs), where only 6 per cent of
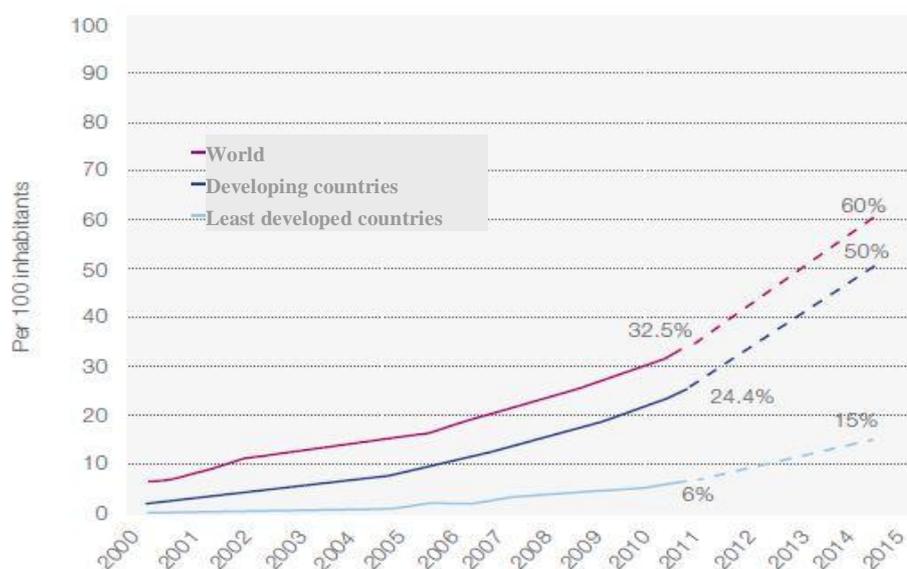
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[2] www.broadbandcommission.org.

[3] ITU-UNESCO Broadband Commission, *The State of Broadband 2012: Achieving Digital Inclusion for All (*2012).

inhabitants had access as of 2011. This proportion is expected to more than double by 2015, but by then, the absolute gap with higher income countries is likely to grow even larger (figure 1).
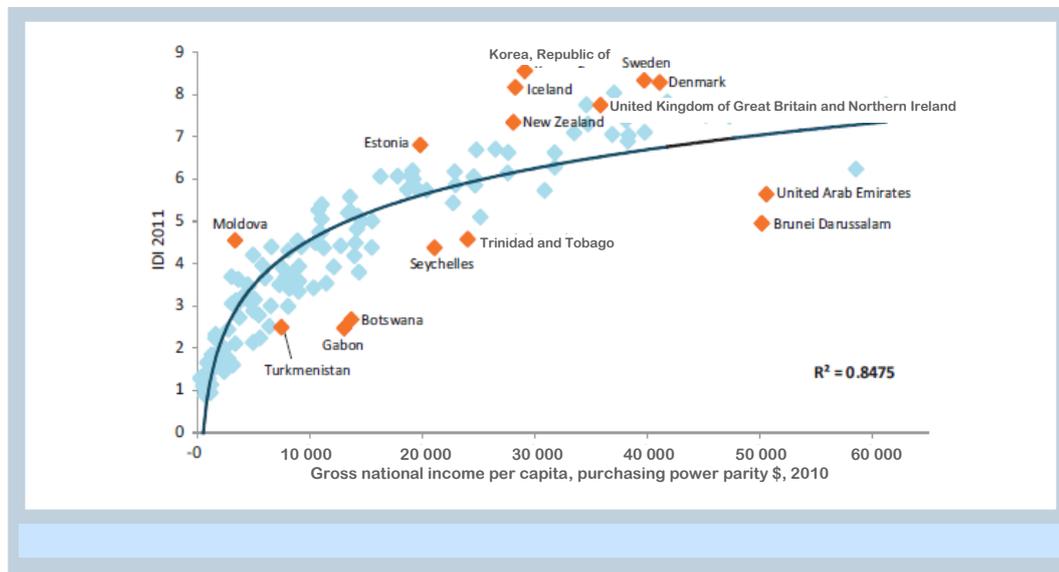
Figure 1
Internet penetration and forecast

Source: ITU-UNESCO Broadband Commission, The State of Broadband 2012: Achieving Digital Inclusion for All, 2012.

13. ITU has developed a number of studies and measures of ICT development. Its ICT Development Index seeks to provide a comprehensive comparison of countries' ICT access, use and skills, incorporating 11 distinct statistical indicators, while allowing the examination of relative strengths and weaknesses along separate metrics. Under this methodology, the top ranking countries as of the end of 2011 are the Republic of Korea, Sweden, Denmark, and a few other economies of the Organization for Economic Cooperation and Development (OECD). Those at the bottom of the rankings are nearly all in Africa. Overall, there is a correlation between country income levels (gross national income) and their ICT Development Index results, notwithstanding some notable exceptions (figure 2).

Figure 2
ICT Development Index and gross national income per capita, 2011

Source: ITU, Measuring the Information Society 2012, Geneva, 2012.

14.   Within countries, especially developing countries, disparities between rural and urban regions in terms of ICT and broadband development are even more pronounced. Figure 3 shows the correlation between the percentage of urban population distribution compared with that of the rural population and the overall teledensity (fixed plus mobile telephones per 100 population), broken down by country income levels. This includes several Asian countries. In many parts of Africa and Asia, broadband connectivity is virtually non-existent outside of main urban centres, and even basic (2G) mobile coverage is often limited.

Figure 3
Correlation between teledensity and percentage of the rural population
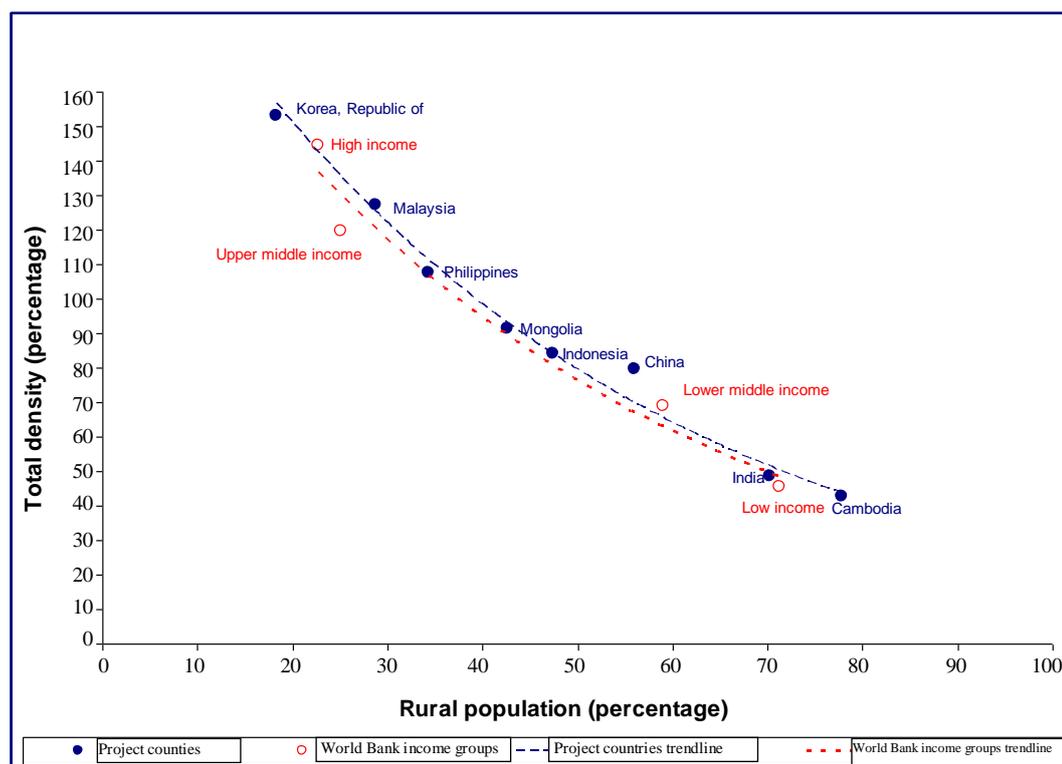
Source: David Townsend and Edgardo Sepúlveda, Rural ICT Policy Advocacy, Knowledge Sharing, and Capacity-building; Policy Principles and Toolkit Report, Asian Development Bank/ITU, October 2011.

C.   Impacts and benefits of broadband

1.   Economic development

15.   Broadband can have significant economic benefits. Adoption of broadband at the company level has demonstrated positive effects on productivity and job creation.[4] The bulk of impacts to date have been realized through adoption by larger, multinational firms, while the greatest potential for further growth remains for small and medium-sized enterprises (SMEs) to improve operating efficiency by better integration of broadband in production, sales, marketing and distribution processes.[5] Availability of reliable broadband infrastructure and services in rural areas in particular can create a strong foundation for businesses to locate and expand in these areas, helping to reduce the pressures of excess urbanization.

16.   Developing economies are also finding new opportunities in domestically produced software and online applications.[6] Lower labour costs and the efficiencies of storing and

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[4] Raul Katz, *Impact of Broadband on the Economy* (Geneva, ITU, 2012).

[5] Olivia Nottebohm, James Manyika, Jacques Bughin, Michael Chui and Abdur-Rahim Syed, *Online and Upcoming: The Internet's Impact on Aspiring Countries* (McKinsey & Company, January 2012).

[6] UNCTAD, *Information Economy Report 2012*: *The Software Industry and Developing Countries* (New York and Geneva, 2012).

accessing data within domestically based servers can facilitate a cost-effective local software industry, while the benefits of customized solutions for domestic businesses and government can be extensive.

17.   Some important research provides a good evidence base of broadband's positive economic benefits. One widely cited study by the World Bank[7] found that the average increase in gross domestic product (GDP) growth in developing countries was 1.38 per cent for each 10 per cent increase in broadband penetration. These results have established an initial benchmark for broadband-related economic impact studies, as well as a strong incentive for governments to invest in broadband growth.

18.   More recently, research and reports have sought to assess the link between broadband development and economic growth. An ITU-sponsored study in 2012[8] presented recent research on contributions of broadband to economic growth, productivity gains, employment and output, creation of consumer surplus and improvement of firm-level efficiencies. The study also included research findings[9] indicating that the impacts and benefits of broadband increase after adoption reaches a critical mass of about 20 per cent of the population, a level that many developing countries have not yet come close to achieving. In terms of GDP effects, the ITU study suggests significantly lower positive effects than the World Bank study cited above, especially for developing countries. For example, in Brazil, the impact of a 1 per cent increase in broadband penetration on GDP can be 0.008 per cent. For Latin America and the Caribbean as a whole, the average impact is 0.0158 per cent. Meanwhile, another recent study by the Inter-American Development Bank[10] found that a 10 per cent increase in broadband penetration in Latin America and the Caribbean corresponded with an average per capita GDP growth of 3.19 per cent. Despite the difference in these estimates, the positive economic effects of broadband penetration call for a more systematic assessment of the factors that link broadband to higher economic growth.

2.   Broadband in education

19.   In developing countries, the goal to employ broadband in the classroom, especially at secondary- and higher-education levels, ties directly to long-term social objectives, particularly the vital need for a technology-literate population and workforce. The deficit of workers skilled in computer- and Internet-related technologies inhibits overall ICT-sector growth and the upgrading of functions in all other business and government realms. A recent study of the Broadband Commission[11] highlights the tremendous gains being made in the deployment of advanced technologies in education and the continuing disparities in ICT access between students in developed and developing countries. Some of the innovations driving educational transformation include the use of digital textbooks, Internet-based research and learning tools, audio-video presentation materials, interactive teaching and learning software, open access digital libraries and courseware, virtual science laboratories and museums, and all manner of remote distance-learning and online degree programmes.

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[7]   Christine Zhen-Wei Qiang and Carlo M. Rossotto, Economic Impacts of Broadband (chapter 3), in World Bank, *2009 Information and Communications for Development*: *Extending Reach and Increasing Impact* (Washington, D.C., 2009).

[8]   See footnote 4.

[9]   Pantelis Koutroumpis, The economic impact of broadband on growth: A simultaneous approach, *Telecommunications Policy*, 33(9):471–485, October 2009.

[10]   Antonio García Zaballos and Rubén López-Rivas, *Socioeconomic Impact of Broadband in Latin American and Caribbean Countries*, Technical Note No. IDB-TN 471 (Inter-American Development Bank, 2012).

[11]   Broadband Commission Working Group on Education, *Technology, Broadband, and Education: Advancing the Education for All Agenda* (Paris, ITU-UNESCO, 2012).

3. Broadband in health care

20.   Broadband networks can link doctors, clinics and treatment centres in rural areas to national medical resources, allowing access to remote consultations and diagnostics and tracking health conditions and epidemics much more effectively. Distribution of basic health information, such as pre-natal and maternal care, the prevention and treatment of malaria and other common diseases, first-aid practices and many other topics, can directly improve the quality of life for previously isolated communities. ICTs also facilitate the integration of health-related data into national databases and networks, which allow more effective and efficient management of all aspects of a nation's health care services. A range of existing and planned innovative eHealth applications and services mark the beginning of dramatic changes in global healthcare delivery.[12]

4. Social and cultural enrichment

21.   Broadband can have very valuable social and cultural benefits with effects that may be realized over a long time horizon. In many cases, broadband complements other development objectives, while also creating new prospects for social inclusion and empowerment. Some of the most prominent examples are described below.

22.   Gender equity: Access to broadband, through both community facilities and individual devices, can create channels of communication, knowledge sharing and mutual support for women who have been isolated from mainstream social and economic structures. ICT technologies support women's entrepreneurial activities and make it easier to provide equal education opportunities for girls, including access to broader sources of learning and support on women's health and child bearing.[13]

23.   Persons with disabilities: ICT providers can enable persons with disabilities to participate more fully in society with the help of customized software, computer and phone equipment. In 2008, the Department of Economic and Social Affairs established the Global Initiative for Inclusive ICTs (G3ict),[14] which has developed a virtual toolkit on e-accessibility policy, with support from a variety of public and private partners.[15] This and other similar initiatives are helping governments and companies make rapid progress in empowering persons with disabilities to access education, jobs and other social amenities.

24.   Arts and literature: Broadband has an immense role in distributing and enabling access to all forms of human artistic and cultural endeavours. It enables unlimited access to creative works in high-quality formats, including paintings, sculpture, architecture, music and books. New generations of artists are producing works using digital tools and the canvas of the Internet. Millions of books are available for download, often free of charge. Programmes such as the Gates Foundation's Global Libraries initiative[16] are bringing still more electronic resources and connectivity to remote populations.

25.   Indigenous cultures: ICTs can also serve as a valuable resource to support and preserve the cultural heritage of indigenous peoples. In some respects, ICTs have often contributed to diminishing indigenous cultures, by accelerating assimilation. More recently, however, movements have begun to embrace and highlight unique cultural features in many

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[12] "In Focus: eHealth Opportunities and Challenges", ITU Telecom World 2011, http://world2012.itu.int/itu-telecom-focus-5.

[13] See World Bank, Gender and Development Group, Gender Development Briefing Notes, ICT & Gender Equality, October 2006; and *info*Dev and PriceWaterhouseCoopers, *Information and Communication Technology for Education in India and South Asia: Essay 4, Gender Equity and the Use of ICT in Education*, 2010.

[14] g3ict.com.

[15] www.e-accessibilitytoolkit.org/.

[16] www.gatesfoundation.org/What-We-Do/Global-Development/Global-Libraries.

developing countries. Some of these efforts utilize broadband ICTs to connect disparate members of tribes and ethnic groups, to share their stories and knowledge and to reinforce dying languages or traditions. ICTs can also act as a preservation medium for arts, crafts, skills, mythologies and almost any other cultural memory. Through these efforts, numerous groups have been working not only to support indigenous peoples, but to expand awareness of their lives to others through educational initiatives.[17]

5. Political engagement

26.   Some the most significant and dramatic examples of the transformative potential of ICTs have been witnessed in recent years in the political arena. Expanding access to the ability to communicate ideas can contribute to increased political participation in developed and developing countries alike.

27.   Information access: ICTs enable more knowledgeable and effective participation across the spectrum of political involvement. Bloggers have emerged as the front lines of investigative and activist political advocates in many countries, while traditional journalism has extended its reach by online reporting. Political parties and other organizations have vastly more resources to connect with and influence voters, contributors, as well as politicians and government agencies. The presence of so many outside information sources also helps reinforce pressure on government itself to provide greater openness and transparency, to allow access to all manner of internal records and data, to investigate and publicize questionable practices and to inform citizens in a politically neutral manner. ICTs – and especially the social media – have also played a pivotal role in activist movements, contributing to political reforms around the world.

28.   E-government: An essential contribution of ICTs in the public sphere has emerged in the form of e-government programmes. Many governments have recognized that there are a variety of opportunities to employ broadband ICT-based services and applications to improve and expand public services, and to encourage citizens to enhance the quality of their lives. Delivery of government services, including ICT capacity-building and public-awareness programmes, can be a vital means to enhance the value of ICTs for citizens and governments alike. Public ICT networks and services for rural communities provide other benefits for citizens, such as access to local government websites, documents, licences and tax records.

29.   The role of broadband-enabled ICTs in various areas of political engagement may be skewed by those who can access information and whose viewpoints or interests are represented or disseminated.

II.   The broadband ecosystem

30.   The concept of access to broadband ICTs must be understood in the context of their evolution during the twenty-first century to become a dominant medium of human interaction. Broadband implies not merely speed or capacity of network data transmission, but a wide array of capabilities, services and applications, as well as technology configurations and platforms, all of which depend upon high-capacity interconnectivity among their components. Thus, true access to broadband is measured by the usefulness of such access to end users – individuals, households, businesses and institutions – and the specific activities that they are able to accomplish by utilizing broadband communications.

31.   For these reasons, it is important to recognize the features and components of what has been called the broadband ecosystem: the interrelated elements that must be in place at

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[17] See, for example, UNESCO Policy Brief, *ICTs and Indigenous People*, June 2011.

multiple levels for broadband services to deliver their potential. The following descriptions summarize the main components of this ecosystem, particularly in the context of a large number of developing countries where broadband is still far from widespread.

A.   Infrastructure and services

32.   Broadband ICT infrastructure consists of several layers of transmission network, access facilities and end-user services, which can be deployed in a variety of configurations. The broadband-based services that end users obtain are delivered over this infrastructure, which consists of separate components of the integrated ecosystem, provided by a diverse group of related and competing suppliers. Some of the principal elements of broadband infrastructure and services are described below.

33.   Backbone networks: Broadband interconnection depends upon very high-capacity international and national backbone transmission networks that utilize fibre optic cables for most high-capacity intercity routes and international connectivity. All broadband networks and services must ultimately be interconnected with the global Internet as well as national public and private data networks. The transmission capacity required on these networks will increase as more users are connected to broadband services, as will the costs of the national backbone network. A typical fibre-optic network buildout to rural regions, for example, can cost in the range of $5,000 to $8,000 per kilometre to construct.

34.   Expanding broadband access beyond urban centres is one of the principal challenges of achieving universal broadband. This requires adding capacity to reach hub locations that are close to rural population centres. Such broadband hubs might include wireless transmission and/or fibre optics – and sometimes satellite connections – all of which can be expensive to construct and maintain. These factors place significant constraints on commercial operators' willingness to extend backbone networks deep into rural regions, where revenues from local broadband services may be low and unreliable.

35.   Local broadband access networks: Completing the broadband connection requires wireline or wireless links between the backbone network and end users. These are often referred to as the last mile. Traditional wireline telephone networks are widely used to provide dedicated broadband connections to businesses, institutions and homes in many countries, including via asymmetric digital subscriber line – ADSL – connections, coaxial cable television systems and fibre to the home, or FTTH. The costs of building such wired local access connections to homes in towns and villages depend heavily upon the density of the location, such that higher expected demand can drive down unit costs dramatically, from over $1,000 to less than $100 per connection.

36.   All of these platforms are widely deployed in developed markets and are finding new openings in developing countries, at least within relatively dense and higher income urban areas. Established incumbent telecommunications operators, along with a variety of new competitors, are seeking to expand the market base for broadband services by delivering combinations of options known as multiplay packages that include local and long-distance telephone calling, high-speed Internet access and television entertainment.

37.   Wireless broadband: The most significant trend contributing to the worldwide spread of broadband has been the rapid and dramatic increase in the capacity and functions of wireless telecommunications services. The mobile revolution was driven by the availability of flexible, convenient and increasingly affordable voice telephony. As basic mobile service upgraded to 2G, 3G and 4G technologies, together with fixed wireless such as WiMAX or WiFi, broadband followed a similar trajectory. More and more users worldwide, especially in rural areas, are gaining wireless broadband connections. Similarly, the cost structure of wireless networks continues to evolve rapidly, as new innovations and growing demand drives down the costs of infrastructure and services, including for rural and remote networks. Some estimates foresee mobile communications services reaching a

price threshold as low as $1 per month for basic users. Even broadband prices are already decreasing to below $10 per month in some markets.

38.   Retail broadband Internet services: In a broadband environment, infrastructure and retail end-user services that are delivered over broadband networks are not always the same. Services can be offered by multiple providers, including network operators as well as independent providers, such as Internet service providers, mobile virtual network operators, aggregators and resellers, and other third parties. The more diverse the service offerings, the more robust the broadband market and ecosystem. For many users in developing economies, especially rural regions, access to broadband is most likely to be available through public access Internet facilities, which offer use of computers, Internet, telephone and other ICT equipment and services. Typical models include both government-sponsored telecentres as well as private commercial cybercafes, along with ICT labs in schools, post offices, libraries and other public places. In some locations, public broadband access may be offered simply as a free wireless (WiFi) signal, managed or funded by the local government.

39.   Data storage and exchange points: For broadband, the massive amount of digital information and applications that must be stored and exchanged requires separate facilities and increasingly large investments. Companies and governments that deal in terabytes and petabytes of data require access to infinitely huge storage sites – data warehouses – along with ultra-high capacity transmission links and exceptionally reliable and secure power sources, physical premises and data protection protocols. The collective body of such facilities worldwide is referred to as the cloud. However, there are great cost efficiencies to be gained from retaining locally produced and consumed data within the boundaries of individual markets, including both domestically produced content, and local pockets of major global applications.[18] Such a strategy can be achieved by establishing designated Internet exchange points, which keep domestic data within the national network, as well as local data warehouses and domestic cloud arrangements.[19]

B.   End-user devices

40.   The advances involved with broadband require far more sophisticated equipment for end users than what was necessary to benefit from traditional telephone services. As much as the underlying networks and transmission technology, the broadband revolution has been driven by an ongoing mass transformation in the market for end-user devices that connect to these networks. The separation between computers and phones is becoming entirely obsolete, and the range of consumer and business equipment that now qualifies as smart – that is to say, can connect to the Internet and to other devices and perform multiple interactive functions – continues to expand.

41.   Smart phones and tablets have become the fastest growing elements of the hardware market. Personal computers and laptops remain vital, especially in the business world, but even these tend to merge with the mobile and tablet domain. Meanwhile, a host of other devices are signing up for the Internet of Things, from smart televisions, game consoles and countless other consumer toys to security devices, automobiles and nearly all links in the chain of business processes.

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[18] See OECD, UNESCO and the Internet Society, *The Relationship Between Local Content, Internet Development, and Access Prices,* OECD Digital Economy Papers No. 217 (Paris, OECD, 2013), http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/local_content_study.pdf.

[19] See, for example, Africa's future data architecture beginning to fall into place – exchange points and data centres, Balancing Act, Issue No. 625, 5 October 2012, http://www.balancingact-africa.com/news/en/issue-no-625/top-story/africa-s-future-data/en.

42.   As the scope of hardware choices continues to expand rapidly, the cost of such equipment has been constantly declining, which creates increasingly flexible options for utilizing broadband services. In developing markets, most users favour smaller, more affordable mobile devices, while larger, more robust computers are more often found in offices, schools and access centres. Even with cost reductions, however, the price of such equipment still represents a significant challenge in the development of the local broadband market for developing countries. Rapidly changing standards and obsolescence compound the challenge, as customers are unlikely to be able to replace or upgrade devices very often.

C.   Software, applications and content

43.   The value and appeal of broadband services are fundamentally dependent on software platforms and operating systems, multimedia applications and the wealth of information content that is made available through broadband connectivity. For many users in developing countries, the nature of information that can be obtained with the Internet, e-government networks, mobile broadband applications and other sources may not yet be as comprehensive as for customers in more developed markets. The scope of information applications and available content continues to expand without limit, and in the context of the social networking revolution, users themselves are becoming the most significant source of such content. As developing countries become more connected to the global information society, their interests and needs will necessarily have to be more reflected in the knowledge bases that they can access and to which they can contribute.

44.   Already, the rapid emergence of broadband networks and advanced consumer devices has yielded an explosion in new "killer apps": ICT applications that have become virtually ubiquitous. The most prevalent of these are in the realm of social media and constitute the interactive, user-driven phase of Internet development known as Web 2.0. Facebook, the single most widespread online application, was launched only in 2004, and in less than a decade has grown to over a billion users, half of whom access the service primarily using mobile devices. Numerous other such services, from Twitter and Google+ to Chinese QZone and Sina Weibo, reach hundreds of millions of users worldwide. Other types of social media allow limitless sharing of videos (YouTube), photos (Flickr), and ideas (Weblogs). Virtually all of these infinitely popular Internet applications were created in the mid-to-late 2000s, concurrently with the spread of broadband communications.

45.   The newest wave of "apps" that operate through mobile phones have heavily augmented, and to a large extent, displaced, conventional online computer-oriented applications. They can offer highly innovative features unique to mobile broadband, further reinforcing demand for wireless services and devices.

D.   Financial sector

46.   The multiple facets of the broadband ecosystem require a considerable degree of financial investment and economic support. In the past, the build-up of telecommunications services was financed initially by public funds in most countries, as telephone operators were State-owned enterprises. The shift to private, competitive market structures and the rapid rise of the mobile industry did not dramatically expand the role of outside finance in the sector, as most large telecom operators have the means to self-finance their capital investments in this profitable and healthy market.

47.   The new and highly diverse, as well as costly, components of the broadband world are creating a greater need for innovative financing sources and wider contributions to ICT-sector investment. It is thus important to recognize that financial institutions, funding mechanisms and a range of public and private actors play a vital role in the ecosystem. This expansion of participation in the financial side of the ICT sector can be a healthy side

benefit of broadband development. Diversification of investment sources, asset ownership, revenue streams and business relationships across a larger portion of a nation's economy can help strengthen economic ties in general and ensure greater public and private commitment to the growth of the information society.

48.   In most developing countries, the private financial and banking sector has been largely on the sidelines of ICT-industry investments. However, new financial instruments, such as domestic venture capital funds, could be established to allow private and institutional investors to participate in the medium- to long-term prospects of broadband development. Similarly, smaller entrepreneurs, start-up ventures and partnerships may be in a better position in the broadband market to contribute to, and benefit from, market growth, especially with incentives from public broadband policies.

49.   In addition, the growth of broadband and mobile ICTs has helped to enable new initiatives within the financial sector. These technologies expand citizen access to banking, money transfer and a growing trend of mobile money services. By partnering with ICT companies, financial firms can have a stronger impact on sector development, and their own contribution to society can expand as well. For such expansion to continue, and in particular for robust e-commerce services to take hold in developing countries, the financial services industries will need to become even more deeply committed to integrating their industry with the ICT revolution.

E. People

50.   Finally, beyond all the technical facilities, infrastructure, equipment, software, and other components, an equally critical element of the broadband ecosystem involves people in virtually every sphere of activity. This includes skilled personnel on the supply side, from business managers and employees, to public officials and users on the demand side. It is especially difficult for markets with a low supply of technical workers to enhance the labour force needed to expand highly technical services, especially in remote locations, where installation, maintenance, technical support and customer service will be especially important.

51.   As many users are unfamiliar with computers, the Internet and other advanced ICTs, local broadband providers will need to reinforce their operations with significant customer assistance, training, and outreach to encourage demand and ensure good market responses. All of this implies a far greater level of local human resource responsibility than is necessary for basic telephone services. Key personnel may be part of the staff of a local telecentre or telecom service provider, or engaged through schools, libraries and local government offices to help support community ICT development. They may also contribute actively to the creation and dissemination of local information content, in cooperation with rural users, community groups and businesses.

III. Key policy challenges and opportunities for broadband development

52.   The preceding sections highlight the wide scope of interrelated trends and interests that are involved in the rapidly evolving broadband development landscape. While most governments, industry participants and international institutions recognize the importance of expanding and accelerating broadband in developing economies, a range of complex challenges hinders such growth. Currently, challenges are spread across the full spectrum of ecosystem components including:

    (a)   High costs of capital investments in infrastructure;

    (b)   Lack of financial mechanisms and investor interest in marginal areas;

(c)   Low revenue potential from low-income, low-demand users;

(d)   High costs for broadband devices, compared with simple phones;

(e)   Lack of awareness, skills and training in the use and value of broadband;

(f)   Insufficient supporting infrastructure in many locations: electricity, roads;

(g)   Inadequate ICT training and knowledge among government officials;

(h)   Lack of digital content in local languages and cultures.

53.   To meet these challenges, governments, in partnership with ICT-sector stakeholders, development advocates, and citizen and community groups, have been pursuing a host of policy and strategy initiatives aimed at spreading the benefits of broadband as widely and equitably as possible. The effective establishment and growth of broadband services and capabilities depend first on an enabling and supportive public policy environment. This section highlights some of the main elements of such policies.

A.   Information and communications technology policy and regulation

54.   Laws, regulations and government oversight need to adapt to the rapidly changing dynamics of the broadband market. Policy regimes that were established to address more traditional communications and information industry conditions may prove inadequate to support the transition to an integrated broadband setting. Some key concerns are summarized below.

55.   Converging regulation: Most countries have a separate telecom regulatory agency responsible for licensing, economic regulation and frequency management relative to a defined group of legacy telecom operators. However, other broadband and ICT-related activities may be regulated under separate broadcasting authorities, cable television and satellite rules, media and information content authorities, business and corporate regulations, and a variety of other regimes. Some countries have begun considering converged media or ICT regulators to address the overlap of these issues, while others have emphasized light regulation, focused mainly on fair competitive practices. Regardless of the approach, the implications of all multifaceted regulatory practices need to be understood and accounted for.

56.   Facilitating market entry: Virtually all countries that have achieved high levels of broadband access have emphasized competitive, coherent, market-oriented policies as a foundation for ICT market growth and innovation. Market-based, technology-neutral policies help ensure that investors and customers keep up with rapidly changing technologies and applications, while vigorous competition ensures that cost savings are passed on to users. Even in rural areas, there is an increasing array of solutions that can deliver commercially viable broadband services to many locations and user groups, given the flexibility to deploy cost-effective technology and targeted service options. Effective rural broadband development policies thus tend to facilitate market entry and competition in the delivery of network infrastructure and services at all levels.

57.   This is accomplished, for example, by issuing multiple licences and using a relatively open regime that allows new competitors to establish service and build networks wherever they perceive a market opportunity. Such licensing policies also involve a robust and strategic allocation of the frequency spectrum among different operators and platforms, including 3G mobile; WiMAX; very small aperture terminal, commonly known by its acronym VSAT; and other broadband wireless options. In some cases, leaving new spectrum available on an unlicensed basis, as typically applies to WiFi technologies, can help accelerate deployments with minimal barriers.

58. For rural markets in particular, open-market entry policies can also help promote targeted local investment in these areas by new investors, where established national operators might have less interest or incentives. In the context of broadband services, this is a relatively new model, particularly for developing countries, although the precedent of smaller, rural telephone companies has been followed in a number of countries in the past. With declining costs of broadband wireless access and innovative new microcell architectures, this concept of independent local communications operators is gaining interest as an option in a number of countries.

59. Ensuring competitive access: Effective broadband market development depends upon fair and equal opportunities for all competitors. This requires that those investing in new telecommunications networks and services be able to interconnect with existing networks on equitable terms. More broadly, the efficient provision of network access can be facilitated by measures to encourage shared use of common passive infrastructure, such as cell towers, telephone poles, underground conduit, and dark fibre, among other resources.

60. Many countries have adopted forms of local open-access obligations, including local loop unbundling, which require owners of last-mile networks to allow the interconnection of such competing service providers to their access facilities. Non-discriminatory, cost-based access obligations for sharing backbone networks and passive infrastructure, such as towers and telephone poles, are also frequently adopted as part of a pro-competitive regime.

61. The regulator must ensure that pricing or cost-sharing arrangements between network operators are fair and equitable. In the case of rural communications infrastructure, this is especially important, as the costs to build into rural areas can be high, and interconnection to the national backbone should be as affordable as possible to encourage rural investments.

62. Expanding beyond the market: Even where market-based development is fully encouraged, practical conditions may limit private firms' willingness to invest in broadband, especially in certain rural areas where likely returns will not cover costs. These conditions may arise from a combination of high costs to deploy infrastructure, as well as low incomes and sparse populations that may not be likely to generate sufficient revenue. Broadband services, equipment and software may not be affordable to many rural users, further suppressing demand, even where there may be interest in obtaining these services.

63. Many governments, together with the private sector and other stakeholders, have undertaken a range of policies to help expand broadband beyond these near-term market boundaries. Direct or indirect financial interventions to promote such expansion or universal access are common components of nearly all broadband development policies. They include a variety of forms of public–private partnerships, in which government funding helps underwrite some of the costs or risks of private investment, to the benefit of both, as well as the use of universal service funds to stimulate both supply and demand in unserved and underserved locations.

64. Policy support for greater access: Market incentives are often insufficient to ensure the availability of goods and services to those that need it most but do not have the ability to pay. Express governmental support to promote access to broadband to the poor, particularly in rural areas, is required. These can take the form of additional financial incentives for greater penetration into rural areas, direct governmental provision of broadband infrastructure to rural areas and network access partnerships that facilitate broadband access to the poor at lower rates, among others.

65. Promoting relevant ICT content: Policies that promote development of relevant ICT content, especially with a focus on the interests of less advantaged users, can help reinforce broadband demand. They can also contribute to the creation of ICT-based businesses and jobs, including software companies, business process outsourcing and online services. Such policies encourage the growth of domestic content that is of value to diverse groups of

citizens and communities, while emphasizing awareness, training and economic opportunity.

66. Support for programmes that focus on local content and application development can be provided through various government initiatives that include partnerships with educational institutions, private corporations, non-governmental organizations, other public funding programmes and activities within local communities. ICT content in developing countries that addresses the interests of non-traditional users, from farmers and rural residents to indigenous peoples, and reflects local community values and social conditions can include:

(a)   Content available in local languages and addressing indigenous cultures and traditions;

(b)   Applications focusing on ICT use in agricultural, fishing, forestry, tourism and other country-specific economic sectors;

(c)   Customized social networking services and programmes that encourage user-generated local content;

(d)   Mobile applications adapted to the devices and capacity levels of typical local users;

(e)   Applications and services aimed at specific disadvantaged or special groups, such women, the elderly, the disabled and non-literate users;

(f)   Business management and support software for local SMEs;

(g)   Entertainment content, including music and television programming, reflective of national values and interests.

67. Local government roles and responsibilities: Local and regional policies and rules can be at least as influential as national standards on broadband growth opportunities. Local government can bring important perspectives to ICT planning and implementation, whereas their opposition or exclusion can often lead to unforeseen impediments. Some key roles and functions played by local governments in the process of promoting rural ICT development include issuing permits and fees for infrastructure rights of way, local taxes, providing e-government services and facilities, direct participation in community access projects and contributions to local ICT education and awareness campaigns.

B.   National broadband strategies and plans

68. Many countries have recently embarked upon the process of creating a comprehensive framework for promoting development of broadband. These initiatives may have different labels, such as national broadband strategy or national broadband plan, and sometimes national ICT strategy or plan, although the latter may address a wider set of issues. Such a strategy or plan is different from a policy on ICT or broadband or telecommunications in that it goes beyond policy foundations to identify specific tasks, activities, targets, responsibilities and time frames to achieve tangible results. For example, stimulation strategies can be oriented to ensure coordinated broadband demand so that consumers adopt and benefit from broadband access. The World Bank's *info*Dev programme has produced a *Broadband Strategies Handbook*,[20] as well as an online

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[20] Tim Kelly and Carlo Maria Rossotto, eds., *Broadband Strategies Handbook* (Washington, D.C., World Bank, 2012).

Broadband Strategies Toolkit,[21] which provide in-depth discussions and recommendations on the development of such strategies.

69.   Governments of developing countries across different regions are putting in place such ICT policies and national broadband plans. For example, Rwanda's vision is to transform the country into a knowledge-based country by 2020. To achieve this vision, improvements were put forward in the business and regulatory environment, as well as in the ICT infrastructure. A 2,500 kilometre fibre-optic backbone connects 30 districts of the country and 9 major border points. A metropolitan network covers 3 districts of the capital, Kigali, and government offices. Several ICT initiatives, in areas such as health, financial services, e-government and agriculture, have already had significant impact on Rwandans. E-health solutions have led to a vast improvement in both quality and access to health care. E-procurement has increased government efficiency in Rwanda by stimulating good governance and promoting accountability and transparency.

70.   Effective broadband and ICT development policies are based on a strategic policy framework involving multiple agencies, which is actively endorsed at the highest level of government. Policy leadership may be asserted by the relevant ministry of communications or ICT, by the national telecommunications regulatory authority, or by a specialized ICT agency through close coordination with and participation of other offices. Key participating agencies generally include ministries of education, health, local affairs, culture, and more, as well as State and local governments. There may be a national coordinating committee to develop policy goals and allocate implementation responsibilities. In addition, some countries have developed broadband stakeholders groups, consisting of private-sector operators and suppliers, user groups, academic and research institutions, and non-governmental organizations, among others.

71.   A coordinated national broadband policy framework incorporates a comprehensive vision of broadband as a critical contributor to national socioeconomic development as well as a range of specific goals and action items, such as the following:

        (a)   Objectives for broadband expansion, including numerical targets for penetration within defined time periods, to create incentives and momentum for growth;

        (b)   Implementation strategy for key components of the policy, including priority activities such as infrastructure funding, licensing and government networks;

        (c)   Stakeholder roles and allocation of responsibilities, for both public agencies and private-sector operators;

        (d)   Funding sources, mechanisms and amounts to be channelled to specific activities;

        (e)   Public relations strategy to engage citizens in contributing to the planning and implementation process, and to promote awareness and demand for broadband.

IV. Findings and suggestions

72.   This report has discussed the nature of the broadband divide, a significant obstacle to the development of inclusive digital societies. Bridging the digital divide at all levels requires the cooperation of different actors. National governments can play an important role in defining and agreeing with all stakeholders on the scope of public policy in national broadband models to increase inclusive broadband development in developing countries.

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[21] http://broadbandtoolkit.org/en/home.

This concluding section summarizes the findings presented above and proposes a set of key issues for consideration by the Commission.

A. Findings

73. The findings are as follows:

(a) Broadband penetration and deployment contribute to economic and social development in all countries. There is evidence that economic gains occur at the macro level in terms of GDP growth arising from broadband expansion, while benefits can also accrue at the micro level in terms of productivity gains, employment and firm efficiencies. Important social benefits can be found in areas such as education, health care, information access and e-government;

(b) The debate over the goals for broadband service has evolved from universal access to universal services. However, there are still regions with important gaps in terms of access to broadband services, both between urban and rural areas, and between higher- and lower-income populations. Several factors explain these gaps. Some of the main barriers to broadband ICT development are the high prices of the Internet, the lack of an enabling policy environment, elevated costs of infrastructure, low revenue potential and low digital literacy rates;

(c) Comprehensive strategy frameworks for national broadband development must have shared, tangible objectives and be created, planned, and implemented using a multi-stakeholder approach;

(d) Coherent and holistic national policies and plans with clear targets and strong government commitment, clear regulatory frameworks and coordinated demand strategies are crucial to ensure that consumers can adopt and benefit from broadband access;

(e) Providing an enabling regulatory and policy environment focused on open markets and fair competition is crucial to ensure the benefits of broadband ICTs;

(f) Literacy, including traditional and digital literacy, plays a decisive role in the penetration and use of broadband access. Therefore, investment in education, with a focus on ICT-oriented curricula, is also critical to benefit from broadband development;

(g) Local content development can strengthen knowledge in communities and can be used as a platform to reach new markets;

(h) The development of an appropriate model of broadband infrastructure is essential to realizing the benefits of ICTs. Financing is a key element in this regard. New business models are required to capitalize on available opportunities.

B. Suggestions

74. The Commission is encouraged to take the following steps:

(a) Provide a forum for the sharing of best practices on the design and implementation of national broadband policies, with special attention to using comprehensive and multi-stakeholder approaches during all stages;

(b) Share and analyse evidence of best practices oriented towards reducing the urban–rural gap in broadband access in developing countries;

(c) Share and analyse policies and best practices aimed at reducing the digital divide in countries, especially in LDCs and landlocked developing countries;

(d)   Raise awareness about the importance of local content development to take full advantage of the opportunities offered by broadband ICTs, especially in terms of SMEs and entrepreneurship.

75.   Member States are invited to consider the following suggestions:

(a)   Consider a multi-stakeholder approach in developing national broadband plans. These plans should include clear definitions about roles and responsibilities, especially those of governments;

(b)   Develop coherent policy and regulatory frameworks to promote competition and investment in the ICT sector focused on achieving access to and affordability of broadband Internet;

(c)   Establish coordinated broadband demand stimulation strategies aimed at ensuring that consumers adopt and benefit from broadband access;

(d)   Explore new models for spectrum allocation and regulation. Innovations in this area can contribute to reducing the broadband access gap;

(e)   Explore the trade-offs with regard to the security issues of using international servers as data repositories;

(f)   Take action at policy and implementation levels to leverage existing pools of technology and infrastructure to reduce the digital divide at international and country levels;

(g)   Put emphasis on education and training policies that allow citizens to access and take advantage of the benefits of broadband services.

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