THE STATE OF BROADBAND 2012: ACHIEVING DIGITAL INCLUSION FOR ALL

A REPORT BY THE BROADBAND COMMISSION
SEPTEMBER 2012

ABOUT THE COMMISSION

The Broadband Commission for Digital Development was established by the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) in response to UN Secretary-General Ban Ki-Moon's call to step up efforts to meet the Millennium Development Goals (MDGs). Launched in May 2010, the Commission comprises government leaders from around the world and the top-level representatives and leaders from relevant industries and international agencies and organizations concerned with development.

The Broadband Commission embraces a range of different perspectives in a multi-stakeholder approach to promoting the roll-out of broadband, and provides a fresh approach to UN and business engagement. To date, the Commission has published a number of high-level policy reports, as well as a number of best practices and case studies. This report is published by the Commission on the occasion of the 2012 Meeting of the United Nations General Assembly in New York.

More information about the Commission is available at: www.broadbandcommission.org

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CONTENTS

LIST OF ANNEXES

LIST OF FEATURED INSIGHTS

LIST OF FIGURES

LIST OF TABLES

LIST OF BOXES

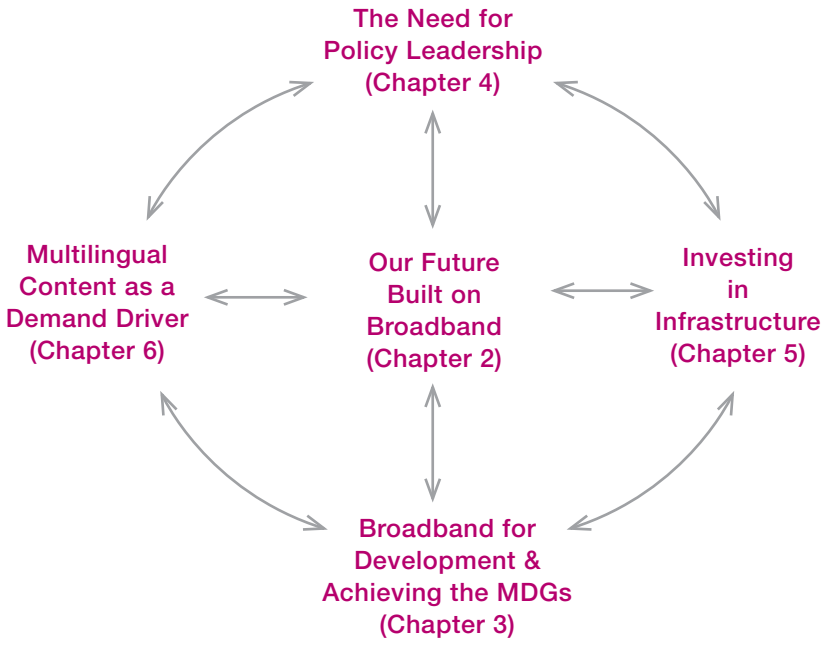
1 INTRODUCTION

High-speed affordable broadband connectivity to the Internet is essential to modern society, offering widely recognized economic and social benefits (Annex 1). The Broadband Commission for Digital Development promotes the adoption of broadband-friendly practices and policies for all, so everyone can take advantage of the benefits offered by broadband.

With this Report, the Broadband Commission expands awareness and understanding of the importance of broadband networks, services, and applications for generating economic growth and achieving social progress. It has been written collaboratively, drawing on insightful and thought-provoking contributions from our leading array of Commissioners and their organizations, foremost in their fields.

This Report is structured around four main themes which can help us to realize the potential of broadband:

Figure 1: The Structure of this Report



The extension of broadband infrastructure, services and applications is challenging, especially in the current economic climate – this Report explores some of the technical, policy and business decisions involved. It tracks countries' progress in the Commission's four targets anounced at the Broadband Leadership Summit in October 2011 for: making broadband policy universal; making broadband affordable; connecting homes to broadband; and bringing people online.

The Report recognizes a clear need for policy leadership to establish a strong vision among stakeholders and prioritize the deployment of broadband at the national level. A growing number of countries now have a national broadband plan, policy or strategy in place, with some 119 countries having a policy in place by mid-2012. Broadband is also becoming more affordable around the world, although it remains out of reach in many countries. Worldwide, countries are broadly on-track to achieve the Commission's target for household penetration. However, additional growth in access is needed to achieve the targets for individual Internet user penetration. Smartphones and mobile broadband may provide the much-needed impetus to achieve this extra growth.

The Commission hopes that this Report will inform and guide international broadband policy discussions and support the continued expansion of the benefits of broadband globally. The recent UN Rio+20 Conference advancing the Sustainable Development Goals (SDGs) recognized that "it is essential to work toward improved access to ICT, especially broadband networks and services, and bridge the digital divide, recognizing the contribution of international cooperation in this regard" (Rio+20 Outcome Documents). For then, broadband can deliver digital inclusion for all and continue to transform policy, social, and development outcomes around the world.

2

INTRODUCING OUR FUTURE BUILT ON BROADBAND

The Internet is changing. From narrowband to broadband, from kilobits to Gigabits, from connected people to connected things – our networked world is changing in speed, size, scale, and scope. Our ultra-connected future will build on converged Next-Generation Networks (NGN), while embracing broader concepts of embedded intelligence, automated Machine to Machine (M2M) traffic, and the 'Internet of Things'.

In our future networked world, we shall enjoy high-speed connectivity on the move, roaming seamlessly between networks, wherever we go – anywhere, anytime, via any device. Today, the stellar growth of mobile means that many people now access the Internet via a mobile device (Figure 2a). Worldwide, mobile phone subscriptions exceeded 6 billion in early 2012, with three-quarters of those subscriptions in the developing world (ITU, 2012). As the price of handsets falls and their functionality increases, soon the vast majority of people on the planet will hold in their hand a device with higher processing power than the most powerful computers from the 1980s (World Bank, 2012[1]). In 2011, the number of networked devices surpassed the global population.

By 2020, the number of connected devices may potentially outnumber connected people by six to one (Figure 2b), transforming our concept of the Internet, and society, forever (Featured Insight 1).

Today's Internet economy is large and growing fast by every measure. In 2012, the Boston Consulting Group estimated the size of the Internet economy in the G20 countries at around US$ 2.3 trillion or 4.1% of GDP in 2010; by 2016, this could nearly double to US$ 4.2 trillion[2]. In 2011, McKinsey estimated that the Internet accounts for 3.4% of total GDP and one fifth of all growth in GDP for the G8 countries plus five major economies (Rep. of Korea, Sweden, Brazil, China, and India – McKinsey Global Institute, 2011[3]). Taking into account the spillover effects of broadband could boost these estimates further, as broadband connectivity is also argued to impact positively labor productivity (e.g. Booz & Company, 2009[4]) and job creation (e.g. Ericsson, Arthur D. Little, 2012[5], Shapiro & Hassett, 2012[6]).

Figure 2: Introducing our Broadband Future

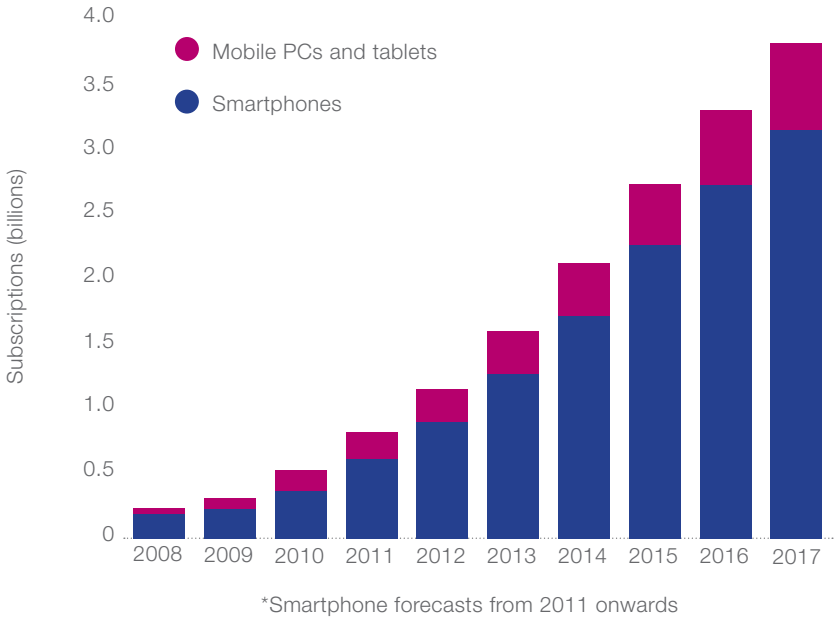


Figure 2a: Mobile (at least for Users)

The networks may or may not be mobile – but the users and devices definitely are.

Source: Ericsson Traffic & Market Report 2012.

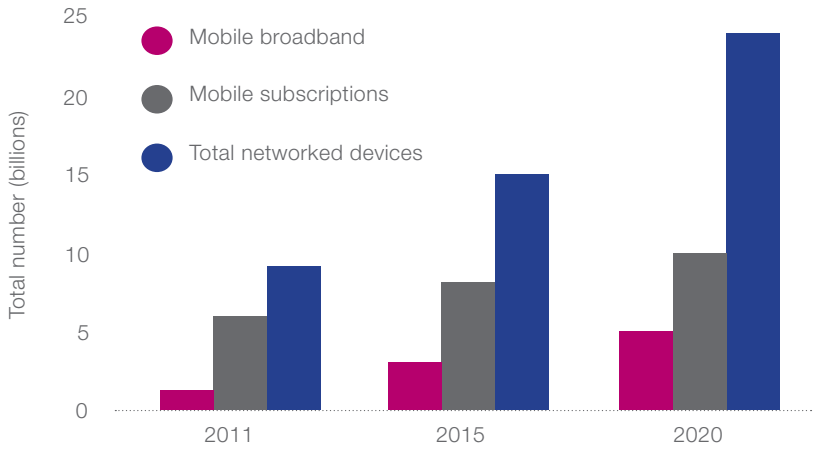


Figure 2b: Talking Things & Talking People

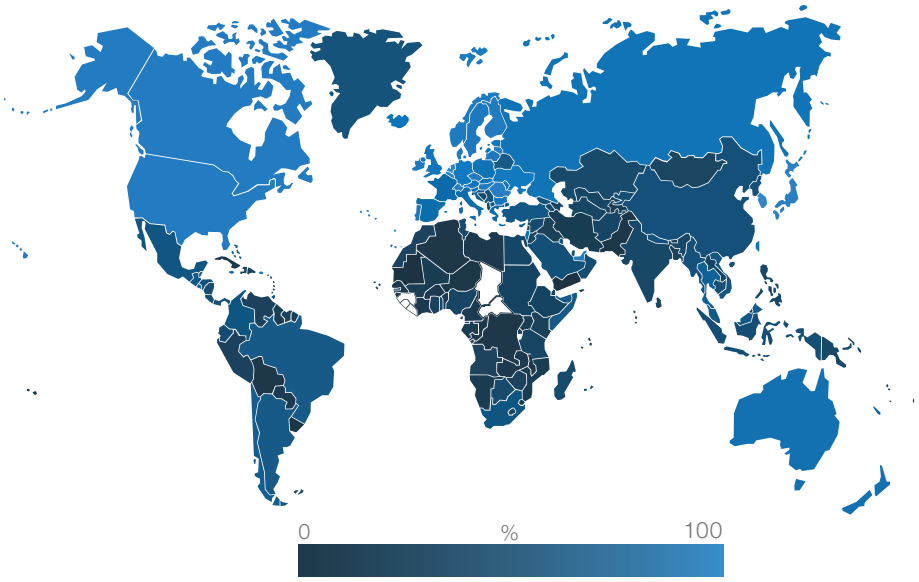
The number of networked devices overtook the total global population in 2011.

Source: ITU.
Note: "Total networked devices" refer to all SIM cards and M2M connections.

Figure 2c: High-speed (at least for some)

Countries with % connections to Akamai > 5 Mbps, shown on a sliding scale with light blue showing 100%.

Source: Akamai: www.akamai.com/stateoftheinternet/Map Visualization
Note: Data unavailable for countries shaded in white.



The World Bank (2009) has estimated that a 10% increase in broadband penetration would yield a 1.21 and 1.38% increase in GDP growth on average for high-income and low/middle-income countries respectively[7]. Country case studies yield similar estimates for individual countries as diverse as Panama[8], the Philippines[9], and Turkey (see Annex 1). Broadband is today a critical infrastructure in the growing global digital economy, and countries that fail to invest in broadband infrastructure risk being excluded from today's online economy, as well as the next stage of the digital revolution and future Internet.

Internet Protocol (IP)-enabled broadband connections are not just about economic empowerment, however. Always-on connectivity can improve our lives in a myriad of ways by providing better access to health and education, enabling financial inclusion, facilitating m-payments, and creating transparency in government, as just a few examples. Broadband will ultimately also enable everyone to access data easily in the cloud, use video conferencing and Voice over IP (Figure 2d), share updates over social networks (Figures 2e, 2f), and outsource – or crowd-source – everything from housework to homework (Box 1).

This will be the cutting-edge case for those of us able to access high-speed broadband connections to the Internet. Large swathes of the industrialized world can already access high-speed Internet connectivity at over 5 Mbps; however, the picture is not as bright for Africa, much of southern Asia, and Latin America (Figure 2c).

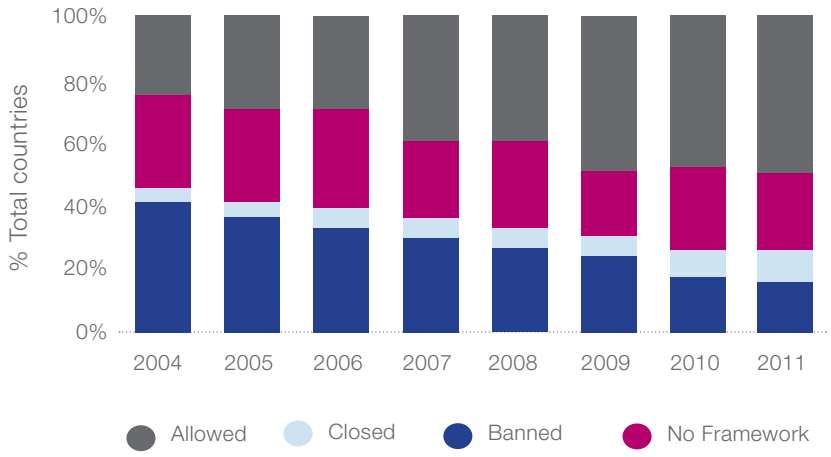


Figure 2d: Internet Protocol (IP)-enabled

Worldwide regulation & legalization of VoIP, 2004-2011 (% of total number of countries).

Source: ITU.

Figure 2e: Real-time

Growth in Twitter @replies to and from users in Japan in real-time after the earthquake on 11 March 2011.

Source: Twitter cited at Maproom: www.maproomblog.com/2011/06/twitter-mapping_the_japanese_earthquake.php

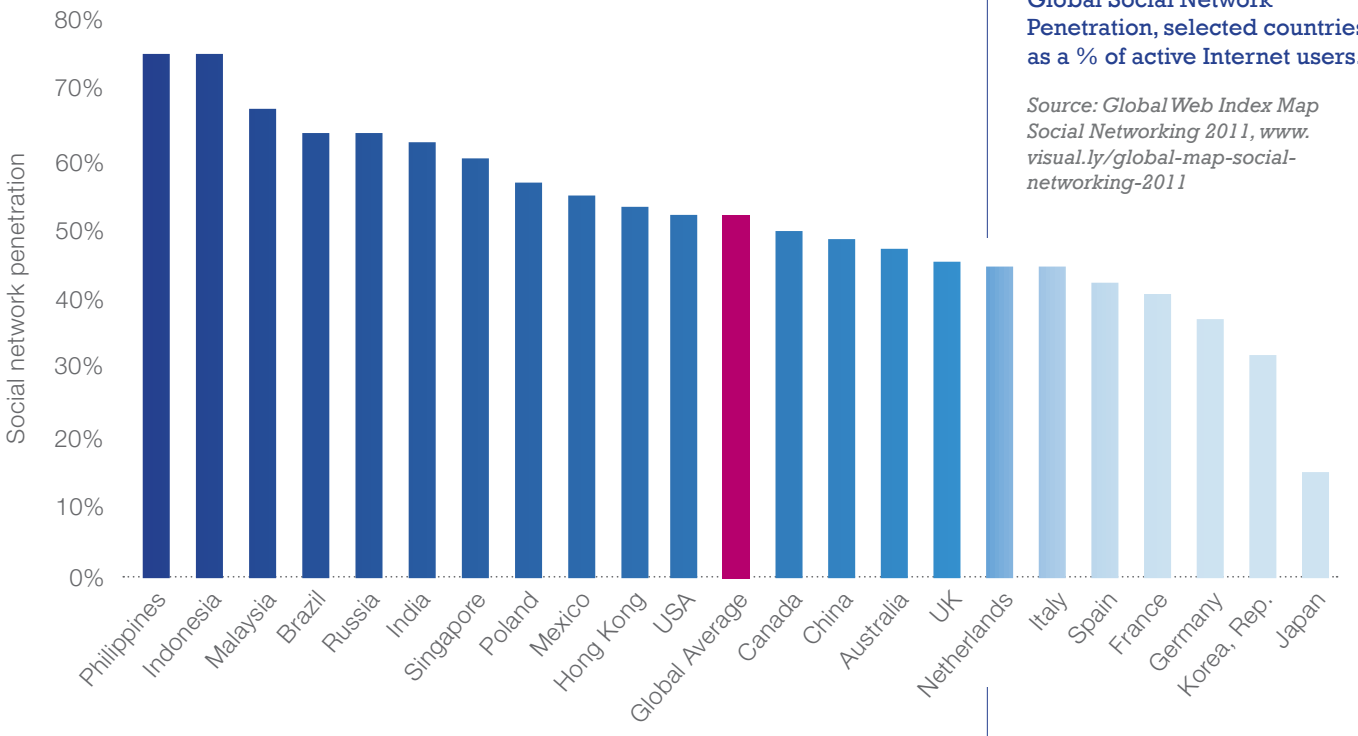


Figure 2f: Loud & Social

Global Social Network Penetration, selected countries, as a % of active Internet users.

Source: Global Web Index Map Social Networking 2011, www.visual.ly/global-map-social-networking-2011

Box 1: Our Mobile High-speed Future

Which trends will drive our mobile high-speed future, and how will they impact users?

- Real-time status updates for objects, as well as people, in a growing 'Internet of Things';
- Using location-based services and Global Information Systems (GIS) in many different ways in our lives – for example, to summon taxis, avoid traffic jams, track late buses or stolen cars, locate friends – and ourselves;
- Apps 'pushing' out information to users, rather than users searching for and 'pulling' in information;
- Sharing our likes and dislikes, resulting in targeted advertising, as well as search results tailored to our personal preferences;
- Better access to healthcare or government services and job opportunities;
- Collaborative crowd-sourcing in authorship, project management, funding relief efforts, generating encyclopaedias or news reporting;
- 'Collaborative consumption'[10] or the outsourcing of tasks or household chores for a price;
- Changes to our notions of privacy, or even the demise of privacy?
- Converged cross-platform malware, as well as converged services;
- Storing data in the cloud – you need never again be dependent on your physical device.

Source: ITU.

Given the prolific spread of mobile, in the future, the digital divide[11] (or inequality in access to Information and Communication Technologies or ICTs) may no longer describe disparities in access, but instead denote disparities in speed and functionality – or more specifically, what people can do with their mobile devices (Figure 3). Indeed, the handset may become relatively less important, as more and more people will use their mobile device as a portal to the content and apps available in the online world. A host of online services and apps are today making mobiles and smartphones even more powerful by combining several functions – for example, Instagram enables the fast sharing of photos and video over different devices or different social networks, while Mini Opera 'compresses' data-heavy websites for easier access over lower speed mobile connections.

Figure 3: Smartphones as portals to the online world

There were 589 million fixed broadband subscriptions by the end of 2011 (most of which were located in the developed world), but nearly twice as many mobile broadband subscriptions at 1.09 billion (Table 1). Of a stock of 5.97 billion mobile cellular subscriptions worldwide by the end of 2011, some 18.3% related to mobile broadband subscriptions. Nearly a third of all handsets shipped in 2011 were high-speed devices (IDC, 2012)[12]. According to Ericsson, to date, mobile broadband subscriptions are growing by approximately 60% year-on-year and could reach around 5 billion in 2017[13].

Worldwide, the total number of smartphones is expected to exceed 3 billion by 2017 (Ericsson, 2012[14]), with the number of smartphones sold in Africa and the Middle East expected to increase four-fold from 29.7 million units sold in 2011 to 124.6 million by 2017 (Pyramid Research[15]). In Latin America, smartphones could represent half of all mobile phone sales by 2016[16]. Smartphone adoption is also gaining momentum rapidly in the Asia-Pacific region[17], where smartphones are projected to account for 33.2% of all handsets sold in 2012, with China alone representing 48.2% of units sold[18]. According to Ericsson, Singapore ranked number one in the region for smartphone ownership[19].

We are moving towards a world with a multiplicity of devices, including new specialized devices in a pervasive "Internet of Things". With laptops shrinking in dimensions, as smartphones gain in functionality, the space between smartphones, tablets and PCs is shrinking fast, while the gap between smartphones and basic feature phones is widening. Tablets remain a great enabler for broadband usage, as they are able to deliver more content via a larger screen. In reality, there is an important role for all of these different devices (smartphones, tablets, netbooks, PCs, and fixed devices), with people choosing the appropriate device for the task at hand – but they all need broadband (see Box 2: The Device Wars).

The strong growth in mobile broadband and smartphones is promising, but should not generate complacency. Indeed, growing multi-device ownership means that the number of mobile cellular subscriptions is today significantly larger than the number of actual mobile phone users (see Box 3: Have We Cracked Access?).

Table 1: Summary statistics for high-speed connectivity

	Total 2011	Broadband Total, 2011	% Global Total high-speed, 2011
Internet users	2.26 billion	-/-	-/-
Fixed Internet subscriptions	658.8 million (2010)	589 million (2011)	80% (2010)
Mobile subscriptions	5.97 billion	1.09 billion*	18.3%
Handset shipments	1.55 billion	491.4 million (smartphones)	31.8%

Source: ITU (www.itu.int/ITU-D/ict/statistics/at_glance/KeyTelecom.html). Smartphone shipment statistics from IDC 2012 at www.mobithinking.com/mobile-marketing-tools/latest-mobile-stats#phone-shipments.
*Note: * includes data-only subscriptions.*

FEATURED INSIGHT 1: HOW BROADBAND IS CHANGING OUR SOCIETY

Technology and innovation are what makes it possible for human civilization to advance. Throughout history, technology and innovation have transformed the way we live and brought about civilizational change. Today, the digital revolution is transforming our world and our societies even faster, some of which are now connected through voice data and video at the speed of light. Technological progress is taking us from a secondary industrial society to a tertiary service society. More than 80% of the population in developed countries now work in the service sector. The telecom network represents the circulation system of the knowledge society, with advances in IT and computing leveraging our knowledge and brainpower. The development of the Internet has triggered profound socio-economic and political changes, and is transforming the services industry.

Broadband Internet should be accessible to all – this is the aim of work underway at the UN and the ITU. In 2010, ITU and UNESCO launched the Broadband Commission to provide universal access to broadband and universal access to connectivity. Today, being connected is crucially important – everyone has to be connected, everyone should have access to knowledge and understanding – for education, health, business, for entertainment. The Broadband Commission is working for digital inclusion for all by 2015.

High-speed Internet access via mobile handsets is the most likely way of achieving this. Most people can access voice via mobile, but not yet data. High-speed 3G and 4G technologies are starting to impact, but we need to invest more quickly in the smart technologies which will make access to data happen. Globally, 15% of the world population have smartphones, and more than 50% in the US, both growing fast. Operators have to offer customers the best conditions in quality, price and technology over multiple platforms.

In 2012, the US has launched Connect2Compete. In Mexico, we launched a programme for technological innovation in 2010, and this year, Connect2Grow, with the main aim of equal opportunity for all people. In Latin America, we are creating free Digital Libraries mainly in public schools where people can go to learn and surf the web for free with loaned computer equipment at high speeds. Telmex has a programme in Mexico, which has benefited more than 2.8 million students, teachers and parents. In Telmex's Bibliotecas Digitales, IT training is provided, while people can borrow laptops and take them home. We are developing thousands of WiFi hotspots for our customers. The Broadband Commission is documenting best practices, so we can know and learn from what is being done in different countries.

However, with such rapid technological change, serious challenges are arising, due to a lack of the deep structural changes accompanying civilizational change. We are seeing very high unemployment, especially among youth. What activities will create new jobs? Where are these new jobs being formed? We need to promote sectors which will create these new jobs. Governments should introduce IT in their activities, promote digital culture and economic activities that are creating new jobs. It is clear that IT is a key tool for economic growth.

There are huge vistas of opportunity opening up to create millions of jobs, with the possibility of developing hundreds of thousands of apps and content that can be used by everyone connected via the web. People need to be trained to higher levels of skills and education, so the young are better trained for working in job openings in tourism, health, ICTs, culture and education. Online universities should be created and made accessible to educate many more people successfully over the Internet. How we work – and how we retire – will have to change. Structural changes have to be made, and quickly, to avoid a deterioration in living standards, unemployment, socio-economic and political problems and crisis. We need to look back and also acknowledge the costs associated with the ways in which societies move from the agricultural society to the industrial civilization.

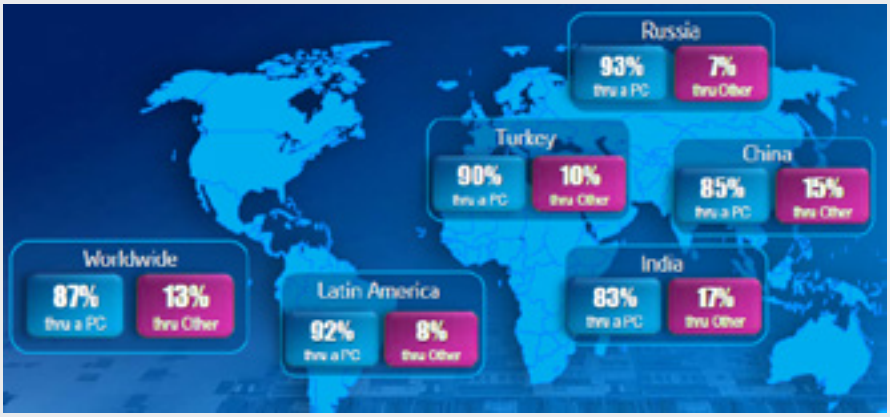
Source: Mr. Carlos Slim Hélu, President, the Carlos Slim Foundation.

Box 2: The Device Wars

With laptops shrinking in dimensions, and smartphones gaining in functionality, the differences between smartphones, tablets and PCs are shrinking fast, while the gap between smartphones and basic feature phones is widening. Which device will win out? How will tomorrow's digital generation access the Internet? The answers, as always, depend on the the exact question asked.

Today, according to survey data about how people are accessing the Internet, PCs remain the dominant Internet access device of preference in many countries by a large margin, including in many emerging markets (see chart below). According to Ericsson's Traffic & Market Report (2012), "mobile data is expected to have almost doubled in 2011. Laptops, which are perhaps more aptly described as mobile PCs, dominate data traffic in most mobile networks today, but smartphone traffic is growing faster, due to high growth in subscriptions".

The devices which people are using to access the Internet, 2012



Source: Intel.

In the near future, the outlook for Internet access devices will be more diverse. Ericsson estimates that the total subscriptions of data-heavy devices (smartphones, mobile PCs and tablets) will grow from around 850 million at the end of 2011 to 3.8 billion by 2017. In terms of the number of devices, Ericsson predicts smartphones will outnumber both tablets and PCs (Figure 2a). Regarding data traffic however, the picture is quite different. Cisco (2012) estimates that adding one smartphone to a network is equivalent to adding 35 non-smartphones; adding one tablet is equivalent to 121 non-smartphones (or 3 smartphones); while adding a laptop/mobile PC is equivalent to 500 non-smartphones. This leads Ericsson to conclude that "in later years [i.e. towards 2017], data traffic will be split fairly equally between smartphones, mobile PCs and tablets" (see chart below).

Global mobile traffic: Voice and data, 2010-2017

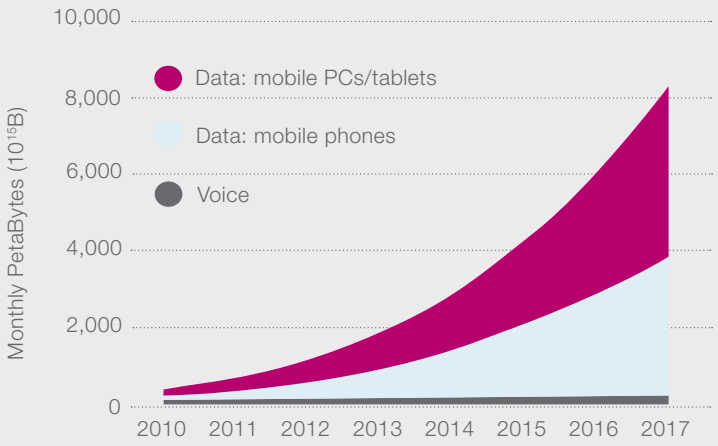


Figure source: Ericsson Traffic and Market Report 2012.
Box sources: Intel, Ericsson and Cisco Virtual Networking Index 2012.

FEATURED INSIGHT 2: BROADBAND FOR PRIVATE SECTOR DEVELOPMENT

As a Broadband Commissioner and head of UNCTAD, the UN body that promotes the development-friendly integration of developing countries into the world economy, understanding the implications of emerging technologies for economic development and poverty reduction is high on my agenda. Possibilities to make use of ICTs for development have never been greater. New mobile apps, innovative usage of the Internet and the expansion of broadband connectivity to more developing countries are creating unprecedented opportunities for enterprises in the South to link to national and international value chains, knowledge networks, and markets. This is encouraging.

At the same time, there is no reason for us to become complacent. The global broadband landscape is still characterized by huge gaps in basic connectivity, as well as bandwidth. According to Ookla, highest average download speeds for consumers are currently found in Luxembourg at 49Mbit/s, compared to some LDCs, such as Bangladesh, Malawi, and Sudan, with speeds of 1 Mbit/s or less. In areas where the market is failing to deliver desired broadband connectivity, policy-makers may need to intervene to expedite network and service deployment.

In most low-income countries, mobile solutions will be the preferred route to extending broadband. In several developing countries, high-speed wireless subscriptions already surpass fixed broadband subscriptions. The challenge is to leverage broadband in a way that helps accelerate development where it is most needed. Effective use of the Internet can help enterprises become more productive, access information and knowledge, and bring their output to markets. The Internet enables enterprises to engage in e-commerce, as well as with Governments. However, the extent to which enterprises are making use of this opportunity varies considerably – both between countries and between companies of different sizes (UNCTAD Information Economy Report 2011). UNCTAD data show that fixed broadband use is today almost ubiquitous in developed economies, with around 90% of enterprises benefiting from high-speed Internet access. The pattern is more diverse elsewhere. For example, more than three-quarters of medium and large enterprises in Brazil, Colombia, Qatar, Singapore, Turkey & UAE enjoy broadband access, but the corresponding share is much lower in LDCs, especially among smaller companies.

Source: Dr. Supachai Panitchpakdi, Secretary-General, UNCTAD.

Box 3: With 6 Billion Mobile Subscriptions, Have We Cracked Universal Access?

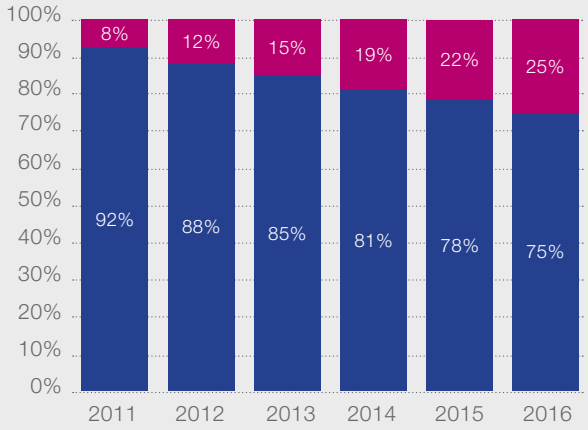
Accurate and up-to-date statistics are vital for good policy-making. With nearly 6 billion mobile subscriptions globally and per capita mobile penetration standing at 86.7% by the end of 2011 (ITU, 2012) three-quarters of the world's population now have access to a mobile phone (Pew, 2011[20], World Bank 2012[21]). Mobile phone penetration stood at 117% in the developed world at the end of 2011, compared to 78.8% for developing countries, so disparities in penetration and access still persist.

Do statistics based solely on subscriptions risk generating complacency? Cisco (2012) estimates there were around 4 billion actual mobile users in 2011, forecast to rise to 5 billion mobile users by 2016, with one billion more users joining the mobile world over the next four years, equivalent to the population of India. Basing statistics on users rather than subscriptions leads to different conclusions as to whether access remains an issue for the developing world as, according to these estimates, actual user penetration is considerably lower than subscription penetration rates. The discrepancy in statistics partly derives from multiple Subscriber Identity Module (SIM) card ownership and multi-device ownership, which are increasing dramatically. Cisco estimates that by 2016, a quarter of all mobile users will own more than one device and about 9% will have three or more devices. Deloitte notes a similar trend in multi-tablet ownership (TMT Predictions 2012[22]) .

Multi-ownership is a trend which mobile operators are monitoring closely. Today, most mobile subscriptions are device-centric (with typically one subscription per device). With multiple device ownership, it may be better to pool the bandwidth across different devices (per user), so mobile operators can offer packages for multiple devices. In spring 2012, Verizon announced the imminent introduction of data share plans, "Share Everything", which allow users to share data plans within a single family and across multiple

Multiple Device Ownership

One-quarter of users will have Multiple (2+) Mobile Devices in 2016, up from 8% in 2011



devices[23]. AT&T has also committed to launching multi-device data plans[24]. This is good news for consumers with multiple devices, as they will no longer have to hold a separate plan per device[25]. Growing demand for services via multiple devices could exacerbate bandwidth constraints, with providers looking for new ways to keep pace with need.

Better market data is needed, improved statistics, and more informed discussion of trends in mobile usage. High-level broad-brush statistics may be useful, but may engender complacency and need to be accompanied by informed discussion of the real needs for analysis in different countries. ITU hosts an annual World Telecommunication/ICT Indicators Meeting (WTIM) to generate discussion and provide training on ICT statistics and statistical issues (www.itu.int/ITU-D/ict/wtim12/index.html).

Sources: ITU, World Bank IC4D Report 2012, Cisco VNI 2012; Voice of Broadband, Vol. 7, Issue 2; Deloitte TMT Predictions.

ENDNOTES

1. "Information and Communication for Development Report 2012: Maximizing Mobile", World Bank (2012), available at: www.worldbank.org/ict/IC4D2012.
2. Boston Consulting Group press release, 27 January 2012, available at: www.marketwire.com/press-release/g-20s-internet-economy-is-set-reach-42-trillion-2016-up-from-23-trillion-2010-as-nearly-1611718.htm, citing from "The Connected World: The Internet Economy in the G20", Boston Consulting Group (BCG) Report, March 2012.
3. "Internet Matters: The Net's sweeping impact on growth, jobs, and prosperity", McKinsey Global Institute (2011) found the Internet accounts for 3.4% GDP & 21% of GDP growth in G8 plus S. Korea, Sweden, Brazil, China & India: www.eg8forum.com/fr/documents/actualites/McKinsey_and_Company-internet_matters.pdf.
4. For example, Booz & Company (2009) found that a 10% increase in broadband penetration in any year is correlated with a 1.5% increase in labour productivity over the following five years. "Digital Highways: The Role of Government in 21st-Century Infrastructure", co-authored by Roman Friedrich, Karim Sabbagh, Bahjat El-Darwiche and Milind Singh.
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3

BROADBAND FOR DRIVING DEVELOPMENT AND ACHIEVING THE MDGs

The real power of broadband lies in its potential to improve development outcomes around the world. There is today growing evidence that broadband is making a tangible difference in the lives of people around the world and accelerating progress towards the Millennium Development Goals (MDGs). The Rio+20 Conference advanced Sustainable Development Goals (SDGs) recognizing that "it is essential to work toward improved access to ICT, especially broadband networks and services, and bridge the digital divide, recognizing the contribution of international cooperation in this regard"[1].

Broadband technologies offer major opportunities to advance socio-economic development, from providing access to education or health information to making electronic payments enabling people to set aside valuable savings and survive economic shocks. Mobile phones are increasingly powerful portals to the online world, making people more informed and enabling them to exercise choice and make better decisions. Featured Insight 3 and Table 2 outline the ways in which broadband, and especially mobile broadband, is making a difference in the lives of people around the world and accelerating progress in achieving the MDGs.

FEATURED INSIGHT 3: ENABLING SUSTAINABLE, ECONOMIC WELL-BEING THROUGH MOBILE TECHNOLOGY

Mobile networks are increasingly pervasive, transforming our lives in numerous ways. This phenomenon is most compelling in emerging and developing markets where the impact of resource deficiencies are amplified due to information asymmetries. Technological platforms – first mobile, and now broadband – are unprecedented levelers for society, enabling access to economic opportunities and social welfare earlier out of reach.

In India, farmers are among the major beneficiaries of the mobile revolution. Bharti Airtel reaches out to more than one million farmers, contributing significantly to their productivity and incomes. Through its joint venture with IFFCO, the world's largest fertilizer cooperative, farmers are provided with vital information on weather, commodity prices, agronomy, horticulture, government schemes, etc., helping them make timely, informed decisions. With more than two-thirds of India's population dependent on agriculture for their livelihoods, the scope is significant.

Mobile money is another revolution which has steadily emerged as a potent driver of inclusive growth in India and Africa, driven by their large populations and vast geographies needing coverage. According to the Boston Consulting Group, US$ 350 billion is expected to be channeled through this medium by 2015 in India alone. Airtel Money, present in eight African countries and India, enables unbanked citizens to join the financial mainstream – for example, by facilitating money transfers, which would otherwise be impossible or prohibitively expensive.

With 0.6 doctors for every 1000 people, access to affordable, quality healthcare is a distant hope for a vast majority of the Indian population. Airtel's m-Health service, 'Mediphone', is a doctor-on-call service, providing customers with quality health advice over mobile phones – anytime, anywhere. Launched in November 2011, Mediphone has already helped nearly 100,000 people. With more than 900 million mobile subscribers in the country, the potential to bridge the gap for medical support is tremendous.

The power to progress well-being through the mobile phone is, perhaps, best exemplified in a pilot led by The Earth Institute. In this initiative, Airtel is supporting a host of innovative programmes in villages across six countries in Africa. Under this programme, Airtel enables citizens to access education, health and solar energy through mobile connectivity.

As the data revolution transforms mobile, the opportunities for enhancing economic well-being through mobile broadband are endless. Smartphones and feature phones are already becoming cheaper. A nurturing regulatory landscape will be the catalytic force for realizing the transformative impact of the broadband revolution.

Source: Sunil Bharti Mittal, Chairman & Managing Director, Bharti Airtel Ltd.

There is today no doubt that even low-speed connectivity and Short Message Service (SMS) systems such as RapidSMS are improving development outcomes – concrete proof of the benefits of connecting remote and rural communities is found every day.

The experience of the Praekelt Foundation shows just how powerful simple text messages can be - the Praekelt Foundation in Africa is sending out a million SMS per day, such as (for example): “HIV positive and scared to tell your partner? For help, please call the AIDS helpline 1-800-123-232”. The foundation sent 2 billion messages in seven languages over the last two years and generated 2.5 million calls to the National AIDS helpline.

Even more could be achieved with broadband connectivity – not simply due to higher speed connectivity, but due to a raft of new opportunities arising from the integration of communications into existing or improved health systems. For example, using information systems in conjunction with health databases and Global Information Systems (GIS) can help ensure health support and education are delivered where they are most needed (Featured Insights 5, 6 and 7). This has been accomplished by the Azim Premji Foundation in education. ICT connectivity is not a panacea, but when integrated effectively with existing systems, it can facilitate new services and help deliver the best results (Table 2).

But what does growth in mobile broadband mean practically for development? Some have argued that, from a demand perspective, low-income consumers may spend valuable money on ICT services – money which they need urgently for basics such as food and shelter. Others argue that money spent on ICTs reflects people’s changing needs and that choice should remain with individuals as the best judges of their own needs. Connectivity can enable people to take on new forms of work and earn more money (Box 4). Decades of experience of development work suggests that empowering women through access to ICTs could result in optimal decisions over income and work for their families (Featured Insight 4).

Table 2: Broadband and the MDGs

 End Poverty & Hunger	A growing body of evidence suggests that broadband can boost GDP and income, helping combat poverty and hunger. Research by the World Bank suggests that a 10% increase in broadband penetration could boost GDP by 1.38% in low- and middle-income countries. Country case studies suggest a strong impact of fixed and/or mobile broadband in individual countries, depending on their economic structure – e.g., in the Philippines (see Annex 1).
 Universal Education	Governments and NGOs are providing schools with PCs to foster a sound primary education[2]. In Senegal, a survey found 27.8% of school pupils reported they had acquired better knowledge, and 6.5% understood lessons better with content from ICTs[3]. High-quality electronic content curricula can improve educational outcomes[4]. Portugal and Uruguay have launched programmes to provide students and teachers with laptops as a basic tool for improved education. The Jokko m-education program builds literacy for women and girls through SMS in Senegal.
 Gender Equality	In India, the Azim Premji Foundation works using computers as an inducement to keep children in schools[5], particularly girls, whom they find have 20% lower literacy[6]. Various studies have reported that men and women use ICTs differently, e.g., in Senegal, women use ICTs to access information while men prefer communication with friends and family members[7]. For mobile telephony, GSMA has estimated that closing the mobile gender gap would increase revenues for mobile operators by US$ 13 billion (Chapter 5)[8].
 Child Health	ChildCount+ is a community health reporting and alerts platform aimed at empowering communities to improve child survival and maternal health[9]. It helps community health extension workers register children under five to monitor their health status, including screening for malnutrition every 90 days, as well as monitoring immunizations, malaria, diarrhoea and pneumonia[10]. It integrates with existing health information systems to help experts analyze data on child health more rapidly to improve treatment.
 Maternal health	ChildCount+ registers pregnant mothers and provides support for antenatal care, such as the launch of a software module in Ghana in August 2011 aspiring to reduce mother-to-child transmission of HIV[11]. Hospitals connected via broadband networks are also enabling remote diagnosis and support for maternal health. WE CARE Solar in Nigeria provides healthcare workers and midwives with mobile phones and reliable lighting using solar electricity to facilitate safer deliveries of babies.
 HIV/AIDS	Bozza is an online platform which shares content (music, video, poetry etc.) from across Africa. This app uses data-intensive mobile services to raise awareness about AIDS and condom use and create job opportunities in South Africa, Nigeria, Kenya and Tanzania[12]. In South Africa, the Praekelt Foundation uses an open source SMS TxtAlert system to remind HIV patients about appointments and track which patients miss them or ART medication pick-ups. However, the project faces challenges in expanding to clinics without digitized electronic databases outside Johannesburg[13].
 Environment	Smart grids can significantly reduce energy consumption through improved heating, cooling and monitoring technologies[14]. Broadband can reduce energy and water consumption through a range of technologies such as smart transportation and logistics, smart grids and meters, smart buildings, use of video conferencing and dematerialization. Smart use of ICTs can reduce greenhouse gas (GHG) emissions by up to 25%[15]. Mobile technology alone could lower GHGs by 2% by 2020[16].
 Partnership	The benefits of new technologies, especially ICTs, should be made available in cooperation with the private sector[17]. In conjunction with public sector policy leadership, the private sector has driven expansion in the markets for fixed and mobile broadband. The market for mobile broadband has been driven by competition and private sector investment in many countries.

FEATURED INSIGHT 4: BROADBAND FOR IMPROVING THE LIVES OF WOMEN – AND THEIR FAMILIES

Empowering women through ICTs can help generate social and economic development. Experience from development work over recent decades shows that empowering women leads to positive economic and social change – for women and for their families. Some of the most powerful ways to advance development focus on increasing women's access to education, healthcare and financial services, which in turn allow them to improve their quality of life and that of their families. Evidence for the importance of women as socio-economic change agents includes:

- **A 2008 OECD report cited evidence that women spend up to 90% of their income directly on their families and communities.**
- **The FAO underlined in 2009 that women are critical for food security, as they cultivate up to 80% of all food in many low- and middle-income countries.**
- **IDB has found that children of employed mothers have 5% better educational attainment than other children in 13 out of 15 Latin American countries.**

The conclusions are clear – if policy-makers wish to improve standards of living over the long-term, they need to ensure that mothers, aunts, and sisters have access to mobile phones and broadband, as women often make choices with the best interest of the family and the future generation at heart.

Source: H.E. Jasna Matic, Former State Secretary for the Digital Agenda, Government of the Republic of Serbia.

ICTs and broadband can also improve the delivery of education, enhancing educational outcomes. Current figures show that despite the objective in MDG 2 of achieving Universal Primary Education (UPE) by 2015, 69 million children still lack formal education[18]. Moreover, 774 million adults cannot read or write[19]; the majority of whom live in developing countries.

Whereas serious attention has been devoted to mHealth, mAgriculture and mPayments, mEducation or mLearning is taking a little longer to come to fruition. National investments in education are a solid and consistent predictor of economic growth (Rodrik, 2000). One report concludes that one additional year of school can be directly associated with a 30% increase in per capita income[20]. With the advent of cheaper tablets and smartphones, the world is realizing the potential of broadband to enable access to education from anywhere and anytime via mobile devices. Cloud technology also promises to offer even greater opportunities for mLearning and improving educational outcomes (Featured Insights 5 and 6).

Meanwhile, ITU, its Members and NGOs are experimenting with concepts of m-learning and digital literacy. ITU and telecentre.org Foundation launched the Telecentre Women Digital Literacy Campaign in April 2011 with the goal of training 1 million women to become digitally literate. Open to all stakeholders, nearly 240,000 poor and marginalized women have already been empowered through this initiative (see www.women.telecentre.org/).

Box 4: Practical Uses of Mobile Communications in Low-income Countries

Using even a basic mobile phone, people in remote, rural and/or low-income areas can:

Obtain better-paid work with more stable and/or increased income by:

- becoming contactable and working on a flexible basis (e.g. in hotels, bars, nursing or childcare);
- saving, borrowing or transferring seasonal and/or variable income, enabling them to withstand external shocks (e.g., floods, drought or a collapse in commodity prices).

Help farmers in agriculture and food chain intermediaries by:

- finding the best market price for their crops, increasing their income;
- tracking the latest weather information to protect crops and raise yields;
- tracking the movement of important food sources (e.g., fish stocks or herds of wild deer or horses).

Improve health outcomes:

- checking the nutritional value of food or allergens to improve nutritional outcomes;
- receiving diagnoses and/or treatment reminders, helping limit and contain disease outbreaks; and
- monitoring and analyzing vital symptoms for better preventative healthcare.

Survive emergencies and natural disasters by:

- summoning assistance, getting critical support and coordinating relief efforts;
- finding and contacting the nearest relief centre, clinic, or field hospital; and
- tracing, finding, or contacting relatives.

Financial inclusion via mpayments and mbanking:

- mPayments/mBanking can help transfer remittances;
- mPayments could promote transparency and combat corruption;
- the ability to transfer money can improve lower income workers' ability to contract micro-loans, enabling them to better withstand financial shocks.

Help create a low-carbon economy by:

- Introducing more energy-efficient infrastructure;
- improving crop yields and reducing food wastage;
- reducing carbon consumption through more efficient communications;
- cutting down or avoiding travel through improved communications.

Source: ITU.

FEATURED INSIGHT 5: BROADBAND AND MLEARNING

mLearning is especially meaningful in developing countries and in rural areas, where infrastructure is poor and access to resources may prove a challenge. mLearning provides anytime, anywhere educational content delivered via mobile technology. Mobile phones are truly unique in their ubiquity, accessibility and affordability. mLearning differentiates itself from e-learning in the sense that it is independent from any fixed infrastructure. mLearning can range from simple SMS messaging, MMS live classroom sessions, web and podcasting to audio-to-text or text-to-audio applications. It provides rich learning experiences via educational video, logical reasoning and problem solving games, and even mobile whiteboards for interactive discussions.

In developing countries, only 25% of homes have computers[21], so perhaps the most important benefit of mLearning is its potential to reach people through devices which, before long, will be in the pockets of every person on the planet. The most up-to-date content can be accessed immediately and from anywhere and repeatedly reviewed for better understanding. Although most mLearning happens today via feature phones, our imaginations are inspired by the greater possibilities of higher bandwidth (e.g., live tutoring via a mobile device). Examples of successful mLearning projects and initiatives already underway include:

Ayala Foundation - Text2Teach in the Philippines: This programme offers complementary classroom-based learning and teacher support. It allows teachers to download short videos to a mobile device and screen them in the classroom. Over 57 000 students already benefit from this program[22].

MoMaths (mLearning for Mathematics Project) in South Africa: Nokia has partnered with several global and South African organizations so teenagers can access short math courses and a database of 10,000 questions. Students receive immediate feedback on multiple choice practice tests. By 2010, this service had reached over 4,000 students.

BBC World Service Trust in Bangladesh – Janala: This ground-breaking multi-platform project uses mobile phones, Internet and TV to provide English lessons to millions of people in Bangladesh. Students dial 3000 to access hundreds of 3 minute audio lessons and can assess progress with interactive audio quizzes. Nine months after launch, this service had attracted some 3 million calls with many repeat users.

Source: Alcatel Lucent.

FEATURED INSIGHT 6: INTEGRATING ICT INTO EDUCATION – THE MILLENNIUM VILLAGE PROJECT

To leverage the power of ICT to help improve the quality of education for students everywhere through access to teaching and learning resources, Connect To Learn was launched in 2010 as a collaborative effort between the Earth Institute providing advice on development, education, and evaluation; Ericsson as lead technology partner; and Millennium Promise, a non-profit organization.

The Millennium Village Project places education at the core of integrated rural development across sub-Saharan Africa. Building on the expertise of each partner, Connect To Learn identifies strategies to integrate teacher professional development with 21st century ICT-based teaching, tools and practices in classrooms.

Connect To Learn combines a cloud-based ICT solution developed by Ericsson and other partners for schools with the on-the-ground experience of partner NGOs. By using cloud technology, it aims to remove ICT support tasks from teachers and provides them with technology that is simpler to manage, so teachers can focus on improving the quality of education. The solution is provided as a service, and is designed for users with little or no IT competence. Improved access, energy efficiency and reduced costs are possible because users do not have to worry about virus protection, software updates, content-

control capabilities for safe Internet browsing, application installation or maintenance – all tasks which are managed in the cloud.

Technology improves educational opportunities by enabling personalized study, while enhancing the potential for learning through community-based education and access to educational resources, even in remote rural schools. Connect To Learn partners recognize the transformational role that broadband and other ICT solutions can play in scaling up access to quality education through innovative programs.

Source: Ericsson and the Earth Institute.

FEATURED INSIGHT 7: E-HEALTH IN CHINA

In 2010, China Mobile's Jiangsu Branch worked with Huawei to establish a health management platform, co-operating with adjacent cities' government health departments, to offer an innovative health service model which allows users to access a wealth of real-time remote health services at affordable cost. The e-Health service greatly eases social and medical supply shortages in the context of population-ageing, and significantly reduces the costs of chronic disease to society, in some cases, by up to 50%.

The core component of this eHealth solution is its health management platform complementary to existing medical information systems. It integrates regional health information systems, and hospital information systems, combining health solutions and communications solutions. The health management solution includes medical terminals, communication terminals, call centers and a cloud-based service platform.

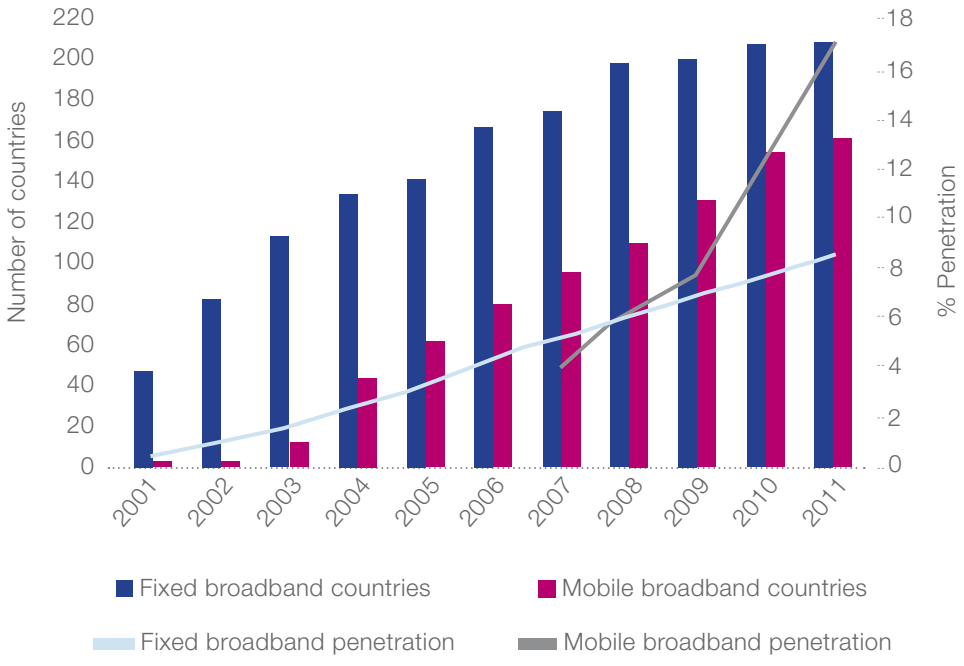
Source: Huawei.

The good news is broadband deployments are accelerating rapidly around the world. By the end of 2011, fixed broadband services were commercially available in 206 economies (including broadband access through satellite and leased lines), compared with 166 economies five years earlier. Mobile broadband (3G and 4G) services are now commercially available in 160 economies, up from just 80 economies five years earlier (Figure 4). Globally, mobile broadband penetration overtook fixed broadband penetration in 2008 (Figure 4).

ITU data show that that there were 589 million fixed (or wired) broadband subscriptions by the end of 2011, up 11.5% from 2010 (Figure 5a, top). Point Topic puts this estimate slightly higher, at 597 million fixed broadband lines, with total annual additions for 2011 the strongest since 2006, at 65.5 million new additions over 2011. The milestone of 600 million fixed broadband subscribers was surpassed in Q1 2012[23]. Growth in fixed broadband is spiking, due to new active markets coming online and standards-based deployments on the rise[24]. In terms of technologies, Digital Subscriber Lines (DSL) account for six out of ten fixed broadband lines, with fibre optic FTTx and FTTH accounting for 16.7% of the market (Point Topic, Figure 5c). According to the research consultancy iDATE, there were 220 million FTTH/B subscriptions in the world at the end of 2011 (iDATE, 2012[25]).

Nevertheless, the role of mobile communications for developing countries needs to be coupled with adequate investment in robust backbone networks, since as mobile broadband usage increases, the pressure on the access networks will also increase. The next chapter considers the vital importance of policy leadership, while Chapter 5 examines the key considerations driving network investment to connect the next billion people.

Figure 4: Growth in broadband worldwide, 2001-2011



Sources: ITU, Trends in Telecommunication Reform 2012; World Telecommunication/ICT Regulatory Database.

Note: lines refer to per capita penetration (right y-axis); bars refer to number of countries with service available (left y-axis).

Figure 5: Global broadband subscriptions, end 2011

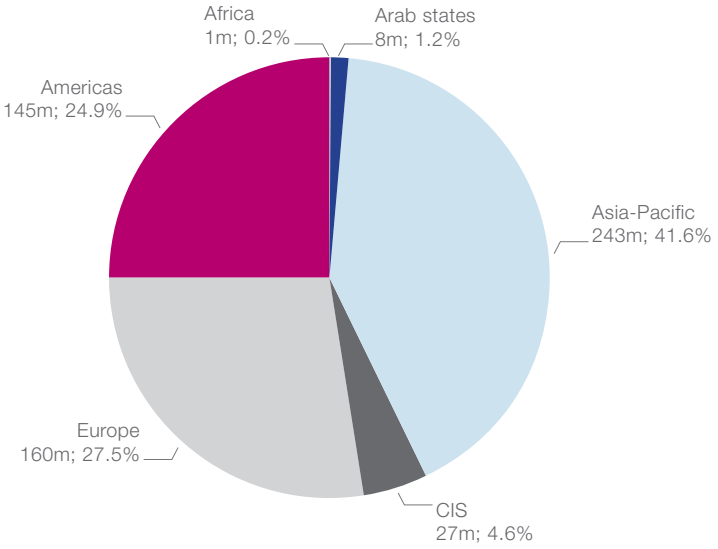


Figure 5a: Global Fixed Broadband Subscriptions, 2011

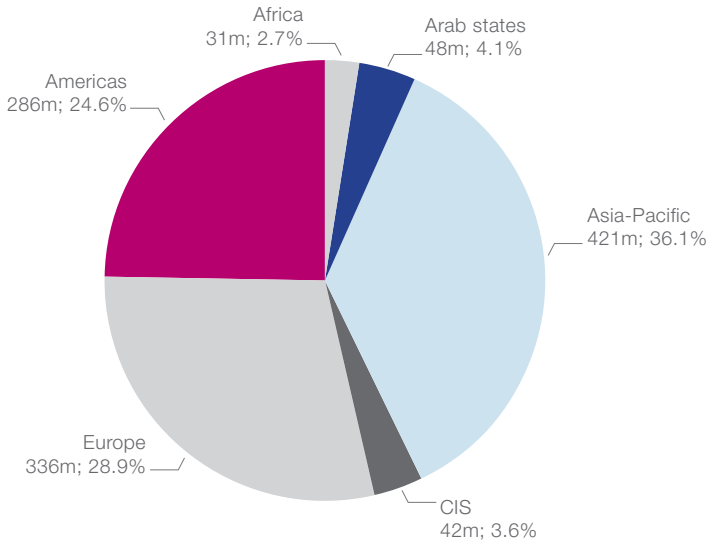


Figure 5b: Global Mobile Broadband Subscriptions, 2011

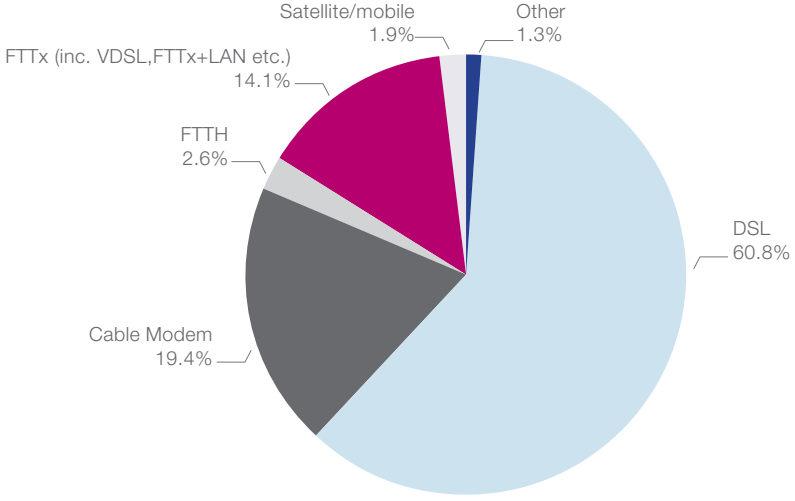


Figure 5c: Global Fixed (wired)-Broadband Users by technology, Q4 2011

Sources: ITU (top, middle); Point Topic (bottom).

FEATURED INSIGHT 8: A TALENT FOR INNOVATION – WHY BROADBAND IS THE QUESTION & THE RESPONSE

To maximize its benefits for growth, employment and development, broadband needs new skills and talents; the good news is that broadband will also generate such talents on a global basis.

Why does broadband need new skills?

Obviously, fresh technical skills are needed to master the technologies, networks, and applications associated with broadband. Today, we are in the early days of broadband deployment in many parts of the world, so such skills are mainly to be found in the firms involved in deploying broadband networks and services. In-house training will play a vital role over the coming 3 to 5 years.

More innovative are the fresh skills needed to capitalize on the new opportunities broadband will generate – for example, high-speed high-quality transmissions will impact the commercial and strategic value of various forms of digital content (video, multi-lingual, interactive). Generic skills (in business, finance, management and strategy) need to be combined with e-skills (digital content production, network management, cybersecurity).

Finally, global broadband will drive new types of global and local environments and ecosystems, needing a new type of skills-mix. For example, regulatory challenges call for a new mindset in terms of convergence, content regulation and 'open collaboration'.

Faced with the need to attract and provide such new skills, many countries (especially in the developing world) may find themselves in a delicate situation whereby they need to depend on external know-how to foster the deployment of their own broadband networks and services. The good news is that broadband can play a critical role in bridging the skills gap.

How can broadband help spur new talents?

The Broadband Commission has repeatedly emphasized that education will benefit tremendously from broadband. Although the MDGs have focused on alphabetization and primary education, it is now clear that secondary and vocational education play a vital role in generating growth, employment and development through affordable broadband access. The possibility of upgrading workers' skills through online, on-the-job and on-demand training could significantly improve firms' performance for all types of firms and organizations, especially SMEs.

New tools and concepts can be applied to learning, through the development of a largely virtual 'augmented classroom' through which students can interface with educators, as well as others. The recent success of the Khan Academy (where volunteers post short videos to illustrate or explain basic concepts in mathematics, physics, economics or other subjects) is an example of how social media, online webcasts and education can educate and inform large populations. The impact of such approaches would grow exponentially with broadband. Open courseware and models (e.g., those pioneered by OCW at Harvard) can increase the number of students around the world and help promote multilingual and localized versions of the same content. Interactive education can become a reality (e.g. the growing use of tablets in primary and secondary schools in Singapore), fostering local talent bases.

Innovation through collaboration (crowd-sourcing and crowd creativity, for example) can generate an unprecedented environment for 'Globally Engineered Serendipity' (GES). As confirmed by recent innovation benchmarks (such as the WIPO-INSEAD Global Innovation Index released in July 2012), the ability of experts in different areas to interact is key to innovation, especially in its early stages. Until recently, 'cross-fertilization' of ideas would typically happen in a

serendipitous fashion, on university campuses. Broadband offers a brand new way to engineer and systematize such an approach at the global level. Hence the phrase of 'Globally Engineered Serendipity'. In conclusion, broadband is both the source of need for new skills, and the potential producer of many of those skills. The Broadband Commission has made a recommendation in Chapter 7 to support virtuous circles of education, skills and talents in countries around the world.

Source: Professor Bruno Lanvin, Executive Director of INSEAD eLab.

FEATURED INSIGHT 9: THE TRANS-EURASIAN INFORMATION SUPER HIGHWAY PROJECT (TASIM)

The Trans-Eurasian Information Super Highway Project (TASIM) aims to improve the international Internet connectivity of central Eurasia and to establish a major new transit route between Europe (Frankfurt) and Asia (Hong-Kong). TASIM will provide a regional Tier 1 backbone network, improving the global topology for Tier 1 backbone networks. This international infrastructure project will improve connection speeds and reduce access costs, delivering long-term economic and social benefits for the whole region and remote, underdeveloped areas of Eurasia in particular. Developed countries will benefit through improved connectivity for their operating companies abroad, enabling effective provision of multimedia and cloud computing services to fast-growing Eurasian markets.

Azerbaijan proposed the establishment of TASIM in November 2008. In December 2009, the 64th Session of the UN General Assembly adopted a Resolution on the Transnational Eurasian Information Super Highway (A/res/64/186). Major regional telecom operators, representing Azerbaijan, China, Kazakhstan, Russia, Turkey and the EU have been in talks on establishing a commercial TASIM consortium since 2010, with several milestone framework documents having been signed.

The TASIM project benefits from the support and collaboration of governments, businesses and international organizations alike (including ITU, UNDP, UNDESA, UN SPECA, UN ESCATO, BSEC, RCC, OIC, and the EC/Eastern Partnership). The Eurasian Connectivity Alliance, coordinated by the ITU, will help realize the synergies of governments, private sector and international organizations in expanding broadband backbone and access networks.

Source: H.E. Minister Professor Dr. Abbasov, Minister of Communications and Information Technologies of the Government of the Rep. of Azerbaijan.

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4

EVALUATING GLOBAL GROWTH IN BROADBAND: THE NEED FOR POLICY LEADERSHIP

How can the benefits of broadband be extended to the world's population? One answer lies in policy leadership (Featured Insight 10). Action and investment to boost access to broadband are more likely when they are based on clear policy leadership, comprising a national broadband plan[1] or project investing in the national roll-out of broadband[2] and/or the inclusion of broadband in countries' Universal Access and Service (UAS) definitions. The clear statement of policy objectives and/or targets may often (but not always) take the form of a National Broadband Plan.

Broadband policies are sometimes framed in the context of a national vision document or broader Information Society strategy (this was often the case for earlier policy objectives set out between 2000 and 2007). The advantage of these broad plans is that they often consider linkages between broadband and other sectors.

Regardless of form, policy objectives should be consistent over all national territory and ensure coordination at the regional and local levels and be updated regularly, to better guarantee successful outcomes.

For example, the European Commission, Australia, New Zealand, Switzerland and the U.S. all recently reviewed their telecommunication frameworks. The European Commission adopted a Communication outlining common rules within which EU and national policies should be developed to meet broadband targets, and today almost all EU Member States have broadband strategies which they are actively implementing. The EU Communication was adopted along with a Recommendation on Next-Generation Access Networks to encourage investment through clear regulatory measures, together with a proposal for a Radio Spectrum Policy Programme[3]. Switzerland has concluded no change was necessary to its own forward looking telecom policy objectives[4].

National broadband strategies can be used as a vehicle for cross-sector collaboration and cross-ministry coordination supporting a common vision and enabling broadband applications and services to develop most effectively.

However, many current regulatory and policy institutions often still work in a 'silo' approach, making decisions in isolation without regard to other sectors. Policy-makers must come together to formulate common strategies on a converged ICT policy aligned with other policy areas such as energy, health, education and climate to maximize the impact of ICTs.

FEATURED INSIGHT 10: THE NEED FOR POLICY LEADERSHIP

Over the last few years, country leaders, communications ministries and national regulators have made broadband a policy imperative. This rising trend in strategic broadband policies is driven by growing recognition of the impact of broadband on national goals. Empirical evidence demonstrates the effects of broadband on increasing economic growth (through productivity gains and employment), fostering social inclusion and engagement, positively impacting environmental sustainability (as highlighted in the recent report, "The Broadband Bridge: Linking ICT with Climate Action"[5]). The number of broadband plans and policies, as tracked by the ITU, has steadily increased since 2008.

119 Governments have now adopted broadband plans (Figure 6a) and have taken a range of roles leading to the question: what is the appropriate role of governments in driving deployment and adoption? Governments play a critical role in convening the private sector, public institutions, civil society and individual citizens to outline a vision for a connected nation. Policy leadership is necessary to:

- Highlight the role of broadband in national development;
- Establish a forum for dialogue and encouraging work across Ministries and sectors;
- Set an agenda that outlines policy goals and targets; and
- Provide an enabling environment for private investment to flourish.

Policy leadership provides the structure to identify constraints, opportunity gaps and actions around the supply and demand of broadband deployment and adoption, where the components of network infrastructure, user skills, government use and promotion, applications and content creation all play roles in a mutually reinforcing system. For example, in 2010, the U.S. Federal Communications Commission introduced the National Broadband Plan[6]. At the time, it was one of the first comprehensive country level attempts to spur broadband adoption by focusing on both supply and demand issues and by identifying challenges, opportunities and actions at the local, regional and national levels. In the same year, the UN Broadband Commission was formed to boost the importance of broadband on the international policy agenda and leverage connectivity to help meet the MDGs.

Governments play a crucial role in enabling a business environment where broadband deployment and adoption can grow rapidly. By ensuring a fair and dynamic market where barriers to entry are low and competition is healthy, governments can encourage private sector investment. And by implementing demand-driven programs such as e-government platforms, digital literacy initiatives and connected public institutions, governments enable the broadband environment by both stimulating investment and spurring Internet adoption.

Strong policy leadership to catalyze broadband adoption through orchestrating plans and enabling investment does not have to mean active government build out and operation. In most cases, private firms build and operate networks more efficiently. Governments should consider direct investment only in cases of market failure such as in rural areas where financial returns are low or non-existent. While national broadband policies are critical components of country development strategies and the structures of national broadband plans can vary widely, a common crucial element is government involvement and leadership. Governments play key roles in convening, enabling and orchestrating policy.

Source: Dr. Robert Pepper, Cisco.

Broadband strategies, whether designed by policy-makers or public institutions, must consider the market dynamics of supply and demand. Better broadband infrastructure and access are inherently spurred by advances in, and the availability of, digital services, education and e-government access. All stakeholders in the ICT value chain must be taken into consideration, if the benefits of broadband are to be fully realized. A policy focusing solely on one side of the market is unlikely to prove successful.

Similarly, market conditions differ, and must be taken into account. A "one size fits all" approach is ill-advised for the communications sector, where inappropriate national policies can foster or undermine crucial private investment in broadband infrastructure. An extensive and detailed cost-benefit approach should be adopted before implementing any legal and regulatory changes in this dynamic and evolving sector. Featured Insight 11 considers key factors to be taken into account in designing national broadband strategy.

FEATURED INSIGHT 11: DESIGNING NATIONAL BROADBAND PLANS

The design of national broadband programmes should focus on three components:

1. Developing human skills to increase demand for broadband services: Countries should undertake comprehensive strategies best suited to national conditions and requirements. In Latin America, countries can commit to digital literacy along the lines of the Plan Inter-Americano promoting basic literacy, connecting schools, training teachers and getting laptops to schoolchildren. Governments can also look to adopt other initiatives that have proved successful in expanding digital literacy, such as linking national e-gov portals to existing government services, programmes to increase the business use of digital applications by SMEs and integrating e-health into government services. Incentivizing content creation, innovation through application development and services, and bringing content closer to end-users (e.g., localizing information) are also key.

2. Deploying telecom infrastructure in coordination with private industry: Governments can promote broadband deployment by: (1) reducing taxes and import duties on broadband services and terminals; (2) carrying out auctions or beauty contests of spectrum suitable for 2G, 3G and 4G (where available) quickly, and not waiting for completion of the digital TV switchover to auction the 700 MHz band for mobile broadband; and (3) using Universal Service Funds (USFs) to finance critical broadband infrastructure.

3. Improving legal and regulatory frameworks to improve the enabling environment for accelerated broadband deployment and to vastly expand coverage among individuals, households and businesses. Increasing regulatory certainty and lowering barriers to market entry are also key.

Source: Inter-American Development Bank.

4.1 Advocacy Target 1: Making broadband policy universal – by 2015, all countries should have a national broadband plan or strategy or include broadband in Universal Access/Service (UAS) Definitions.

The importance of national policy leadership is now clearly understood by policy-makers and Governments around the world. Today, some 119 or 62% of all countries have developed a national plan, strategy, or policy to promote broadband; and a further 12 countries or 6% are planning to introduce such measures in the near future (Figure 6a). However, 62 countries do not have any form of broadband plan, strategy or policy in place. Further, of those countries with plans, achieving progress in implementation may be more challenging or slower than envisaged. The U.S. launched its National Broadband Plan in 2010, and in an effort to speed broadband deployment further, President Obama recently issued an Executive Order[7] to accelerate the construction of broadband infrastructure throughout the U.S. by implementing a "dig once" policy for the U.S. Federal government (Featured Insight 12).

FEATURED INSIGHT 12: U.S. EXECUTIVE ORDER TO "DIG ONCE"

In the U.S., President Obama issued an Executive Order in 2012 aimed at lowering governmental barriers to broadband infrastructure deployment on federal lands and along U.S. highways. The "Dig Once" initiative is designed to help rapid deployment of broadband throughout the U.S. by requiring Federal agencies to facilitate broadband deployment activities where roads or other property are already under construction. Federal agencies will also be required to develop a consistent federal contracts process for the leasing of property and uniform steps for broadband firms to follow that will eliminate bureaucratic hurdles and make submission and approval of infrastructure projects much easier. The Executive Order also requires that Federal assets and lease requirements be listed on departmental websites and that regional broadband deployment projects be listed and tracked on the U.S. Government's Federal Infrastructure Projects Dashboard (http://permits.performance.gov). The order affects all properties managed by the Federal Government, and includes tracts of land, roadways, and more than 10,000 buildings across the U.S.

Source: U.S. Federal Communications Commission (FCC).

Progress on policy leadership is relatively recent. Today, a small but growing number of countries are including broadband in their definitions of universal service (Figure 6b). For example, Singapore's USO for its next generation fibre broadband services will start on 1 January 2013. In 2010, 99 or two-thirds of the 144 developing countries had a universal access/service (UAS) definition. Of those, 49 had included Internet dial-up within their definition, but only 36 out of the 99 countries included broadband in their definition of UAS. This is a dramatic improvement on the situation five years earlier, when just 21 developing countries included Internet dial-up in their UAS definitions and only one included broadband. Including broadband in definitions of universal access and universal service implies a degree of maturity in communications policy and signals a policy commitment to digital inclusion for all.

Figure 6: Policy Leadership in Broadband

Figure 6a: Countries with National Broadband Plans, World, 2011

Source: ITU.

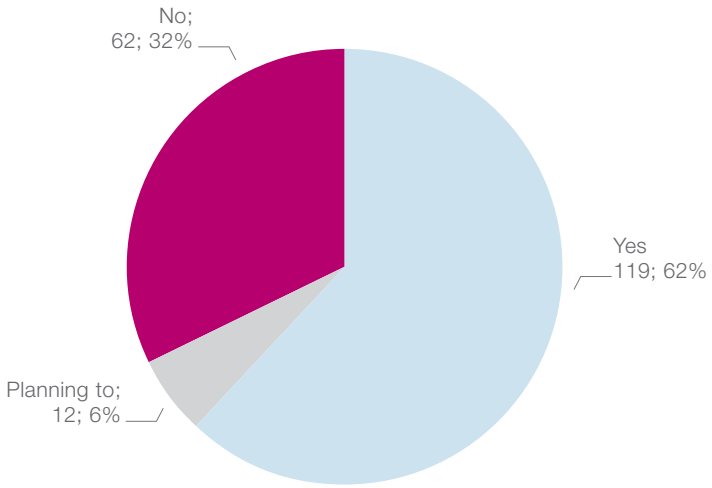
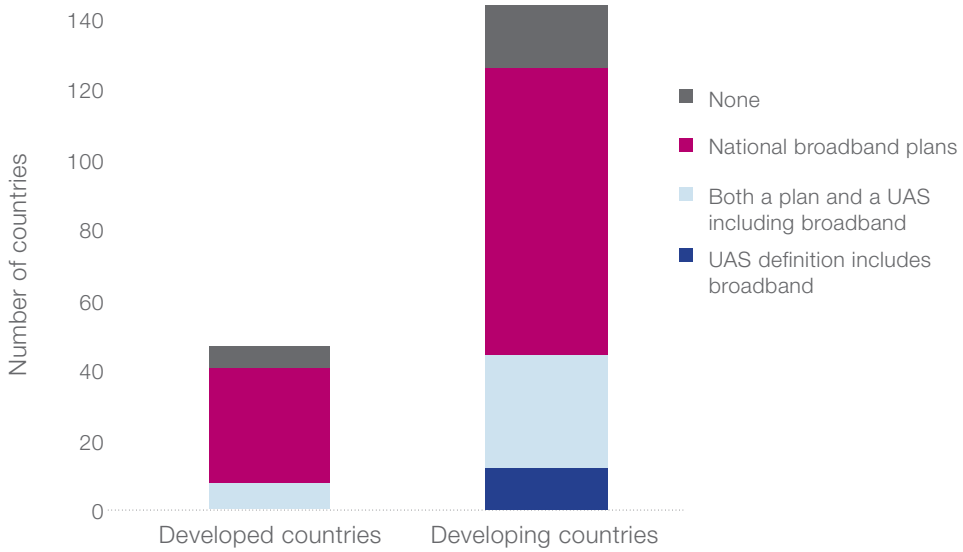


Figure 6b: Countries with Policy Instruments to Promote Broadband

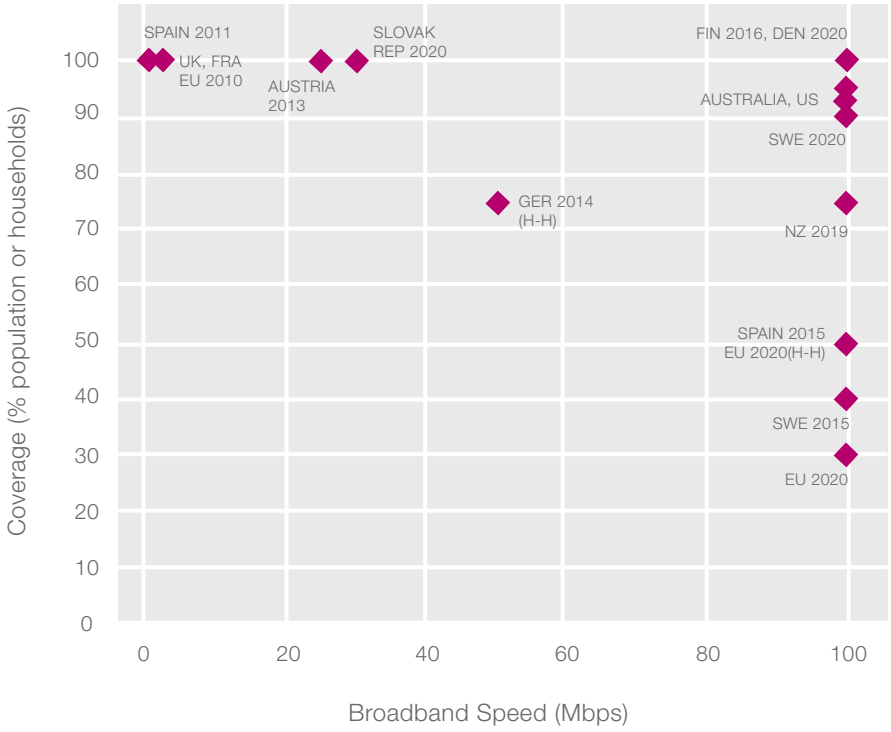
Source: ITU.
Note: Left chart based on data for 185 countries.



To date, national broadband plans often provide targets for rolling out broadband to populations or priority groups and communities – often in phases with rolling targets for specified years; often with specified speeds; sometimes with specified technologies. Countries have varied in the boldness of their targets. A number of countries have specified universal service as a national policy priority – for example, Denmark and Finland (Figure 7). Finland went even further and made broadband a legal right for its citizens in 2010.

The advantage of setting national targets for coverage and broadband speed is that they provide clear signals by Governments and regulators of their commitment to establishing advanced and modern infrastructure. National targets may also include a type of universal service obligation (USO), embodying social and public policy objectives within commercial and competitive markets. In this regard, countries should take care to ensure that national targets do not become a blunt tool that can fail to take into account the needs and geography of certain areas (e.g. for remote or rural areas). Targets also need to remain relevant and realistic, rather than abstract and overly ambitious. Featured Insight 13 considers the specific experience of Australia in introducing its National Broadband Network (NBN) as part of a broader review of policies in its National Digital Economy Strategy.

Figure 7: Targets set by National Broadband plans



Source: ITU.
Note: Australia's targets specify 100% coverage, with 93% at 100 Mbps and 7% at 12 Mbps. The EU has a dual objective for 2020 of 30 MB for all households & 100 MB for 50% of households.

FEATURED INSIGHT 13: AUSTRALIA'S NATIONAL DIGITAL ECONOMY STRATEGY & NATIONAL BROADBAND NETWORK

Today's communications rely increasingly upon broadband. Like water, roads, rail and electricity, Governments around the world now recognize that broadband is fundamentally important for the economic growth of all nations. The formation and implementation of Australia's telecommunications and infrastructure policy is partly defined by our unique geography. Australia is vast in distance and sparsely populated, but Australians pride themselves on overcoming the challenge of isolation for communications service delivery with determination, tenacity, and innovation. Our landscape means Australians are often forced to think big and make it work.

So in meeting the communications challenges of today, we again aimed high, building a world-class National Broadband Network (NBN) that will provide all Australian premises with access to high-speed broadband. Australia's NBN will use optic fibre capable of providing broadband speeds of up to 1 Gbps to 93% of premises, and a combination of next-generation fixed wireless and satellite technologies providing peak speeds of 12 Mbps to 7% of premises. Every home, school, medical facility, business, and government service in Australia will have access to the NBN.

We announced the NBN in 2009 for a number of reasons. Australia was falling behind other developed countries in terms of broadband penetration – a critical concern given the competitiveness of our region. Our broadband was delivered over an ageing copper-based network and was not uniformly available. The benefits of competition in the telecommunication market were not being fully realized.

The Australian Government identified nationwide, reliable, and affordable high-speed broadband as key to our future, so the NBN was launched as an ambitious project transforming how services are delivered and offering unprecedented opportunities for growth. The NBN is the biggest telecommunication reform in Australia's history, because it delivers separation between wholesale and retail service providers. NBN Limited (NBN Co) is the company the Australian Government established to design, build and operate the network, which is offering wholesale services to providers on an open access, equivalent basis. In turn, these service providers are offering retail services to consumers. A uniform national wholesale access price has been established across all technologies for the basic service. This means fairer infrastructure access for service providers, greater retail competition and better services for Australians whether located in the city or in regional Australia or more remote areas.

The NBN optic fibre roll-out is well underway, with commercial services already available in twelve communities. More than 3.5 million homes, schools and businesses will be or are underway to receiving NBN optic fibre services by mid-2015. By the end of its 10 year roll-out, the NBN will provide access to high-speed broadband for all premises. We have also launched an interim satellite service before the launch of a dedicated, long-term satellite service in 2015. The first fixed wireless services are now available in regional areas and the network will be fully completed in 2015.

In parallel to the build-out of NBN, the Australian Government has pursued significant legislative and regulatory reforms to ensure the telecommunication sector provides competitive and innovative services to consumers. Landmark reforms have been achieved in the structure of the industry, the access regime, and the strengthening of consumer safeguards. The incumbent carrier, Telstra, will separate its fixed line monopoly through an enforceable undertaking, approved by the competition regulator, and will no longer be a vertically-integrated supplier.

In short, the telecommunication sector in Australia has undergone an extensive overhaul in tandem with the roll-out of the NBN. To fully unlock the potential of a broadband-enabled economy, the Australian Government has initiated reform of the policy framework for our media and communications sector. The Convergence Review of the effectiveness of existing policy recently concluded, which provides clear guidance for new arrangements as the basis of necessary reforms. So Australia can maximize the potential of the NBN, the Government has also released the National Digital Economy Strategy, which lays out eight goals for Australia to become a world-leading digital economy by 2020. The Strategy outlines initiatives that will assist progress towards the goals, including several demonstrating the potential of the NBN.

As Minister for Broadband, Communications and the Digital Economy, I have no doubt that the NBN will render the transition between our digital and physical lives seamless. The Australian Government is proud of the NBN. And the implications for Australia, both economically and socially, will be profound. The huge tracts of land and oceans that separate us from each other and from the region and the rest of the world will no longer be the impediment of the past. With all that behind us, we can now concentrate on the possibilities the NBN will soon deliver as we enter a new era in our telecommunications history. Yes, it is ambitious… but our history has proven we are at our most innovative when we aim high.

Source: Senator the Hon Stephen Conroy, Minister for Broadband, Communications & the Digital Economy, Government of Australia.

4.2 Advocacy Target 2: Making broadband affordable – by 2015, entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces (amounting to less than 5% of average monthly income).

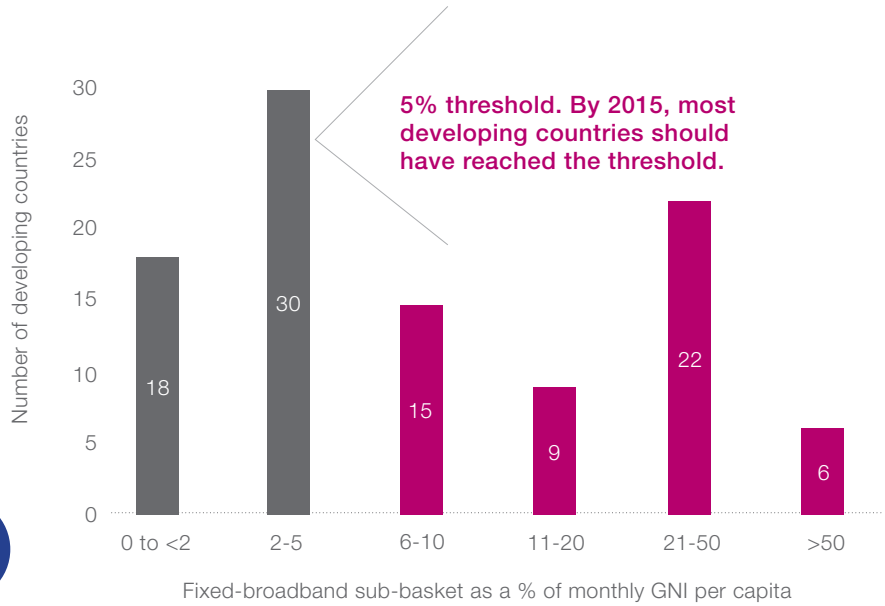
The price of broadband access plays a critical role driving broadband diffusion and is a key barrier to extending access to broadband in developing countries. While broadband is becoming more affordable around the world – prices have fallen by over 50% over the last two years in some countries – it nonetheless remains unaffordable in many parts of the developing world.

Huge discrepancies in affordability persist. In 2011, the price of fixed broadband access cost less than 2% of average monthly income in 49 economies in the world, mostly in the industrialized world. Meanwhile, broadband access cost more than half of average national income in 30 economies; in 19 of the LDCs, the price of broadband exceeds average monthly income (ITU, 2012[8]). By 2011, there were 48 developing economies where entry-level broadband access cost less than 5% of average monthly income, up from just 35 the year before (Figure 8).

Progress towards this target has been encouraging. For example, between 2008 and 2009, 125 countries saw reductions in access prices, some by as much as 80%. Over the last two years, prices for fixed broadband have dropped by 52.2% on average and mobile broadband prices by 22%[9]. In Africa, where a number of undersea cables are due to, or have already, come online between 2010–2012, prices have dropped significantly, and are expected to continue falling.

Policy-makers can address affordability in a number of ways, including regular monitoring, regulation, the introduction of subsidies, increased competition, and tiered services. A number of national plans recognize affordability as a key policy priority, including Hungary's National Broadband Strategy, Nigeria's National ICT Policy, and the U.S. National Broadband Plan. Nevertheless, genuine competition is widely recognized as the most effective means of lowering prices to date.

Figure 8: Fixed broadband sub-basket for Developing Countries, 2011



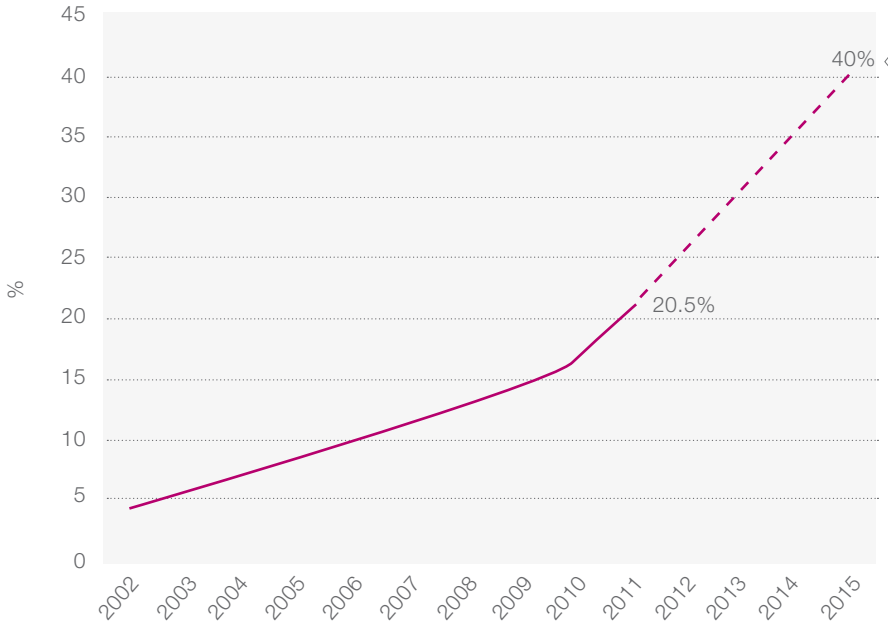
Source: ITU.

4.3 Advocacy Target 3: Connecting homes to broadband – by 2015, 40% of households in developing countries should have Internet access (either fixed or mobile).

Access to broadband or the Internet at home is one of the more inclusive ways of bringing people online. At home, all household members can have access – no matter whether they have jobs, go to school, are male or female, children, adults, or elderly. Research has shown that children with Internet access at home perform better in school.

In developed countries, more than two thirds of households already had Internet access at the end of 2011, compared to around 20.5% of households in the developing world (Figure 9). Yet this proportion is likely to increase significantly by 2015, especially with the rise of mobile Internet. Private investment is vital to driving growth in this area, and needs to be supported by public policies. Interestingly, the stronger growth in household access needed to achieve this target by 2015 is seen over the period 2010-11. For national rankings in this target, see Annex 5.

Figure 9: Proportion of households with Internet access in developing countries, 2002-2015



By 2015, 40% of households should be connected to the internet

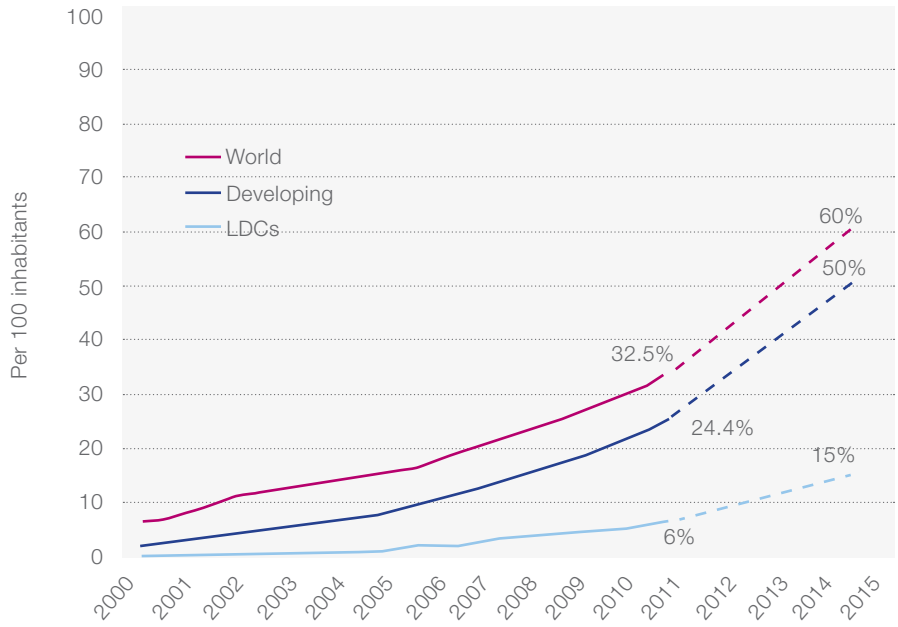
Source: ITU.

4.4 Advocacy Target 4: Getting people online - by 2015, Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in LDCs.

By the end of 2011, some 2.26 billion people were using the Internet, a figure which suggests that around a third of the world's population is now online. The Boston Consulting Group (BCG) predicts that global Internet users will reach 3 billion in 2016, significantly boosting the proportion to around 40%[10]. In the developing world, Internet penetration stood at 24% in 2011 and at just under 6% in the world's LDCs (Figure 10). At current growth rates, Internet user penetration is unlikely to achieve this target, but further impetus is required to achieve it. The question is whether mobile broadband will deliver the extra growth in access needed. For national rankings in this target, see Annex 6.

60% of global population should be online

Figure 10: Internet user penetration, 2000-2015



Source: ITU.

ENDNOTES

1. See GSR 2011 Discussion Paper on Setting National Broadband Policies, Strategies and Plans, by Robert Horton, Senior Telecommunications Expert, available at: www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR11/documents/03-Broadband%20Policies-E.pdf.
2. National broadband plans referring to high-level policy leadership are distinct from national broadband projects, where countries may make specific or operational investments in national broadband backbones. To date, over fifty countries have announced public sector investments in national infrastructure (ITU Confronting the Crisis, 2009).
3. See www.ec.europa.eu/competition/consultations/2012_broadband_guidelines/index_en.html
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5

ACHIEVING DIGITAL INCLUSION FOR ALL: INVESTING IN INFRASTRUCTURE

Given the economic benefits of broadband, making broadband services available and affordable for all has become vital for economic growth and social welfare. This chapter explores the factors creating a positive environment for broadband investments. In order to foster broadband deployments, regardless of the source of financing, operators must invest in infrastructure efficiently and optimally to make best use of available resources in the current challenging economic climate.

Different infrastructure layers need to be addressed separately from a policy and financing perspective, rather than using a "one size fits all" approach. Indeed, new investment models are needed to connect new subscribers, and to drive expansion in capacity in order to handle the anticipated explosion in data over the years to come.

To date, the private sector has had considerable success in providing efficient broadband infrastructure in many countries, and is well-placed to drive (or follow) technological evolution and evaluate the most appropriate mix of broadband technologies. Private investments need to be facilitated by public authorities to ensure that a vibrant, sustainable private ICT sector exists with a long-term perspective.

Connecting new subscribers and handling the data explosion can be achieved by: regulatory flexibility leaving operators greater freedom of choice; improved and more advanced technology; better usage of spectrum; the introduction of small cells (Featured Insight 15); and new and improved network configurations; among other factors.

Investing in broadband is a complex challenge. National priorities for broadband availability tend to be long-term in focus, but the needs and returns of short-term capital investments also need to be taken into account. A network is composed of three distinct layers with very different characteristics in respect to their cost and return on investment. The first layer, the passive layer (civil works and dark fiber), can account for up to 80% of the cost and has a payback period of approximately 15 years (Table 3). The second is the active infrastructure layer, where the intelligence of the network concentrates, with a 5 to 7 year rate of return. The service layer has a very different cost structure and a much shorter rate of return. Different sources of financing are best suited to different types of investment in different network layers, characterized by different payback periods.

Table 3: Investing in Different Network Layers

	Order of Costs	Payback Period	Examples
Passive layer	70-80% of network costs	15 years	Trenches, ducts, dark fibre
Active infrastructure layer	20-30% of network costs	5-7 year rate of return	Electronic equipment, OSS, BSS
Service layer	N/A	Few months - 3 years	Content, services and applications

Source: ITU, Alcatel-Lucent.

The passive layer underpins the other layers, with longer term rates of return. Depending on market conditions, it may make sense in some cases to share it voluntarily, co-finance it and make it open. Passive infrastructure sharing can lower the cost of civil engineering work by sharing network segments and ducts (the terminals may not need to be replicated). Active infrastructure sharing – where equipment and IT platforms for business and operations support are shared – may be optimal where there is no viable business case.

For mobile networks, sharing infrastructure (e.g., sharing civil works, passive to active infrastructure, and in some cases, even wavelengths or spectrum) needs to be evaluated carefully on a case-by-case basis, in order to avoid discouraging investment or undermining competition between different platforms. Today, open access (opening up network facilities to service providers on fair and equivalent terms) is gaining momentum as one way of curbing market dominance, while protecting incentives to invest (see Featured Insight 14). When establishing public policies on broadband deployment, public authorities have to take into account the competitive consequences for other platforms (e.g., cable or mobile). Innovative radio-frequency licensing schemes, passive infrastructure sharing and wholesaling capacity are also important trends to consider.

FEATURED INSIGHT 14: OPEN ACCESS IN THE DIGITAL ECONOMY

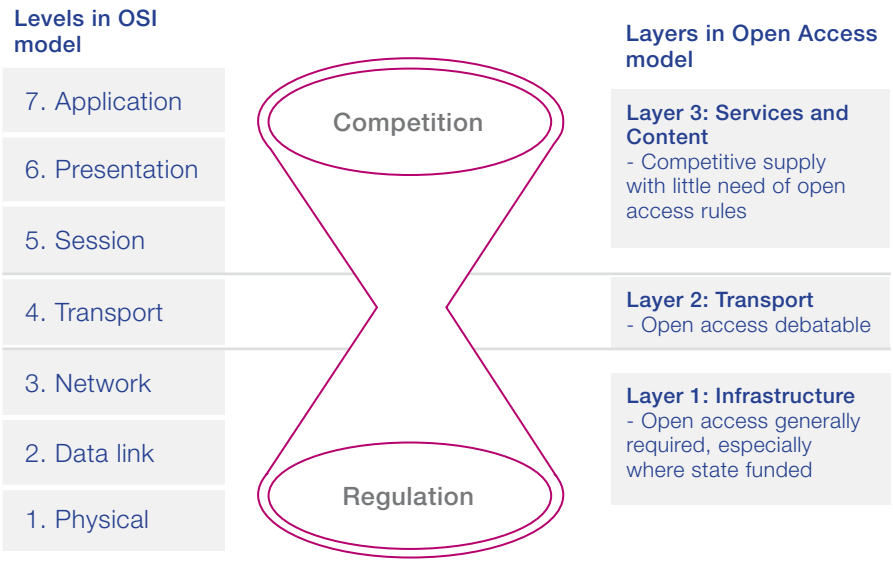
Recently, legacy networks are proving incapable of supporting the insatiable growth of bandwidth-hungry applications. New investments are needed, and on a grand scale, but liberalization and competition have created a fragmented market lacking the economies of scale and the regulatory certainty needed to underpin such large-scale investments in many countries. This is not to deny the evident benefits of competition, but fresh regulatory thinking is now required for a successful transition to the digital economy.

Open access is critical in the case of publicly-funded national broadband networks and generally needed wherever there are actual or potential economic bottlenecks preventing competitive supply. However, open access is progressively less important moving up the layers (see Figure below), provided that open access is available at the lower layers and there are sufficient incentives in the regulation of open access to encourage investment in infrastructure. Regulatory and policy objectives for services and applications in the digital economy should focus mostly on demand leadership, the protection of public interest, and curbing abuse of market dominance.

Different regulatory practices across regions illustrate that there is an emerging regulatory consensus on the requirement for open access to national broadband infrastructure. Even in the most developed markets, the scale and scope of investment required for broadband networks tend to limit the market to one dominant provider. Except in the most densely populated geographic markets, fibre access pipes remain an essential facility or bottleneck, for which duplication is neither commercially nor economically viable. Together, these characteristics support a thesis of natural monopoly, a thesis even stronger in rural areas and developing countries. Consequently, regulatory action for broadband networks should seek to ensure access on fair, reasonable and non-discriminatory terms.

Open access is especially critical where broadband and NGA roll-out is supported, at least in part, by public funding. In such circumstances, mandated open access can play a pivotal role in promoting network investment, in preventing uneconomic duplication of resources, and in strengthening competition. European State Aid rules make this particularly clear, so the provision of public funding to broadband infrastructure projects is dependent on a commitment to open access.

Open access and the Open Systems Interconnection (OSI) model



Source: ITU, Trends in Telecommunication Reform 2012, Open Access Regulation in the Digital Economy.

However, it is equally important that open access be established in such a way as to retain incentives for infrastructure investment. Care must be taken, for example, when open access is mandated as a condition of receiving state subsidies for infrastructure investment. The EU Recommendations are particularly concerned with this issue, as strict EU State Aid rules prohibit subsidy of any infrastructure that could be provided under competitive supply conditions. In other words, state aid must not distort the markets. This means that subsidies should be provided up to, but not beyond, the point at which the broadband investment becomes commercially viable. The means of identifying this tipping point is typically through an auction.

Regulators need to be wary of imposing terms for open access that are overly onerous, such as low access prices that squeeze the potential returns on investment. Such onerous terms are a disincentive for potential investors in infrastructure. Moreover, to the extent that these terms reduce ROIs, they increase the costs of network infrastructure for private investors; this, in turn, ultimately increases the amount of public funds needed to subsidize the national broadband network. In this regard, onerous terms also reduce expected payback on the public investment. Given the proven economic benefits of broadband penetration, policy should aim to maximize investment in order to maximize the economic multiplier effects. In these circumstances, it is likely to be counterproductive for the regulator to drive too hard a bargain on the terms of open access.

If the goal of open access regulation is maximizing competition at all layers of the network, then regulatory authorities need to realize that open access itself may not always be the right solution. As described above, where network investment requirements are beyond the capabilities of the private capital, the desire for open access has to be tempered by the need to support investors (including the State). At the other end of the spectrum, where a fully and effectively competitive market develops, there is no need for regulatory intervention to enforce open access rules. The only regulatory intervention that is required in such circumstances may occur ex-post using competition law principles, e.g. to prevent anti-competitive mergers or acquisitions or to prevent collusion.

Whichever regulatory strategy is adopted, open access is key to success. Open access means that all suppliers, whether in horizontal or vertical markets, are able to obtain access to the new network facilities on fair and equivalent terms. The precise definition of open access may vary depending on the regulatory model adopted, and the terms and conditions of access most certainly will vary. Nevertheless, open access is paramount, if the new digital economy is not to rest on network infrastructure provision that has folded back into a purely monopolistic framework.

ITU hosts an annual Global Symposium for Regulators (GSR, at: www.itu.int/gsr/) at which emerging regulatory issues are debated to evaluate key regulatory trends and forge best practice guidelines to help the global regulatory community in their decision-making.

Source: ITU Trends in Telecom Reform 2012, Chapter 3: Open Access Regulation in the Digital Economy, see www.itu.int/trends12.

How can we go about connecting new subscribers? Broadband services are usually provided through a mix of technologies, depending on geography and market analysis. In urban areas with high population density, private companies are likely to be willing to invest in commercially viable markets which may be easy to serve. Infrastructure-based competition may also be feasible (area 1 in Figure 11).

In some countries, broadband can be provided to densely populated major cities and urban areas by laying a national fibre backbone infrastructure, for example. Many countries, including Australia, have government policies about extending broadband networks to the premises or work with a mix of technologies to suit requirements. The use of optical technologies can help ensure scalability, reliability, and security in some cases. Leveraging existing infrastructure deployments (such as roads or electricity lines) can also help create backbone and backhaul networks through sharing and/or public/private collaboration.

In second-tier metropolitan areas, broadband can be provided through mobile, high-capacity microwave, passive optical networks, metro-aggregation optical networks, or IP/MPLS. Third-tier "no broadband" area is the area that can often be served (either in isolation or additionally) by satellite ISPs, particularly under universal service policies. Although fibre backbone infrastructure might be preferred for urban areas with high population technologies, satellite technology can play an important role in serving remote areas, rural areas or sparsely populated areas, where the expansion of terrestrial fibre is unlikely.

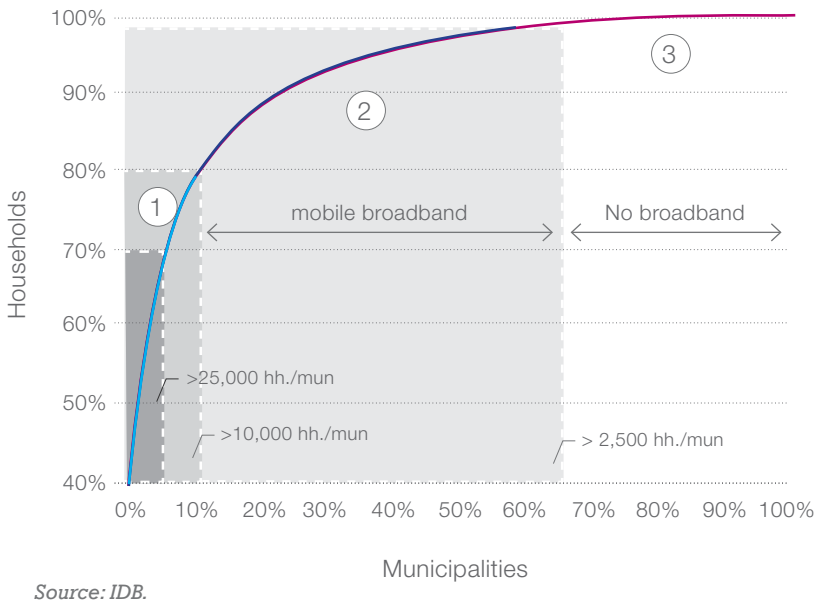
Getting the mix right ensures an economical balance to meeting connectivity targets. Service convergence around IP-based technologies can support multiple services, as well as multiple service providers sharing the same network. Such alternatives need to be evaluated case-by-case, taking into account competition and market conditions and cost-benefit analysis, to avoid discouraging investment.

1. PRIVATE: Areas of high population density, where infrastructure - based competition is feasible. The main problems are related to the regulatory framework and competition.

2. PRIVATE/PUBLIC: Areas where mobile infrastructure may be the best technological option for voice and data services. Competition is often feasible on mobile network infrastructures. There are may be regulatory and infrastructure problems. Public intervention may accelerate broadband development.

3. PUBLIC: Areas for Service / Universal Access, which may require a public intervention for developing broadband. The main problem is the lack of infrastructures.

Figure 11: Market Analysis for Broadband Provision

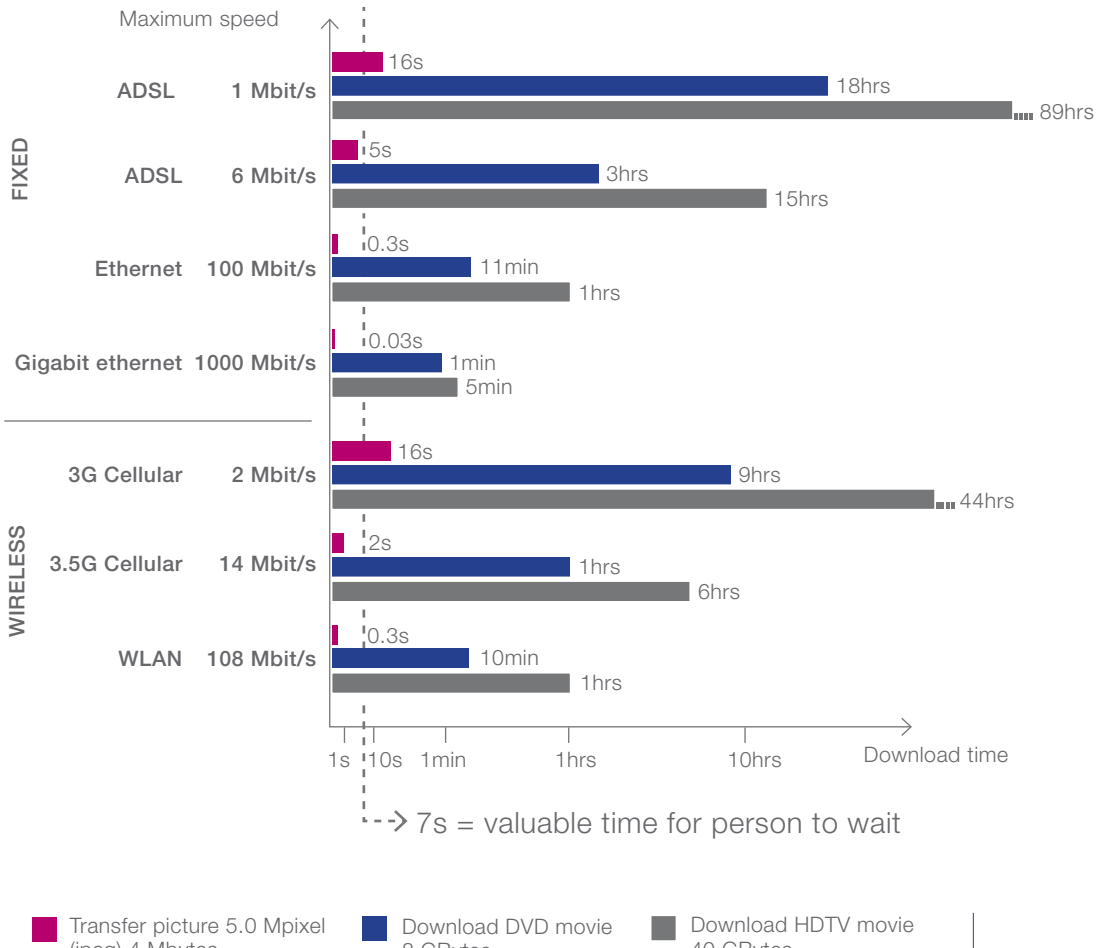


Source: IDB.

Leveraging existing passive assets as much as possible can lower costs and avoid replication of infrastructure. Open application development platforms, Content Distribution Networks (CDNs), and distributed data centers can also help meet the demands and expectations of end-users, taking into account long-term needs, broadband goals and target objectives, as well as the all-important user experience. Studies suggest that 7-8 seconds or less is the average tolerance time after which a typical web-user may become frustrated and quit (Figure 12, compiled on the basis of Bouch, Kuchinsky & Bhatti 2000[1], King 2003[2], Akamai/Forrester 2006[3]).

However, there are growing challenges associated with strong growth in broadband and high-speed services, leading some to question whether the industry may fall victim to its own success. The worldwide mobile data market will see a tenfold increase in consumption by 2016, with mobile phone users consuming six-and-a-half times as much video, eight times as much music, and nearly ten times as much gaming than they did in 2011, according to Informa Telecoms and Media[4]. While the mobile data market would normally welcome such dramatic growth in consumption rates, Informa notes that the increase in data traffic will far outstrip revenue growth.

Figure 12: Functionality & User Experience



Source: Intel.

The rapid growth of Internet traffic is not new – Internet traffic has been continually accelerating since the Internet was launched. Even if the strong growth in mobile data traffic is sustained (Box 2), the majority of data will still have to be transferred over a fixed-line backbone network, making fixed-line backbone and mobile access networks complementary. Technology-based developments such as Content Distribution Networks (CDNs) and new Internet Exchange Points (IXPs) have resulted in some economic efficiencies and have generally proven helpful, where the regulatory environment has been favorable. Continuing to meet the challenge of traffic growth successfully requires policy-makers to promote regulatory certainty and lower barriers to entry.

Accelerating the deployment of optical fiber networks would help to solve the increasing challenge of ensuring the transport capacity of mobile networks. Currently, mobile networks are based on macro and micro cell layers allowing transport capacities of up to 42 Mbit/s per cell. The small cell layer could offer throughput capacities easily exceeding 100 Mbit/s in radius of circa 50-200 meters, assuming they are connected to the network via optical fiber. Featured Insight 15 describes the potential impact of small cells on wireless broadband service delivery.

FEATURED INSIGHT 15: THE IMPORTANCE OF SMALL CELLS FOR WIRELESS BROADBAND

Recent advances in wireless broadband technologies offer a variety of solutions for deployment where wired solutions are too expensive or difficult to install, slow to deploy, or not well-adapted to usage requirements. Small cells offer a cost-effective alternative to macro-only deployments for meeting coverage and capacity demands. They will not replace macro base stations, but complement them by optimizing network performances. Due to their size, they can be self-installed (home and enterprise cells) or installed by a single person (metro cells). When small cells are added, they offload traffic from macro networks, increasing available network capacity without deploying new macro sites. Metro small cells are a cost-efficient alternative in areas where new macro sites are needed.

A new priority for policy-makers and operators, small cells are raising some challenges, but provide many potential benefits to meet political and environmental objectives, including:

- Small cells allow for superior network capacity, reduce the footprint of the macro layer in crowded urban environments and can help improve Quality of Service (QoS).
- Small cell deployments can help achieve broadband goals like those set by the European Commission's Digital Agenda or by President Obama for the U.S.
- Smaller equipment installed "invisibly" in dense urban environments can reduce visual pollution and can improve public perception and acceptance.
- Small cells can contribute to targets set by the EU Energy Law 2020. Metro cells ensure better capacity where required and better radio links, reducing the output power of user devices, as well as the power radiated by the macro layer. As such, the network provides coverage and capacity in a more efficient and greener manner, with better performance and reduced energy consumption.

Governments and regulators need to consider the speed and changing focus of the mobile industry from plain coverage towards coverage and capacity and reflect this trend in regulatory frameworks to ensure that mobile broadband services are deployed to match citizens' expectations.

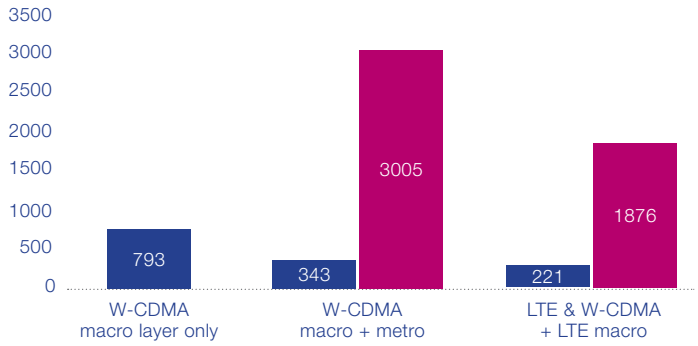
Alcatel-Lucent Bell Labs research demonstrates the benefits of small-cell deployments and latest state-of-art technology. Assuming an 18-fold increase in data traffic over five years for an operator with good W-CDMA coverage, Bell Labs ran simulations for a densely populated Western European city for three different scenarios for increasing network capacity to support the future growth of data traffic:

a. Lay-out of the W-CDMA macro layer only;
b. Deployment of W-CDMA macro and metro layer; and
c. Deployment of LTE macro layer and a mix of W-CDMA/LTE metro layers.

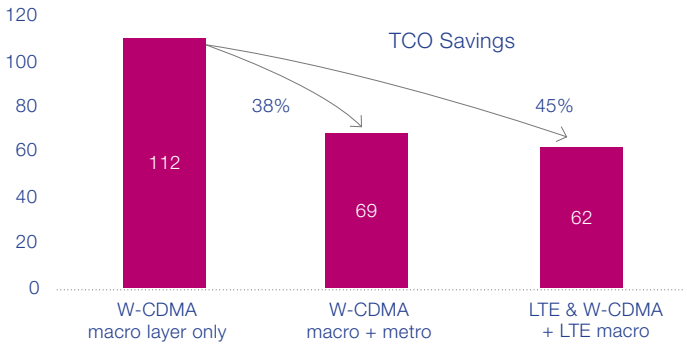
The study suggested that using a mix of technologies (WCDMA and LTE) and a heterogeneous network with macro and metro cells layers could reduce total cost of ownership (TCO) by up to 45%.

Source: Alcatel Lucent.

18x Traffic increase over 5 years in a Western European Dense Urban City



Additional sites required to support a 18x increase in traffic over 5 years



Five-year TCO (in M€) for the 3 deployment scenarios

Source: Alcatel Lucent.

Different technologies offer different advantages, but it is clear that satellite communications offer major potential for deploying 'universal' broadband services rapidly to large numbers of people (Featured Insight 16). Satellite broadband can prove an ideal solution in remote areas, rural areas or large, sparsely populated areas, while satellite technology can also provide full coverage in rural, as well as metropolitan, areas. Satellite broadband connections can be deployed rapidly without large investment in terrestrial infrastructure – users only need a satellite antenna and a modem to obtain broadband access. It is also a useful back-up if an undersea fibre connection goes down, although comparative cost issues still persist in some cases. Hence, satellite technologies shall continue to play an important role in expanding broadband access.

Despite its capital-intensive nature, the satellite industry maintained steady growth rates throughout the economic slowdown since 2008[5]. This is partly because satellite communications can provide broadband Internet connectivity at virtually zero marginal cost, once the satellite is deployed and until the satellite reaches its capacity constraints, which has made satellite operators good candidates for stimulus funding in some countries. Some observers perceive today's satellite solutions as lagging fibre and wireless technologies in latency, mass throughput, and cost per bit delivered. However, today's satellite technologies can be very advanced in terms of reliability, speed of deployment, and security, while the next generation will deliver higher transmission speeds competing with other broadband technologies in speed and costs (Featured Insight 17).

FEATURED INSIGHT 16: THE ROLE OF SATELLITE IN CONNECTING THE NEXT BILLION

Satellite technologies offer opportunities for achieving universal broadband coverage through the large coverage achievable via a single footprint, and the fact that satellite technologies can be deployed as soon as the satellite is operational, regardless of terrain, distance or 'last mile' infrastructure.

Satellite has a major role to play in achieving universal broadband coverage either in its own right or as a complementary technology, following these best practices:

- Including satellite technologies in National Broadband Plans.
- Adopting an 'open skies' policy approach to facilitate competition and choice for end-users;
- Promoting competition and investment in satellite services;
- Avoiding discrimination between foreign and national satellite systems, and ensuring that licensing procedures are equitable and transparent.
- Ensuring full transparency in licensing and oversight.
- Harmonizing licensing frameworks at the regional and global levels.
- Regularly reviewing spectrum availability to service the needs of satellite communications.

By addressing these, costs of service could be significantly reduced in future, with further reductions as new technologies are brought into use. Capacity-building for policy-makers, regulators, and operators is also helpful in building awareness about satellite technologies. Today, numerous efforts are underway with training offered by various partnerships (e.g., between ITSO/ITU), but more needs to be done.

Resolution 11 (WRC-12) requires ITU-R to carry out studies regarding possible regulatory measures for the use of orbital slots for delivery of international public telecommunications. This is an important development that could yield significant positive results and enhance the performance of the satellite industry even further.

Source: Mr. José Manuel Do Rosario Toscano, Director-General, ITSO.

FEATURED INSIGHT 17: HOW BROADBAND SATELLITE-BASED SERVICES WILL CONTRIBUTE TO MEETING THE GLOBAL BROADBAND CHALLENGE

Mobile satellite communications are vital for ensuring the availability of universal broadband access. Consumers in all countries should have access to affordable broadband Internet services, requiring the industry to develop innovative business models and governments to make broadband policy universal and develop stable and enabling policy and regulatory frameworks.

Broadband also underpins the collection, sharing and analysis of data on the environment. Satellite broadband provides a reliable platform for public safety in the event of natural disasters, as terrestrial communication networks may prove more vulnerable to disasters and attacks. VSATs and satellite-based applications provide cost-effective and reliable communications for government and humanitarian teams to coordinate their operations. On land, VSATs can be deployed to the most rugged and remote terrains in just hours or days, allowing new users to take advantage of broadband services immediately.

Some commentators argue that today's satellite solutions lag behind fibre and wireless technologies in latency, mass throughput, and cost per delivered bit. However, satellites can be very advanced in terms of reliability, speed of deployment, and security. Indeed, the next generation of satellites is under procurement and will deliver higher transmission speeds, potentially competing with other types of broadband connectivity both in terms of speeds and costs.

New technologies are being developed to fully integrate the Ku-band and L-band, offering maritime and aeronautical users a compelling combination of high-speed broadband with increased bandwidth and speeds of up to 50 Mbps delivered globally via compact and affordable terminals at reasonable cost – e.g., via fixed fee unlimited data packages. VSATs and existing compatible terminals could be upgraded.

In the next 10-15 years of growth in mobile, competition in mobile broadband should help reduce prices and increase market penetration and usage. Mobile broadband is enjoying very high growth rates driven by growth in data services, traditional satellite terminals, VSATs and personal mobile devices, as well as improved spectrum efficiency.

Source: Dr. Esteban Pacha, FNI, FIMarEST, FRGS, MIISL, Director-General, IMSO.

In addition to choices of the best technological infrastructure for providing broadband to different markets, operators and service providers must also consider optimal ways of marketing services to end-users. Inspirations for new business models abound; positive experiences with prepaid telephony in driving growth in the mobile market have encouraged the private sector to explore similar initiatives for broadband (Featured Insight 18).

FEATURED INSIGHT 18: REACHING THE THIRD BILLION – BRINGING THE PREPAID MIRACLE TO BROADBAND

The Intel World Ahead Program makes 21st century technology more affordable and accessible for people worldwide. We work with Governments to implement programs that increase access to technology for all citizens, help improve education quality, create local jobs and spur economic growth, foster entrepreneurship, lower healthcare costs, and increase access to online services for all citizens. Over two billion people worldwide now enjoy the economic and social benefits of PCs with Internet access. Our next challenge is to bring similar access to more than 70% of the world's population that have yet to experience these benefits.

To reach the next billion users, a new approach was needed. Our inspiration came from Sri Lanka and Bangladesh, where we saw billboards advertising 300 MB of mobile broadband for extremely low prices of ~$0.45 USD along with inexpensive mobile broadband prepaid vouchers. The value proposition for customers was compelling and successful, resulting in many new sales. Sri Lanka and Bangladesh were utilizing the "prepaid miracle" that has helped make mobile phones ubiquitous around the world.

Elsewhere, however, PCs were typically sold with expensive monthly Internet contracts, even for entry-level PCs targeting lower income citizens. To calibrate, an entry-level PC might cost $350 but with a $25/month broadband service, the Total Cost of Ownership (TCO) amounts to $1550 over 4 years, unaffordable for most of the 3rd billion people. It also requires them to commit to extended contracts, which may be less suitable, since their cash flow and future revenues may be uncertain or erratic.

It was clear that we also have to increase the desire for a PC. We found that many of the 3rd billion citizens are not familiar with the advantages of PCs with broadband service. However, when presented with the greater capabilities and value of PCs compared to a mobile phone, citizens often desired the added benefits. Students, small-business owners, and others want larger screens, the ability to create and store content, and other features not available on mobile phones.

In fast-growing developing countries (such as Brazil, China, Indonesia, Malaysia, Mexico and Russia), broadband access can account for 60-80% of the TCO of a PC. Often, only about 20% of citizens could afford the monthly plans. We decided to pick eight countries for a pilot study of prepaid broadband with entry-level PCs. Working together with telecommunication companies, PC manufacturers and, in some cases, governments, Intel made available bundles of entry-level notebooks, compelling content, and prepaid broadband, accompanied by exciting advertising, branding and marketing.

The results were staggering! By the end of 2011, all eight pilots were complete and had proved successful. We had delivered more than one million PCs plus prepaid broadband packages in the pilot phase. These large PC volumes also encouraged the PC industry to aggressively lower prices to as low as $200, and encouraged content providers to create exciting new content. For example, in Vietnam, PC and broadband subscriptions sales soared. The major telcos, Viettel and VNPT, offered 700 MB of data download for just $2 prepaid. At that price, broadband affordability surged from 12% to 70% of citizens. We launched the offer in June 2011 and had sold 150,000 packages in just three months. To put that in perspective, sales of PCs in Vietnam are typically about 140,000 per month. The additional 150,000 over 3 months represented a 30% increase. More importantly, this helped lower-income citizens, who might otherwise never have been able to afford a PC and broadband.

Early results from the pilots have shown that boosting access to broadband is about much more than just price – it is about delivering meaningful content and applications. In Kenya, entry-level prepaid netbooks are delivered with valuable content, including British Council 'Learn English' software, education applications (e.g. Intel® Skoool and Encyclopaedia Britannica) and

McAfee safety apps. In addition, netbooks come with 1.5 GB of free data download – a very compelling offer that enhances learning, and runs far better on a PC than over a phone or tablet.

In 2012, we moved into full deployment mode. Since the start of this year, we have launched Reaching the 3rd Billion in 30 countries, with 3 million packages already sold. With the TCO often reduced to 2/3 of the previous cost (see Annex 2), over one billion people can afford to enjoy technology benefits for the first time. We aim to have programs in fifty countries by the end of this year.

Important examples of key learning points from Intel's worldwide programs include:

China – The program was launched in early 2012 with three main telecommunication operators: China Mobile, China Telecom, and China Unicom. Focusing on students in tier 4-6 cities and rural areas, the program is live in six provinces, with over 200,000 packages sold. Key drivers of success include:

- Program embraced by all major carriers with attractive broadband package offerings;
- Focus on tier 4-6 cities and rural with 2 MB data package priced lower than in urban.

India – The program was launched in August 2011 to coincide with India's National Day. All major telecommunication companies have embraced the prepaid business model and tied it with the launch of their 3G service. Since launch, it has gone viral across India. Aircel, Airtel, BSNL, MTNL, MTS, Reliance, TATA, and Vodafone offer different prepaid broadband packages, starting from as low as 100 MB for the equivalent of $1 USD. More than 500,000 packages have been sold since the program was launched. Key drivers of success include:

- All 3G connections can be purchased prepaid, raising awareness of prepaid broadband;
- Packages are low cost and memorable, with a simple price point of 100 MB prepaid for $1 USD.

Nigeria – The program launched in April 2012 and is focused on student education. Key partners are MTN, the largest service provider in Africa, and Intel. Early results show that the offering has created a tremendous momentum in Nigeria, benefitting many thousands of schoolchildren. Partnering with a regional leader like MTN has made it easy to scale, with MTN Ghana launching a program one month later. Key drivers of success include:

- Local content, including Nigerian folk stories from Ajapa, a leading online education company;
- Attractive broadband packages of 750 MB and 1.5 GB from MTN;
- Comprehensive content package pre-loaded onto PCs addressing education, security, and digital literacy: Encyclopaedias, Intel AppUpsm, Intel® PC Basics, Intel® skoool™, and McAfee protection.
- Additional online educational content from Zinox card (www.zinoxcard.com)

Reaching the third billion of the world's population that is close to being able to afford valuable technology needs new ideas, and a new approach. We are pleased that the innovative prepaid sales model delivered by Intel and partners is making technology packages of broadband service, PCs, and digital content more desirable and affordable for new customers in developing markets worldwide.

Source: Mr. John Davies, Vice-President, Intel World Ahead Program.
Note: See also Annex 2, describing Intel's Reaching the 3rd Billion (R3B) program.

2/3

Women represent nearly two-thirds of the untapped market for mobile growth. Mobile operators aiming to be market leader in five years time must excel at bringing on new female subscribers.

Are there any 'hidden' under-represented or potentially neglected markets? According to estimates from the GSMA and Cherie Blair Foundation, women represent nearly two-thirds of the untapped market for mobile growth. Globally, a woman is 21% less likely to own a mobile phone than a man (Featured Insight 19). Closing this gender gap would bring the benefits of mobile phones to an additional 300 million women[6]. Mobile operators looking to lead the market in five years' time should excel at bringing in new female subscribers.

FEATURED INSIGHT 19: BROADBAND FOR EMPOWERING WOMEN

Women have less access to technology than men. Despite the ubiquity of mobile phones, there is a significant global gender gap – a woman is 21% less likely to own a mobile phone than a man (GSMA, Cherie Blair Foundation and Vital Wave Consulting). Although technology does not perceive gender, ICTs are not "gender neutral" as they may be used in different ways by men and women and may take on the gender perspective of their developer from basic content through to use to functionality to beneficiaries. More women need to be involved in the ICT industry to ensure that technology is shaped to include the needs of female consumers.

Experience from international policy efforts suggests that gender biases in the information society will persist for the foreseeable future. However, ICTs may give women the opportunity to be agents of their own development. The mWomen report (2011) suggests that women feel safer and more independent and have more economic opportunities when owning a mobile phone. Women are not "waiting" for access to ICTs, but are using ICTs when they are available to get around the constraints they face in society, economy, and politics. Case studies on gender and ICTs from around the world highlight efforts by women and their communities and organizations to overcome the "digital divide" independently.

Providing women with access to ICT tools such as mobile phones can lead to a better quality of life and wider economic growth (World Bank World Development Report 2012, UNCTAD Information Economy Report 2011). Empowering more women with mobile phones can accelerate social and economic development (Featured Insight 4). The 'knowledge economy' is now taking on new and unforeseen dimensions, as ICTs and broadband become drivers of social change.

Policy-makers need to pay attention to the gender digital divide in designing policies considering accessibility, affordability and digital literacy. Incentives for content development need to promote content catering to the interests and needs of women, including content focusing on education, health, jobs and economic empowerment, family, and community life. Policy also needs to encourage women and girls to embrace technology for their own empowerment, to study and choose careers in this sector, and to engage passionately in the future of broadband.

Source: H.E. Jasna Matic, Former State Secretary for the Digital Agenda, Government of the Republic of Serbia, quoting the mWomen webpage at: www.mwomen.org/Research.

ENDNOTES

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6 MULTILINGUAL CONTENT AS A DRIVER OF DEMAND

The vast majority of humanity lives in multilingual societies where multilingualism is the norm. The preservation and promotion of multilingualism are essential to preserve the vitality of human societies, to strengthen dialogue between cultures and between peoples, and to develop openness, transparency, mutual understanding, tolerance towards others, as well as to combat violence and promoting peace.

As early as 2003, UNESCO adopted a Recommendation concerning the Promotion and Use of Multilingualism and Universal Access to Cyberspace by the UNESCO General Conference. In 2005, the General Conference further asked Member States to report on measures taken by them. UNESCO's 2011 Consolidated Report notes progress in a number of areas, as well as several obstacles[1]. Globally, Internet services in many Member States often remain costly and limited in availability and speed. Consequently, a full range of online public services may only be provided to a limited proportion of the population. In addition, the importance of multilingualism is acknowledged in WSIS Action Line C8 (Cultural diversity and identity, linguistic diversity and local content). Slow development of local technical skills and expertise has also been reported, with low levels of digital literacy and emerging info- and infrastructures creating barriers for marginalized groups to access information and content on the Internet[2]. Appropriate policy responses, structural changes, and improved educational systems are needed to create a favourable environment for the creation and access to information and knowledge online.

There is growing evidence that the creation of digital content and digitization of existing information are important drivers of the digital economy. It is not just about connecting individuals, but connectivity and services are driving a new digital ecosystem (Booz & Company[3]). Digital content in different languages is an important driver of demand. Research by OECD, ISOC, and UNESCO finds a strong correlation between local infrastructure and local content (Featured Insight 20).

FEATURED INSIGHT 20: THE RELATIONSHIP BETWEEN LOCAL CONTENT AND INTERNET DEVELOPMENT

A recent OECD, ISOC, and UNESCO study reveals a correlation between the development of network infrastructure and the growth of local content[4]. Local content is defined as being in the users' own language and relevant to the communities in which they live and work. The study identifies factors present in environments with high levels of local content:

- Homogeneity in the local language and national population (e.g., Korea, Egypt, and China), even a cultural insularity, explains why the volume of local content is ahead of foreign content.
- The presence of local Internet Exchange Points (e.g., Kenya and Egypt).
- Broadband penetration drives lower costs of access and faster network performance (e.g., Rep. of Korea).
- For Internet content, successful local language adaptation of global content solutions such as social networks, microblogging, and local online services (e.g., Kenya, China, and Brazil).

The EURid/UNESCO World Report on Internationalized Domain Name (IDN) Deployment (see Featured Insight 21) hypothesizes that these factors, as well as the size of population, are among those that affect the rate of IDN uptake in a given country or region.

Source: UNESCO, OECD and ISOC.

The societies primarily concerned by the MDGs are generally lower-income societies where digital culture is not yet fully embedded, sustaining digital divides. Over recent years, infrastructure development, growing levels of services and new applications have helped bridge the digital divide.

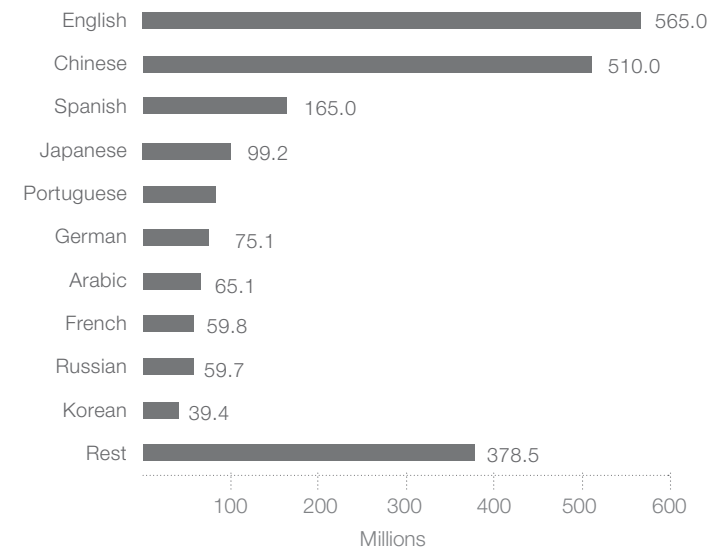
Without appropriate efforts to bridge language divides in online content, returns on investment in infrastructure could be significantly reduced, due to more limited use of the Internet. Content and broadband-enabled services in local languages, as well as the capacities of local communities to create and share content, are important drivers of the use of broadband infrastructure by local population.

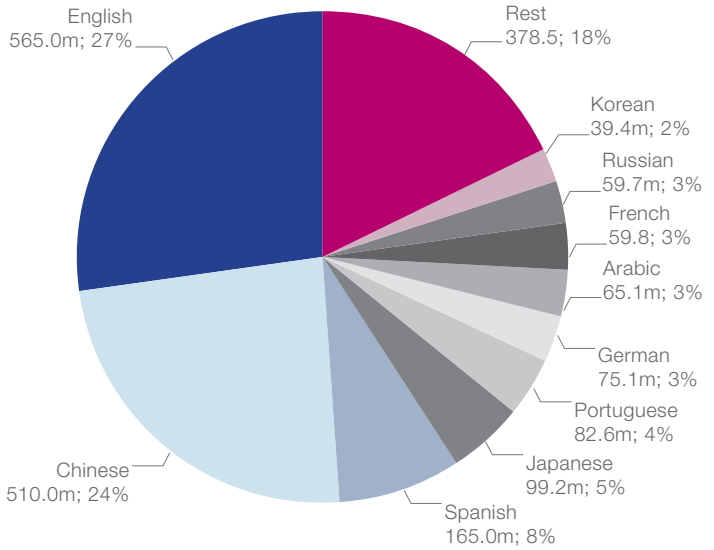
In terms of users, English and Chinese dominate the Internet, accounting for 27% and 24% of total global Internet users respectively, with Spanish a distant third (8% of Internet users – Figure 13). Indeed, if current growth rates continue, the total number of Internet users accessing the Internet in Chinese may overtake the number of Internet users predominantly using English in 2015.

Another means of analyzing languages on the web is to examine the number of languages in which popular portals or services are offered (as opposed to used – many more language groups may use a service in their dialect). Of a potential language universe of over 6,000 languages (estimates differ, according to the stage of evolution at which a dialect may be considered a separate language), LinkedIn's services are currently available in 17 languages; Twitter's in 21 languages; Google Translate currently offers 63 languages; Facebook offers 70, and Wikipedia is available in 285 (Figure 14). Maintaining popular services in as many different languages as possible clearly extends the benefits of the digital world to as many people as possible and offers important and immeasurable side-effects such as diversity and plurality of perspective, and opportunities to appreciate the cultures and views of different communities. The importance of multilingualism online cannot be underestimated (Featured Insight 21).

In addition to delivering content adapted to local cultures and context, ICTs and broadband can help to promote and eventually "safeguarding" endangered languages[5] – see, for example, the UNESCO Atlas of the World's Languages in Danger.[6]

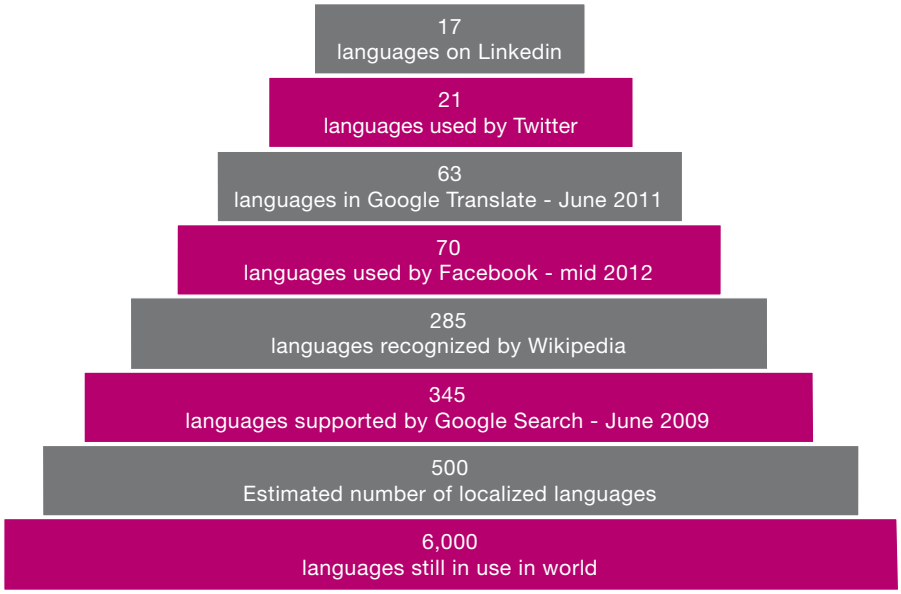
Figure 13: Top Ten Languages on the Internet (May 2011)





Source for both graphs: % of total global Internet users, Internet World Statistics: www.internetworldstats.com/stats7.htm

Figure 14: The Web of Many Languages, mid-2012



Source: www.translate.twttr.com/cms/node/1810 16 May 2012; 35 in 2009 www.searchenginewatch.com/article/2051705/Google-Adds-285-Languages-to-Translator-Toolkit 58 languages on Google - www.translate.google.com/about/intl/en_ALL/ plus 5 more: www.googleblog.blogspot.com/2011/06/google-translate-welcomes-you-to-indic.html#!/2011/06/google-translate-welcomes-you-to-indic.html, 21 June 2011. Note: Number of languages in which Twitter user portal is available – not the number of languages in which Twitter is used.

FEATURED INSIGHT 21: INTERNATIONALIZED DOMAIN NAMES (IDNs)

In order to promote multilingualism on the Internet, the role of IDNs as a vital part of the ecosystem necessary to foster the growth of local languages online needs to be more fully appreciated. Multilingualism on the Internet would facilitate and increase access to linguistically and culturally diverse content and provide new socio-economic development opportunities.

For this to happen, it implies the following:

Policy-makers must give attention to developing strategies to promote the deployment and raise awareness of IDNs in their country or region as an essential component of digital literacy.

The technical community, taking into consideration decisions made at the policy level and local capacities, could implement the available Internet standards to hasten the adoption of email functionality for IDNs, and adopt inclusive, transparent processes to facilitate the introduction of IDNs at the top level.

TLD registries should review their policies on registrars, pricing, and registration eligibility.

Broadband is a high priority for many countries, and IDNs can strengthen the potential of broadband as an enabler of local language content. IDNs should be seen as an important prerequisite and can serve as a benchmark for the creation of enabling environment and infrastructure. Since the introduction of IDN in November 2009, 31 IDN ccTLD have been introduced, representing 21 countries and territories and 23 different languages (see https://charts.icann.org/public/index-idn.html).

However, registering and using IDNs is not always a satisfactory experience for Internet users in some countries. The EURid/UNESCO 2012 World Report reviews the general challenges to achieving universality for IDNs. Its findings include:

- Internet browsers do not provide a consistent user experience for IDNs.
- Lack of email functionality for IDNs. Publication of relevant technical standards occurred in 2012; implementation remains a challenge.
- Poor support for IDNs in popular applications and websites in the creation of user accounts.
- Limited information to customers from local domain name registrars about availability of local IDN domain names in their respective countries.

Until these challenges are overcome, IDN popularity will lag behind that of ASCII domain names.

It is evident that the uptake of IDNs in some regions (e.g. the Russian Federation and the Rep. of Korea) is higher than in others. The EURid/UNESCO 2012 World Report on IDN Deployment explores this disparity in deployment and concludes that language, culture and infrastructure factors on the one hand, and ccTLD factors on the other, combine to impact IDN take up in a region. Country indicators include: Linguistic and cultural homogeneity; local IXPs; overall broadband penetration; Successful local language adaptation of global content solutions; and size of population. ccTLD indicators include: a strong network of local registrars; liberal registration policies; low prices; and how well-known the ccTLD brand is.

The Russian Federation, the Rep. of Korea, and China all have strong country indicators. In contrast, despite having strong infrastructure, Qatar's linguistically heterogeneous society means that English is used for many transactions, impacting the uptake of IDNs. Saudi Arabia has no IXPs or local language adaptations of content solutions.

The Rep. of Korea and the Russian Federation score highly for ccTLD indicators, with strong local registrar bases, liberal registration policies, low prices, and a long-established ccTLD registry. In contrast, the Saudi Arabia ccTLD has no registrars, and high retail prices. Qatar, despite its liberal registration policies, has recently re-established its ccTLD (brand), and 80% of its registrars are international rather than locally based. Egypt has a network of local registrars, but high prices limit the ccTLD's uptake. This analysis does not intend to make any judgment on registries, their policies, or operations. These factors are solely considered on the basis of their contribution to high volumes of IDN registrations, as shown in this matrix:

IDN readiness matrix

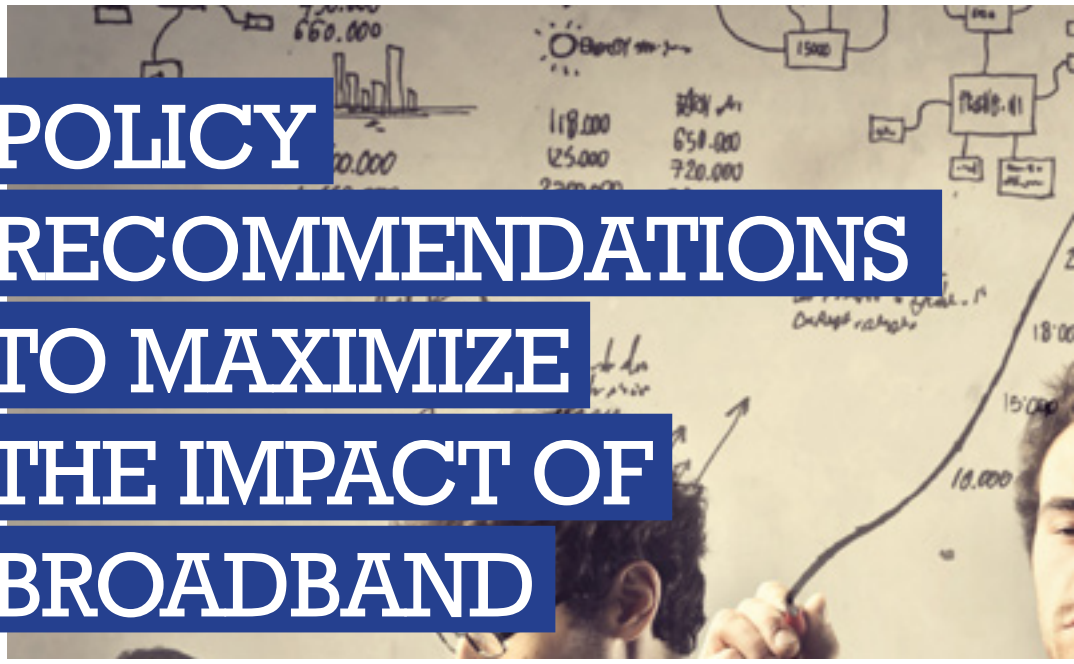
Source: UNESCO, from the EURid/UNESCO 2012 World Report on IDN Deployment.

ENDNOTES

1. “Second Consolidated Report on the Measures taken by Member States for the Implementation of the Recommendation of the concerning the Promotion and use of Multilingualism and Universal Access to Cyberspace”, available at: www.unesdoc.unesco.org/images/0021/002108/210804e.pdf.
2. www.unesdoc.unesco.org/images/0021/002108/210804e.pdf
3. “Maximizing the Impact of Digitization”, Booz & Company, available at: www.booz.com/media/uploads/BoozCo_Maximizing-the-Impact-of-Digitization.pdf
4. “The relationship between local content, Internet development and access prices”, 2011, a collaboration between the Internet Society, the Organisation for Economic Co-operation and Development (OECD) and UNESCO, presented at the IGF Nairobi, 2011, and available at: www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/local_content_study.pdf.
5. Further information can be found at: www.endangeredlanguages.com/
6. UNESCO Atlas of the World’s Languages in Danger, available at: www.unesco.org/new/en/culture/themes/endangered-languages/atlas-of-languages-in-danger/

7

POLICY RECOMMENDATIONS TO MAXIMIZE THE IMPACT OF BROADBAND



Strategies to increase broadband adoption and use must take into account the full range of government actions or policies and their impact on the cost to consumers of services, devices and relevant apps.

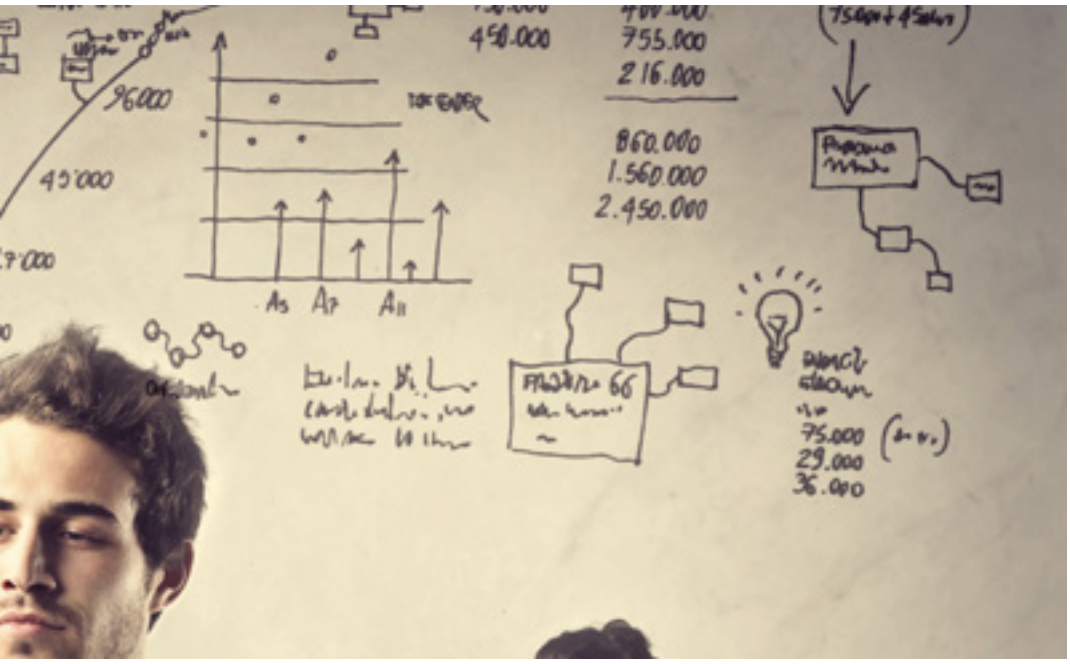
7.1 Explore fresh approaches to spectrum management

Delivering universal and affordable broadband access can only be fully achieved through a balance of technologies and policy approaches appropriate to specific situations. The growth rate in global mobile data traffic is projected to reach 60% annually from 2011-2017, which will result in a 15-fold increase in traffic by 2017[1], mainly due to video traffic. Growth in data consumption will also be driven by growth in smartphones, tablets, portable and mobile PCs. Such an explosion in data traffic requires more spectrum. In this regard, policy-makers and regulators can help to create a supportive environment and encourage investment and ensure sufficient availability of quality spectrum (Featured Insight 22). Optimizing approaches to spectrum policy, allocation, and management become an important aspect of governments' overall broadband policy portfolio.

Defining joint coverage obligations can also help to fulfill coverage goals more efficiently. Depending on which spectrum bands have already been assigned, simultaneous auctions of different bands (high and low bands) may be helpful, but are unlikely to be available in many countries. Care must be taken to give auction winners the ability to meet coverage requirements in alternative ways.

Today, policy-makers are also considering fresh approaches to spectrum management, including Dynamic Spectrum Access. While exploring fresh approaches to spectrum management, it is essential to take into account the expected spectrum needs of different services (e.g. mobile and satellite services, among others).

Note: This chapter has been contributed by Antonio García Zaballos, Lead Specialist in Telecommunications and Broadband Platform Coordinator at the Inter-American Development Bank (IDB), and also draws on sources from the GSR Best Practice Guidelines available from: www.itu.int/ITU-D/treg/bestpractices.html/



FEATURED INSIGHT 22: PREPARING FOR MOBILE BROADBAND

Worldwide, the number of mobile broadband users already outnumbers fixed broadband users by a ratio of two to one, and that imbalance will only grow over time as more developing country users upgrade their mobile phones to smartphones and tablets. However, today's mobile networks carry only a small fraction of the traffic that is carried over DSL, cable modem and fibre access networks. A tidal wave of data demand is on the way, and mobile network operators need to invest heavily to prepare for this.

Although the private sector will drive investment, policy-makers and regulators can help to create a supportive environment and encourage investment. The recent World Bank Report, "Information and Communications for Development: Maximizing Mobile", sets out a series of policy recommendations to consider. On the supply side:

- Ensure sufficient availability of quality spectrum to deploy cost-effective mobile broadband networks;
- Eliminate technological or service restrictions on spectrum;
- Focus on expansion of network coverage rather than on spectrum proceeds;
- Require transparency in traffic management, and safeguarding competition;
- Limit spectrum hoarding that could distort competitive conditions in the market;
- Foster the development of national backbone broadband networks; and
- Foster infrastructure and spectrum sharing.

On the demand side:

- Ensure the availability and affordability of broadband-enabled devices;
- Enable increasing affordability of broadband services; and
- Enable the development of broadband applications and content.

Source: World Bank (2012), "Information and Communications for Development 2012: Maximizing Mobile", available at: www.worldbank.org/ict/ICT4D2012.

FEATURED INSIGHT 23: KEEPING AN EYE ON QUALITY OF SERVICE (QoS) STANDARDS

The mobile network is a key delivery platform for broadband to users on the move, as well as to communities in rural and remote areas. With spectrum constraints and other technical challenges involved in deploying mobile networks, it is important to keep an eye on ensuring an acceptable quality of service (QoS) experience for users. A mobile broadband network with poor user experience will discourage adoption and usage of broadband.

In March 2012, Singapore recorded a mobile penetration rate of about 150% (IDA, 2012). With a population of over 5 million, Singaporeans have shown a strong appetite for smart-phones, according to surveys which rank Singapore one of the world's highest in terms of smartphone penetration (Netsize Guide, Informa, Google, Ipsos, Go Gulf, 2011; Ericsson Consumer Lab, 2012; Nielsen, 2012). The proliferation of smart and data-intensive communication devices has inevitably raised consumer expectations for a better mobile experience, including better coverage especially when indoors, and actual broadband speeds experienced by users.

Over a decade ago, in April 2001, the telecom regulator, the Infocomm Development Authority of Singapore (IDA), first auctioned spectrum for 3G mobile services. Then, IDA required the winning bidders to provide nationwide coverage of their 3G mobile services by December 2004. In 2007, Singapore introduced minimum QoS standards for 3G services. More stringent QoS standards were subsequently imposed in 2012 to ensure mobile operators continue to meet consumer expectations. The enhanced 3G QoS framework includes:

- More than 99% nationwide outdoor coverage
- More than 95% coverage in existing tunnels for roads and subway tunnels
- More than 99% for new tunnels built after April 2012
- More than 85% in-building coverage starting from April 2013

In crafting the enhanced 3G mobile QoS standards, IDA has carefully considered factors such as the nature of mobile and wireless technology in areas where it would be technically difficult for mobile signals to penetrate as a result of location or surrounding building structures. For buildings with limited coverage, mobile operators are required to make reasonable efforts to address issues like installing dedicated equipment within units or building premises.

Since 2011, mobile operators in Singapore have begun deploying LTE services to meet the burgeoning demand for mobile data. IDA is currently consulting on the framework for allocation of spectrum for 4G services, and intends to auction off spectrum for 4G services by 2013. Part of this auction will see similar requirements on winning bidders to provide nationwide coverage for 4G services possibly with other QoS requirements, to ensure that consumers and businesses in Singapore benefit from the next evolution of mobile services.

Source: Leong Keng Thai, Deputy Chief Executive/Director-General (Telecoms and Post), Infocomm Development Authority of Singapore.

7.2 Implement "Dig Once" Policies & Expedite Rights of Way and Construction Permits

Governments can use infrastructure maps as a tool to coordinate investment projects in new roads, as well as power transmission, gas, oil, water, and sewer lines to include fiber optic cables or ducts to provide broadband (see GSR Best Practice Guidelines 2008[2] and 2009[3]). "Dig Once" policies are a bold ideal, although policy-makers may need to be pragmatic, as there are instances where such policies have contributed to delays in the deployment of infrastructure.

7.3 Use Univeral Service Funds (USFs) and other financial mechanisms to develop broadband

Depending on geography and population density, policy-makers and regulatory authorities face different challenges in the roll-out of different broadband technologies. Understanding population distribution, socioeconomic variables (e.g., age, purchasing power) and market variables (e.g. number of operators, prices, etc.) is vital to reducing barriers to competition. Governments and regulators carry out a detailed analysis to determine the types of regulatory problems regulation can fix and identify the areas where PPP may be undertaken to boost the take-up of broadband services. In areas where private firms may not be initially willing to invest, the public sector could use targeted subsidies to foster the deployment of specific infrastructure, devices, and content, so universal adoption can be achieved. Several countries have used public funds or USFs to develop broadband in areas where it had not been commercially available (2011 GSR Discussion Paper on Strategies for Financing Universal Broadband Access[4] & GSR Best Practice Guidelines 2011[5]). One example is the Rep. of Korea, where the Government launched programs lasting 5-10 years to promote broadband development. These programs have made the Rep. of Korea the world leader in mobile broadband, with 105% mobile broadband penetration and more than half the population connected to high-speed, all-fiber networks by the end of 2011.

7.4 Consider Reviewing and Updating ICT Regulations

Given the speed with which the ICT sector is evolving, countries need to update their legislative and regulatory frameworks to provide businesses and users with legal certainty and allow for expanded electronic commerce, as well as the proper protection of personal data, copyright, rights in user-generated content, and other issues. However, necessary revisions need to be managed carefully in order to avoid radical changes to ICT regulatory frameworks, as sudden changes could affect the future evolution of the sector. A cost-benefit analysis must be applied, evaluating each market under review and adapting regulation to the specific needs of the market.

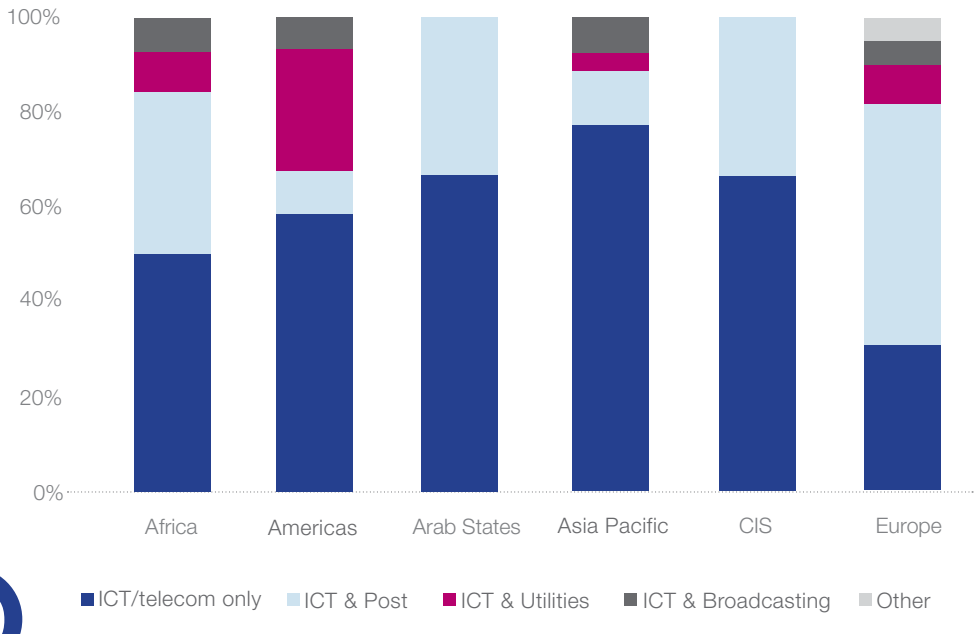
7.5 Consider a Unified Licensing Regime

Service providers have struggled with legacy inherited laws and regulations that award licenses per service, and many companies have taken the issue to court – for example, cable TV companies seeking to provide telephone service over their networks, and telephone companies wanting to upgrade their networks to offer video programming services and compete with the cable companies. More modern approaches to regulation may be needed – such as converged regulation, simplifications to the licensing regime or unified licensing, where one unified license can allow any telecommunication company to provide any service, as long as consumer rights are protected, and the competitiveness of markets is not threatened.

7.6 Consider Converged Regulation

Many countries have two regulators: one for telecommunications and the other for radio and television broadcasting. This arrangement was acceptable in the past when spectrum and telecommunications were clearly divided and regulation of content was a major focus of any broadcasting agency. However, with the proliferation of "triple play" offers, it is increasingly difficult to regulate services separately. ITU notes that the advent of high-speed networks and new kinds of content create an important leadership role for policy-makers and regulators in stimulating the demand for broadband and in promoting investment in infrastructure[6]. In some countries, ICT regulators are becoming converged and involved in many more spheres of influence, reflecting the involvement of ICT in many more aspects of our daily lives. In other countries, regulators are becoming more specialized. At present, most regulators worldwide are still sector-specific (Figure 15).

Figure 15: Converged Regulation? The Mandates of Regulators, 2010



Source: ITU World Telecommunication/ ICT Regulatory Database, Trends in Telecommunication Reform Report 2010/2011.

7.7 Reduce taxes and import duties on telecommunication/ICT equipment and services

There is significant evidence to suggest that reducing taxes and import duties on telecommunication/ ICT equipment and services could significantly boost levels of uptake. For example, since 2009, when Sri Lanka reduced its taxation of ICT products and services, broadband adoption has been growing at 45% annually, and the number of people who can afford broadband has grown from 3.5 million to over 13 million in 18 months. In Colombia, VAT was reduced from 16% to zero for most PCs in 2007. This measure has proven very successful, with PC unit sales significantly outpacing the regional average, so it remains in place today.

7.8 Stimulate the creation of local content in local languages

There is evidence that suggests a positive economic impact from the high volume of local content on local Internet infrastructure (Featured Insight 20). Local users consume mainly local content, while the cost of transmitting Internet traffic locally is usually lower than for international Internet traffic.

Apart from the financial aspect, it is important to note that stimulation of local content creation can boost local job creation. Investments in local broadband infrastructure also contribute to the development of knowledge and expertise in the broadband infrastructure sector.

7.9 Enhance demand for broadband through E-Gov initiatives

E-Gov services are important for the principles of good governance[7], as well as an important driver of demand in many developing countries. Governments are increasingly recognizing this and expanding their e–services for the benefit of both citizens and governments. The UN Public Administration Network (UNPAN) has created an e-government portal with hundreds of examples on how governments are assisting their citizens through e-gov services[8].

One key consideration for generating demand is to have governments take a more active role in helping to bridge the digital literacy gap through e-gov portals and programs. For example, digital literacy programs in libraries can help match citizens with the skills and knowledge of e-gov programs to enhance citizen participation and inclusion[9]. Governments should look for ways to expand the participation of citizens in E-Gov programs through digital literacy training.

7.10 Monitor ICT developments, based on statistical indicators

Policy choices must be informed by reliable data and indicators on ICT developments in countries. Statistical indicators are also essential to assess the impact of broadband policies and to track progress towards national and international broadband goals and targets (including the targets set by the Broadband Commission). Data collected at the national level should be based on internationally agreed standards and definitions, such as those developed by ITU and the Partnership on Measuring ICT for Development[10]. Data should be collected to monitor broadband infrastructure and access, prices and affordability, and broadband usage by individuals, businesses and public organizations such as Governments, schools and hospitals.

7.11 Incorporate sustainability principles into ICT regulations and policies

The outcome document of the 2012 UN Conference on Sustainable Development (Rio+20)[11], "The future we want"[12], recognized the contribution of ICTs to promote knowledge exchange, technical cooperation and capacity building for sustainable development, highlighting the need to work towards improved access to ICT, in particular to broadband network and services.

In April 2012, the Broadband Commission published a report, *"The Broadband Bridge, linking ICTs with climate action for a low carbon economy"*[13], which examined the role of broadband in driving the transformation towards a low-carbon economy. The report advances a set of recommendations promoting the adoption and delivery of environmentally-focused broadband policies. In particular, it highlights the need for visionary leadership and long-term broadband plans, coupled with a convergent view for energy, health, educational and climate-related applications of ICT services. Regulatory certainty, integrated decision-making and cross-ministerial flexibility contribute to overcoming the barriers that currently hinder the adoption of ICT-enabled applications that can promote environmental sustainability. Public policy officials were encouraged to incentivize the uptake of low carbon solutions, fund or facilitate scalable pilots, form partnerships among the private sector and government agencies, promote the dissemination of findings and boost measurement and standardization. Implementing these recommendations would be a step in the direction given by the Rio+20 Conference to advance in a fairer and more sustainable future for all.

7.12 Promote the skills and talents necessary for broadband

Based on Featured Insight 8 on the need for skills, the Broadband Commission encourages all countries to focus on Science, Technology, Engineering and Mathematics in primary/secondary education. Open education networks should be developed for innovators and entrepreneurs, with specially adapted curricula to reflect inter-disciplinary skills. Regulators can also help create the conditions for the emergence of the right mindsets in the public and private sectors. Governments, educationalists and policy-makers should address proactively the issue of gender/ICT, starting in early stages of education and encourage more girls to study ICT. Lastly, but not least, talents must be viewed as real assets subject to constant and growing global competition, so policy-makers must consider how broadband can help generate, grow, attract and retain such talents.

FEATURED INSIGHT 24: INTELLECTUAL PROPERTY (IP) AND BROADBAND

A myriad of competing technologies can provide broadband services, each having different bandwidth, reliability, cost, or coverage. Intellectual property (IP) is key to the development of broadband e-infrastructures irrespective of which technologies are used. The World Intellectual Property Organization (WIPO) is leading work in five areas of impact:

1) Content and Copyright Infrastructure
Shared standards, practices, values and behaviors over protected content and multimedia are critical for the broadband revolution to succeed. Broadband and copyright infrastructure go hand-in-hand: on the one hand, copyright infrastructure services need broadband to operate effectively in the online environment. Conversely, broadband needs effective copyright infrastructure to drive knowledge and creativity (e.g., via online registries and databases providing authoritative, reliable, and searchable information). Broadband offers a solid and reliable infrastructure for IP and copyright infrastructure by enabling the effective exercise and management of rights. WIPO organized a Global Meeting on emerging copyright licensing modalities in 2010 to explore different approaches for the licensing of creative content.

2) Intellectual Property Infrastructure
The development of intellectual property and innovation infrastructure depends on the creation of bandwidth-intensive broadband e-infrastructures and data banks. WIPO and ten partners have launched a R&D networks and IP hubs project to foster scientific collaboration, and reduce the costs of research and IP protection, and commercialization for network members. This model has been implemented in the health R&D sector of six African countries (Cameroon, Central African Republic, Chad, Equatorial Guinea, Gabon and Republic of Congo) and Colombia. In Colombia, the project resulted in 18 patent applications since the start of the program in September 2004 and was successfully expanded from the health sector to 3 other sectors of the economy, namely: agro-business, energy and defense. WIPO has launched the "Pilot Project for the Establishment of Technology Transfer Offices" to improve innovation infrastructure in 5 Arab countries (Algeria, Egypt, Jordan, Morocco and Tunisia), develop local skills, improve technology transfer and the creation of regional IP markets. These innovation infrastructures and platforms are based on collaboration[14] and resource sharing, as well as repositories of data, simulation and modeling, which depend on the full deployment of broadband.

3) Raising Awareness and Education about Intellectual Property
Raising awareness of IP can help promote creativity and innovation. WIPO is putting together a Networked Innovation Initiative (or intelligent

network) as an infrastructural effort for the development of collaborative networks for innovation able to identify and connect multiple actors with complementary resources in the search for creative and mutually helpful solutions; an Interactive Platform for Open Collaborative Projects to share experiences on open innovation; and the Innovation and Technology Transfer Support Structure for National Institutions or digital repository of training modules, guides, tools, models of national IP strategies, institutional IP policies, best practices, case studies and a database of standardized agreements available via a one-stop-shop on WIPO's website.

4) Public Private Partnerships (PPP)
Direct links between the public and private sector facilitate faster end-to-end delivery of services across multiple domains, including universities and research institutions. The WIPO University Initiative connects ideas, technologies and partners from the public and private sector by:
(i) promoting the effective use of IP, in particular, patents;
(ii) creating university/research institutions' IP and technology management infrastructure;
(iii) developing skilled human capital for IP/technology management and dissemination of knowledge;
(iv) creating a national/regional/global university IP Forum.

5) Networked Innovation
Thanks to the digital revolution, innovation is no longer an autonomous activity driven by R&D experts, but the result of networks of interaction. WIPO works with its Member States to support the development of the structures, policies and expertise necessary to nurture capacity for local innovation. Through capacity-building, WIPO aims to connect multiple actors in the search for mutually beneficial solutions. Broadband can drive a "social" process of interactions among nodes in the interactive bandwidth-intensive environment, including the quadruple helix incorporating the government, academic universities & research institutes, the private sector (customers, suppliers and competitors), and individuals.

WIPO is further exploring the relationship between broadband and IP. From the open modalities of IP licensing (such as CC and FOSS) which find their natural home in a networked environment, to the development of new business models for the distribution of music and films, the interactions of IP and broadband are bound to grow exponentially.

Source: Mr. Francis Gurry, Director-General, World Intellectual Property Organization.

8 CONCLUSIONS

This Report has summarized the various policy options open to governments and policy-makers to roll out the deployment of broadband networks and services and to position their country for future competitiveness in the growing digital economy. Broadband networks and services are more than simple infrastructure – they represent a set of transformative technologies that promise to change the way we communicate, work, play and do business. It is essential that every country takes broadband policy into account to shape its future social and economic development and prosperity, emphasizing both the supply and demand sides of the market. Further, it is crucial to adequately evaluate the potential alternatives to be implemented in order to encourage private sector investment. A "one size fits all" policy to broadband roll-out could have negative implications for the ICT market. Finally, a detailed cost-benefit approach should be adopted when evaluating different public policies and regulatory options to promote the growth and development of broadband in different countries around the world.

ENDNOTES

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2. GSR Best Practice Guidelines 2008, available from: www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR08/PDF/GSRguidelines08_E.pdf
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Annex 1: Impact of Broadband on Various Economies

NO	REGION	RESULT	SOURCE	DATE	TITLE
1	**Africa**	ICTs directly contribute around 7% of Africa's GDP, which is higher than the global average. That's because, in Africa, mobile phones give access to services that are available in traditional forms in more developed countries, such as financial credit, newspapers, games and entertainment. The value of a mobile phone is higher in Africa than elsewhere. Now the rapid development of mobile broadband with smartphones and affordable tablets across Africa will bring greater social and economic impacts over the next decade.	The World Bank and the African Development Bank	**2012**	The Transformational Use of Information and Communication Technologies in Africa
2	**Australia**	The economic benefits of broadband for Australia are estimated at 0.44% of GDP for every 10% increase in broadband penetration.	Allen Consulting Group	**2010**	The Allen Consulting Group: Economic Gains of Getting more Australians Online (2010)
3	**Brazil**	Broadband has become a priority, local applications development continues to take place and access devices have switched to laptops, smartphone and tablets which are a one-off cost and becoming increasingly affordable. As a result, lowering broadband costs and improving performance is a key priority to achieve digital inclusion and leverage the benefits of ICTs for development. In an effort to help to improve coverage and reduce the cost of broadband access, the Government has begun a major broadband infrastructure development initiative which has set ambitious targets to triple broadband uptake by 2014. The largest ICT infrastructure project ever carried out in Brazil, the National Broadband Plan (PNBL), it aims to ensure that broadband access is available to low-income households, especially in areas so far poorly served.	Michael Jensen – The World Bank	**2011**	Broadband in Brazil: A Multipronged Public Sector Approach to Digital Inclusion
4	**Brazil**	10% in broadband penetration could reduce the unemployment rate by 0.06%. If broadband penetration were to grow by 20%, the impact on the rate of change of unemployment would be a further 0.138. Deployment of broadband could result in a reduction of unemployment from the original 3.89% to 4.03%. Impact on GDP growth for each 1% change in broadband penetration: 0.008.	Katz et al	**2012**	The impact of broadband on the economy: research to date and policy issues
5	**Chile**	10% increase in broadband penetration will result in an increase of 0.09% in regional GDP of Chile's regions. Broadband deployment, which reached a penetration of 9.8%, contributed 1.76% to the employment rate, which amounts to the creation of 114,426 direct and indirect jobs. Impact on GDP growth for each 1% change in broadband penetration: 0.009.	Katz et al	**2012**	The impact of broadband on the economy: research to date and policy issues
6	**Dominican Republic**	Increase in broadband penetration of 1% would diminish unemployment by 0.29%. If the unemployment rate were to be 14%, an increase of 1% in broadband penetration would contribute to a reduction of unemployment to 13.7%.	Katz et al	**2012**	The impact of broadband on the economy: research to date and policy issues
7	**European Union**	According to the model, process improvement, increased specialization in knowledge-intensive activities and broadband-based development of innovative markets resulted in a growth of the European Gross Value Added (GVA) of € 82.4 bn per year (+0.71%) in 2006. The same study estimated that broadband development would in the basic case contribute to the creation of 1,076,000 jobs in Europe and a broadband-related growth of the economic activity of € 849 bn between 2006 and 2015. In terms of productivity, Koutroumpis shows that for each 1% increase in broadband penetration, GDP increases by 0.025% in the old EU-15 countries.	Micus Koutrompis	**2008** **2009**	Micus, (2008) The impact of broadband on growth and productivity. Koutroumpis,(2009), The Economic Impact of Broadband on Growth: A Simultaneous Approach

NO	REGION	RESULT	SOURCE	DATE	TITLE
8	India	Mobile broadband can generate a $71B incremental increase over the period from 2014 to 2020. The benefit from broadcasting would be just over one tenth of the mobile dividend - $3.3B. Therefore, allocation to mobile would generate an additional benefit of $68.1B, or $43.8B in net present value. Most of this, around 83%, will come from increased productivity across all sectors.	GSMA; Boston Consulting Group (BCG)	2010	Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific
9	India	Direct impact on productivity and economic growth suggesting that an increase in broadband penetration of 1% will contribute INR 162 bn, or 0.11% to Indian GDP in 2015	GSMA; Analysys Mason	2010	India Wireless Broadband Economic Impact
10	India	Broadband has generated nearly 9 million jobs in direct and indirect ways. This result becomes more important taking into consideration the latest estimates provided by the Reserve Bank of India forecasting an increment of 220 million to India's workforce by 2030. 10% increase in penetration will result in an increase of 0.3128% points in regional GDP. Impact on GDP growth for each 1% change in broadband penetration: 0.031	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues
11	Indonesia	The contribution of the broadband variable appears to be an extremely contributor to the reduction of unemployment, with a negative effect of -8.6%. This means that for each 1% increase in the penetration rate of the service among the Indonesian households, the unemployment growth would be reduced it by 8.6% points.	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues
12	Indonesia	In GDP terms, mobile broadband would generate an extra $22.6B. The incremental benefits over the period, on a net present value basis, would be 2.9% of Indonesia's current GDP. The bulk of the increase in GDP, 52% would come from increased productivity in the service sector. 700 MHz band based mobile broadband will stimulate estimated additional productivity gains of 0.4% for service industries, and 0.2% for manufacturing. This would lead to the creation of about 327,000 jobs in 2020 – many of them in rural areas.	GSMA; Boston Consulting Group (BCG)	2010	Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific
13	Jordan	The CAGR (economic growth) for the period of 2007 to 2010 was 44%, which, when multiplied by the broadband penetration growth coefficient yields an average annual increase of GDP per capita of 0.92%.	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues
14	Korea, Rep.	Korea's annual GDP has already passed the trillion dollar barrier, and it can expect to add $68.3B in GDP in the six years to 2020 should it devote the 700 MHz band to mobile (net present value of $59.8B), over and above the expected contribution from broadcasting. More than 75% of this would come from improved productivity in existing companies, taking advantage of the greater speed and flexibility offered by mobile connections. Service sector is expected to enjoy a 0.8% increase in productivity directly attributable to 700 MHz band mobile broadband. Under a quarter of the GDP impact would come from the additional 19,600 new business activities that will be stimulated by the 700 MHz band. More than 37,800 jobs, many of them in Korea's rural regions and varying from highly sophisticated technical posts to basic service functions such as distribution would be created by these new companies.	GSMA; Boston Consulting Group (BCG)	2010	Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific
15	Malaysia	Increase of 10% in broadband penetration will contribute to 0.7% to regional GDP growth. This result has to be put in a context of an economy that has a service sector contributing more than 55% of the GDP. It should be noted that this estimation, based on penetration per household, is lower than the 0.4% impact on GDP per 10% of broadband penetration per inhabitant estimated for Malaysia. Impact on GDP growth for each 1% change in penetration :0.077	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues

NO	REGION	RESULT	SOURCE	DATE	TITLE
16	Malaysia	The economic opportunities created by improved access to mobile broadband would be expected to generate, at current prices, an extra $17.5 bn in GDP for the period 2014-2020. Over 90% of the GDP benefits are generated by increased productivity in existing businesses. The incremental productivity benefit to industry of deploying mobile broadband in the 700 MHz band is estimated at 0.6% for services, and 0.3% for manufacturing. Mobile broadband will generate a further $2.1 bn in revenues between 2014 and 2020, with the bulk from corporation tax on profits ($1.2 bn)	GSMA; Boston Consulting Group (BCG)	2010	Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific
17	Nigeria	Wireless broadband could potentially contribute over 1% of GDP –and 1.7% of non-oil GDP – in 2015. If positive policy actions are taken to remove barriers to broadband, the benefit to GDP in 2015 will be an additional NGN190 billion (USD1.1 billion) or 0.27% of GDP.	GSMA; Analysys Mason	2011	Nigeria – Economic impact of wireless broadband
18	Panama	Fixed broadband has positively impacted GDP of Panama, accounting for 0.82% of GDP and representing 11.3% of all economic growth on average since 2005.	Katz et al	2012	The economic impact of broadband in Panama
19	The Philippines	Mobile broadband adoption was found to contribute an annual 0.32% of GDP. This represents 6.9% of all GDP growth for the economy during the past decade.	Katz et al	2012	The economic impact of broadband in the Philippines
20	Qatar	Qatar surpassed the broadband penetration floor of 1% in 2004; the CAGR of broadband penetration between that year and 2010 was 35%. By multiplying that number by the broadband coefficient in the Arab States general model (0.0186), it is estimated that broadband contributed an average 0.65% to annual GDP growth.	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues
21	Saudi Arabia	10% increase in broadband penetration would decrease the unemployment rate by 2.4% points.	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues
22	South Africa	Wireless broadband and related industries could generate 1.8% of GDP (ZAR 72 bn) by 2015 and about 28,000 jobs – plus further jobs outside the industry. The direct impact on productivity and economic growth suggesting that an increase in broadband penetration of 1% could result in 0.1% productivity gain.	GSMA; Analysys Mason	2010	Assessment of economic impact of wireless broadband in South Africa
23	Sri Lanka	According to the Ministry of Finance and Planning, the post and telecommunications sector accounted for 11.7% of Sri Lanka's GDP growth in 2009 (down from 36% in 2005 and 21.5% in 2007). As an integrated, cross-sector ICT-enabled development program, e-Sri Lanka after Seven years its start, have a number of the projects which are still being implemented and others have been abandoned.	Helani Galpaya –The World Bank	2011	Broadband in Sri Lanka Glass Half Full or Half Empty?
24	Sweden	Economic effects of broadband-enabled ICTs in Sweden have been larger and surfaced faster. From 1998 to 2007, average annual productivity grew much faster in Sweden than in other peer countries (2.32% compared with 0.39% in Italy and an average of 1.66% among OECD countries).	Tim Kelly and Carlo Rossotto – The World Bank	2012	Broadband Strategies Handbook
25	Turkey	Broadband could boost economic growth (growth of GDP) by 0.8-1.7% and potentially create 180,000-380,000 new jobs a year.	National Broadband Vision		
26	Turkey	According to the National Broadband Vision Study of Turkey, through fostering broadband development the Turkish economy could gain US$ 4.9-10 billion extra value added each year thereby boosting its economic growth by 0.8-1.7%. This economic momentum enabled by an enhanced broadband ecosystem would bring 180,000-380,000 new jobs and provide new income opportunities.	Cagatay Telli – The World Bank	2011	Broadband in Turkey: Compared To What?

NO	REGION	RESULT	SOURCE	DATE	TITLE
27	United Arab Emirates	The average annual contribution of broadband to per capita GDP growth between 2004 and 2010 is 0.79%.	Katz et al	2012	The impact of broadband on the economy: research to date and policy issues
28	USA	Broadband added 1.0–1.4% to the growth rate in the number of jobs during 1998–2002	U.S. Department of Commerce, Economic Development Administration	2006	Measuring Broadband's Economic Impact
29	USA	Broadband added 0.5–1.2% to the growth rate in the number of firms during 1998–2002	U.S. Department of Commerce, Economic Development Administration	2006	Measuring Broadband's Economic Impact
30	USA	Broadband added 0.3–0.6% to new business creations in IT-intensive sectors in 1998–2002. Broadband reduced the share of small business (those with fewer than 10 employees) by 1.3–1.6% in 1998–2002	U.S. Department of Commerce, Economic Development Administration	2006	Measuring Broadband's Economic Impact
31	Vietnam	Solid economic growth in Vietnam has coincided with increased broadband usage. Liberalization of the telecommunications sector has led to growing competition with 11 enterprises providing infrastructure. Service providers have developed modern IP-based networks with extensive fiber optic backbones. Incomes have risen so that more people can afford broadband.	Tran Minh Truan – The World Bank	2011	Broadband in Vietnam: Forging Its Own Path
32	International	10% increase in broadband household penetration delivers a boost to a country's GDP that ranges from 0.1% to 1.4%.	McKinsey & Company	2009	Mobile broadband for the masses
33	International	Broadband alone has limited impact as a technological platform, but acts as an enabler. As such, it holds the potential to have a significant impact on economic and social progress and to transform the economy. However, for this potential impact to be unleashed, broadband must be used by businesses, governments, and citizens in a way that increases productivity in the economy. This requires: (a) the creation and availability of broadband-enabled services and applications that increase efficiency and productivity and (b) the capacity of businesses, government, and citizens to use broadband-enabled services and applications in a productive and efficient way. These two requirements are critical for achieving the potential economic impact that broadband can produce.	Tim Kelly and Carlo Rossotto – The World Bank	2012	Broadband Strategies Handbook
34	Emerging markets	Bringing broadband penetration levels in emerging markets to today's Western European levels could potentially add USD 300-400 billion in GDP and generate 10 -14 million jobs	McKinsey & Company	2009	Mobile broadband for the masses
35	Low - and middle-income countries	Every 10% increase in broadband penetration accelerates economic growth by 1.38% — more than in high-income countries and more than for any other telecommunications service	The World Bank	2009	Information and Communications for Development 2009: Extending Reach & Increasing Impact
36	15 OECD nations, 14 European nations & the U.S.	An increase of 1 broadband line per 100 individuals in "medium or high ICT" countries increases productivity by 0.1%. This productivity gain suggests an increase in GDP (holding number of hours worked constant) from an increase of 1%, 5% and 10% in broadband penetration	LECG	2009	Economic Impact of Broadband: An Empirical Study

Annex 2: Examples of key countries with the "Reaching the third billion" program

COUNTRY	TELCOS	BROADBAND SERVICE PLAN OPTIONS	CONTENT SOLUTIONS	TCO REDUCTION
Albania	AMC	• USD 16 for 12 months • for 6 gbs and free 3G dongle	British Council English Language Learning Modules*, Intel AppUpSM center, Intel® PC Basics	**41-50%**
Bangladesh	Qubee	Prepaid USD 4 and USD 15 credit for 3G dongle	Champs 21 (local), Encyclopedia Britannica*, Intel AppUp center, Intel PC Basics, Intel® skoool™ content, Khan Academy, McAfee security software*	**1-10%**
Bosnia	BH Telecom	Free 3G modem and free 2G download	British Council English Language Learning Modules, Intel skoool content, voucher for local ESL classes	**11-20%**
Brazil	TIM	3G prepaid broadband, unlimited Internet access package for USD 1.20 per day	British Council English Language Learning Modules, Intel® Easy Steps, Intel PC Basics,Intel skoool content, other entertainment and learning applications	**71-80%**
Bulgaria	Globul, MaxTelekom, Mobiltel, Vivacom	3G dongle and unlimited Internet access (with purchase of Intel®-based notebook or netbook)	British Council English Language Learning Modules, Encyclopedia Britannica, Intel AppUp center, Intel Easy Steps, Intel PC Basics, Intel skoool content, McAfee security software, Mobiltel antivirus software*	**31-40%****
Colombia	Une	12 months contract for 1G, first six months double speed for free		**21-30%**
Ecuador	CNT	20% discount - USD 15 (was USD 18)		**31-40%**
Egypt	MobiNil	• USD 8 unlimited • USD 4 prepaid for 110 MB (one month plus one month free)	British Council English Language Learning Modules, Intel Easy Steps, Intel skoool content, local content from MoE	**31-40%**
El Salvador	Claro	USD 10/month (was USD 25), 2 year contract	none	
Georgia (Republic of)	Georgian Telecom	• USD 14 unlimited • USD 4 for 1G prepaid for six months	British Council English Language Learning Modules, Intel PC Basics, local ("Learn English Kids")	**81-90%****
Ghana	MTN	2.5 GB for same price as 1G	British Council English Language Learning Modules, Encyclopedia Britannica, Intel AppUp center, Intel PC Basics, Intel skoool content	**1-10%**
India	BSNL, MTS, Reliance (RCOM), TATA	• USD 10 unlimited • USD 1 prepaid for 100 MB	Bluebird, Intel AppUp center, Mobiline (ebook reader), NIIT Course, Twitter,* local digital content	**61-70%**
Indonesia	Axiata, Indosat, Telkom, XL, Telkomsel	• USD 22 unlimited • USD 11 unlimited (subsidy)	British Council English Language Learning Modules, Intel AppUp center, local digital content	**31-40%**
Kenya	Safaricom	• USD 5 for 500 MB • USD 10 for 1.5 GB	British Council English Language Learning Modules, Encyclopedia Britannica, Intel AppUp center, Intel Easy Steps, Intel PC Basics, Intel skoool content, McAfee Family Pack*, local digital content	**71-80%**
Macedonia	VIP Telecom	24 month contract, eight months free plus free 3G dongle	British Council English Language Learning Modules, Intel skoool content, voucher for local ESL classes	**51-60%**
Malaysia	Celcom, Packet One Networks, Telekom Malaysia, Yes from YTL	USD 10 unlimited for 1.5 GB	British Council English Language Learning Modules, local digital content	**11-20%**

COUNTRY	TELCOS	BROADBAND SERVICE PLAN OPTIONS	CONTENT SOLUTIONS	TCO REDUCTION
Mexico	Compuapoyo	USD 8 (was USD 16) financing at 12% (was 24%), USD 80 PC subsidy	Intel PC Basics, Intel Easy Steps, Intel skoool content	**61-70%**
Nigeria	MTN	1.5 GB for same price as 1G USD 25 (was USD 40/month plus an increase to 1.5 GB)	Intel PC Basics, local content, Intel AppUp center, Intel skoool content, Encyclopedia Britannica, McAfee security software	**1-10%**
Peru	Telefonica	20% discount - USD 18 (was USD 22)		**41-50%**
Philippines	PLDT	USD 9.99/month WiFi (5,000 hotspots)	Sing to Win	**1-10%**
PRC (China)	CMCC, CTC, CUC	Reduced from USD 10/month to USD 6/month		**41-50%**
Romania	Orange	Unlimited Internet access with free 3G dongle for EUR 20	British Council English Language Learning Modules, Encyclopedia Britannica, Intel AppUp center, Intel Easy Steps, Intel® Education Help Guide, Intel PC Basics, Intel skoool content	**61-70%**
Serbia	BH Telekom, MTS, Telenor, VIP Telecom	3G dongle with two months of usage; 10 Mbps download and 3 Mbps speed (with purchase of Intel-based notebook, netbook, or desktop)	British Council English Language Learning Modules, Intel skoool content, local government content, voucher for local ESL classes	**41-50%**
Thailand	i-mobile3Gx	• USD 10 for 1 GB • USD 30 for 5 GB	Local options	**1-10%**
Uganda	Orange	USD 10 per 500 MB (prepaid)	British Council English Language Learning Modules, Intel Easy Steps, Intel® Education Help Guide, Intel PC Basics, Intel skoool content	**21-30%**
United States	Comcast	• USD 30 unlimited • USD 10 for 1.5 GB (low-income families)	Digital literacy kits	**31-40%**
Vietnam	Viettel, VNPT	• USD 10 unlimited • USD 5 unlimited (rural and teachers) • USD 1.80 prepaid for 700 MB or USD 3 for 2 GB • Students (14-22) 500 MB/ month free (eight years max)	British Council English Language Learning Modules, Intel AppUp center, Intel PC Basics, Intel skoool content, LV Dictionary	**51-60%**

**Reflects BB cost reduction only.

Annex 3: Fixed Broadband Penetration, Worldwide, 2011

Fixed (wired)-broadband subscriptions per 100 inhabitants, 2011

RANK	ECONOMY	FIXED (WIRED)-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011	RANK	ECONOMY	FIXED (WIRED)-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011
1	Liechtenstein	**71.6**	47	Uruguay	**13.5**
2	Monaco	**44.2**	48	TFYR Macedonia	**13.2**
3	Switzerland	**39.2**	49	St. Vincent & Grenadines	**12.9**
4	Netherlands	**38.7**	50	Russia	**12.2**
5	Denmark	**38.2**	51	St. Lucia	**12.1**
6	Korea (Rep.)	**36.9**	52	Chile	**11.6**
7	Norway	***36.5***	53	China	**11.6**
8	France	**36.1**	54	Trinidad & Tobago	**11.5**
9	Iceland	**33.9**	55	Bosnia and Herzegovina	**11.5**
10	Belgium	**33.0**	56	United Arab Emirates	**11.0**
11	Luxembourg	**32.9**	57	Serbia	**10.8**
12	United Kingdom	**32.7**	58	Azerbaijan	**10.7**
13	Germany	**32.5**	59	Mexico	**10.6**
14	Canada	***32.0***	60	Argentina	***10.5***
15	Sweden	**31.8**	61	Turkey	**10.3**
16	Malta	**30.0**	62	Moldova	**9.9**
17	Finland	**29.5**	63	Seychelles	**8.9**
18	United States	***28.7***	64	Mauritius	**8.9**
19	Andorra	**28.7**	65	Costa Rica	**8.7**
20	Japan	**27.4**	66	Qatar	**8.7**
21	Estonia	**27.1**	67	Brazil	**8.6**
22	Austria	**26.5**	68	Panama	**7.9**
23	New Zealand	**25.8**	69	Georgia	**7.6**
24	Singapore	**25.5**	70	Kazakhstan	**7.5**
25	Slovenia	**24.8**	71	Malaysia	**7.4**
26	Australia	**23.9**	72	Ukraine	**7.0**
27	Israel	**23.8**	73	Colombia	**6.9**
28	Spain	**23.5**	74	Antigua & Barbuda	**6.7**
29	Italy	***22.8***	75	Maldives	**6.4**
30	Hungary	**22.2**	76	Saudi Arabia	**5.7**
31	Barbados	**22.1**	77	Brunei Darussalam	**5.5**
32	Lithuania	**22.1**	78	Thailand	**5.4**
33	Ireland	**22.1**	79	Lebanon	**5.2**
34	Belarus	**21.9**	80	Tunisia	**5.1**
35	Greece	**21.6**	81	Armenia	**5.0**
36	Portugal	**21.0**	82	Tuvalu	**4.6**
37	San Marino	**20.6**	83	Suriname	***4.5***
38	Latvia	**20.4**	84	Bahamas	**4.5**
39	Croatia	**19.5**	85	Albania	**4.3**
40	Cyprus	**18.1**	86	Cape Verde	**4.3**
41	Czech Republic	**15.7**	87	Viet Nam	**4.3**
42	Bulgaria	**15.5**	88	Ecuador	**4.2**
43	Romania	**15.4**	89	Dominican Rep.	**4.0**
44	Poland	***14.4***	90	Jamaica	**3.9**
45	Bahrain	**13.8**	91	Peru	***3.5***
46	Slovak Republic	**13.6**	92	El Salvador	***3.3***

RANK	ECONOMY	FIXED (WIRED)-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011	RANK	ECONOMY	FIXED (WIRED)-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011
93	Jordan	**3.2**	133	Swaziland	**0.2**
94	Belize	**3.1**	134	Mauritania	**0.2**
95	Mongolia	**2.8**	135	Cambodia	**0.2**
96	Algeria	**2.8**	136	Nigeria	**0.1**
97	Fiji	**2.7**	137	Angola	***0.1***
98	Guyana	**2.5**	138	Kenya	**0.1**
99	Iran (I.R.)	**2.4**	139	Papua New Guinea	**0.1**
100	Egypt	**2.2**	140	Burkina Faso	**0.1**
101	Philippines	***1.9***	141	Togo	**0.1**
102	Oman	**1.8**	142	Côte d'Ivoire	**0.1**
103	Morocco	**1.8**	143	Tajikistan	***0.1***
104	South Africa	***1.8***	144	Mozambique	**0.1**
105	Nicaragua	**1.8**	145	Malawi	**0.1**
106	Bhutan	**1.8**	146	Myanmar	**0.1**
107	Sri Lanka	**1.7**	147	Zambia	***0.1***
108	Djibouti	**1.2**	148	Timor-Leste	***0.0***
109	Tonga	**1.2**	149	Bangladesh	***0.0***
110	Indonesia	**1.1**	150	Benin	**0.0**
111	Libya	***1.1***	151	Cuba	**0.0**
112	India	**1.0**	152	Sudan	**0.0**
113	Paraguay	**1.0**	153	Rwanda	**0.0**
114	Kiribati	**0.9**	154	Ethiopia	**0.0**
115	Venezuela	**0.9**	155	Madagascar	**0.0**
116	Namibia	**0.8**	156	Honduras	**0.0**
117	Botswana	**0.8**	157	Congo (Dem. Rep.)	**0.0**
118	Senegal	**0.7**	158	Turkmenistan	***0.0***
119	Bolivia	**0.7**	159	Comoros	***0.0***
120	Lao P.D.R.	**0.7**	160	Gambia	***0.0***
121	Syria	**0.6**	161	Mali	**0.0**
122	Uzbekistan	**0.5**	162	Niger	**0.0**
123	Solomon Islands	**0.4**	163	Tanzania	***0.0***
124	Yemen	**0.4**	164	Guinea	**0.0**
125	S. Tomé & Principe	**0.4**	165	Cameroon	**0.0**
126	Pakistan	**0.4**	166	Congo	**0.0**
127	Nepal	**0.3**	167	Eritrea	**0.0**
128	Kyrgyzstan	***0.3***	168	Liberia	**0.0**
129	Gabon	**0.3**	169	Chad	**0.0**
130	Zimbabwe	**0.3**	170	Central African Rep.	**0.0**
131	Uganda	**0.3**	171	Nauru	**0.0**
132	Ghana	**0.3**	172	Haiti	**0.0**

Notes: The table includes ITU Member States.
Data are unavailable for: Afghanistan, Burundi, Dominica, Equatorial Guinea, Grenada, Guatemala, Guinea-Bissau, Iraq, Korea D.P.R., Kuwait, Lesotho, Marshall Islands, Montenegro, Micronesia, Samoa, Sierra Leone, Somalia, South Sudan, St. Kitts & Nevis, Vanuatu, Vatican.
Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 4: Mobile Broadband Penetration, Worldwide, 2011

Active mobile-broadband subscriptions per 100 inhabitants, 2011

RANK	ECONOMY	ACTIVE MOBILE-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011	RANK	ECONOMY	ACTIVE MOBILE-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011
1	Singapore	**110.9**	47	South Africa	***19.8***
2	Korea (Rep.)	**105.1**	48	Antigua & Barbuda	**19.7**
3	Japan	***93.7***	49	Belgium	**19.4**
4	Sweden	**91.5**	50	Belarus	**18.9**
5	Finland	**87.1**	51	TFYR Macedonia	**18.7**
6	Denmark	**80.2**	52	Uzbekistan	**18.4**
7	Luxembourg	**66.7**	53	Viet Nam	**18.0**
8	United States	***65.5***	54	Maldives	**17.4**
9	United Kingdom	**62.3**	55	Lithuania	***17.2***
10	Qatar	**61.0**	56	Chile	**17.1**
11	Iceland	**60.7**	57	Fiji	**15.5**
12	Ireland	**59.4**	58	Montenegro	**15.3**
13	New Zealand	**53.0**	59	Zimbabwe	**14.9**
14	Netherlands	**49.2**	60	Bulgaria	**14.5**
15	Poland	**48.4**	61	Panama	**14.5**
16	Russia	**47.9**	62	Romania	**14.1**
17	France	**44.0**	63	Hungary	**13.2**
18	Austria	**43.3**	64	Mongolia	**12.7**
19	Czech Republic	**43.1**	65	Mauritius	**12.4**
20	Australia	**42.8**	66	Malaysia	**12.3**
21	Estonia	**42.0**	67	Argentina	**11.7**
22	Israel	***41.0***	68	San Marino	**10.6**
23	Spain	**40.9**	69	Ecuador	**10.3**
24	Saudi Arabia	**40.4**	70	Bahrain	**9.5**
25	Kazakhstan	**38.4**	71	China	***9.5***
26	Oman	**37.8**	72	Bosnia & Herzegovina	**9.2**
27	Latvia	**37.6**	73	Uruguay	***9.0***
28	Switzerland	**36.1**	74	Albania	**8.8**
29	Germany	**34.8**	75	Turkey	**8.8**
30	Serbia	**34.5**	76	Morocco	**8.0**
31	Canada	***32.9***	77	Dominican Rep.	**7.7**
32	Malta	**32.6**	78	Nauru	**6.8**
33	Slovak Republic	**31.9**	79	Croatia	**6.6**
34	Greece	**31.8**	80	Rwanda	***6.4***
35	Italy	**31.3**	81	Brunei Darussalam	**6.3**
36	Slovenia	**29.3**	82	Jordan	**4.9**
37	Portugal	**27.4**	83	Seychelles	**4.7**
38	Norway	***24.4***	84	Mexico	**4.6**
39	Cyprus	**24.1**	85	Paraguay	**4.5**
40	Ghana	**23.0**	86	Ukraine	***4.4***
41	Indonesia	**22.2**	87	Venezuela	**4.2**
42	United Arab Emirates	**21.7**	88	Kyrgyzstan	***4.1***
43	Azerbaijan	**21.5**	89	Guatemala	***4.1***
44	Egypt	**21.0**	90	Solomon Islands	**3.8**
45	Brazil	**20.9**	91	Colombia	**3.7**
46	Georgia	**20.5**	92	Honduras	**3.7**

RANK	ECONOMY	ACTIVE MOBILE-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011	RANK	ECONOMY	ACTIVE MOBILE-BROADBAND SUBSCRIPTIONS PER 100 INHABITANTS 2011
93	Namibia	**3.6**	136	Benin	**0.0**
94	El Salvador	**3.6**	137	Burkina Faso	**0.0**
95	Moldova	**3.5**	138	Burundi	***0.0***
96	Philippines	***3.4***	139	Cameroon	**0.0**
97	Malawi	**3.1**	140	Central African Rep.	**0.0**
98	Cape Verde	**3.0**	141	Chad	**0.0**
99	Uganda	**2.8**	142	Congo (Dem. Rep.)	**0.0**
100	Nigeria	**2.8**	143	Côte d'Ivoire	**0.0**
101	Tunisia	**2.4**	144	Equatorial Guinea	**0.0**
102	Sri Lanka	**2.3**	145	Eritrea	***0.0***
103	Cambodia	**2.2**	146	Gabon	**0.0**
104	Costa Rica	***2.0***	147	Guinea	**0.0**
105	Bolivia	**1.9**	148	Guinea-Bissau	**0.0**
106	India	**1.9**	149	Niger	**0.0**
107	Jamaica	***1.5***	150	S. Tomé & Principe	***0.0***
108	Botswana	***1.5***	151	Algeria	**0.0**
109	Angola	***1.5***	152	Comoros	**0.0**
110	Senegal	**1.5**	153	Djibouti	**0.0**
111	Peru	**1.4**	154	Somalia	***0.0***
112	Tanzania	***1.2***	155	Bangladesh	**0.0**
113	Congo	**1.2**	156	Iran (I.R.)	**0.0**
114	Trinidad & Tobago	**1.2**	157	Kiribati	**0.0**
115	Mozambique	***1.0***	158	Marshall Islands	***0.0***
116	Nicaragua	**1.0**	159	Micronesia	***0.0***
117	Bhutan	**1.0**	160	Papua New Guinea	***0.0***
118	Syria	**1.0**	161	Samoa	**0.0**
119	Swaziland	**0.7**	162	Thailand	**0.0**
120	Lao P.D.R.	***0.6***	163	Timor-Leste	***0.0***
121	Mauritania	**0.5**	164	Tuvalu	**0.0**
122	Gambia	***0.5***	165	Vanuatu	**0.0**
123	Togo	**0.4**	166	Turkmenistan	***0.0***
124	Zambia	**0.4**	167	Bahamas	**0.0**
125	Mali	**0.4**	168	Barbados	**0.0**
126	Kenya	**0.3**	169	Cuba	***0.0***
127	Ethiopia	***0.3***	170	Dominica	**0.0**
128	Pakistan	**0.3**	171	Grenada	**0.0**
129	Liberia	**0.2**	172	Guyana	***0.0***
130	Tonga	**0.1**	173	Haiti	**0.0**
131	Yemen	**0.1**	174	St. Kitts and Nevis	**0.0**
132	Madagascar	**0.1**	175	St. Lucia	**0.0**
133	Lebanon	**0.0**	176	St. Vincent & Grenadines	**0.0**
134	Myanmar	**0.0**	177	Suriname	**0.0**
135	Nepal	**0.0**			

Notes: The table includes ITU Member States.
Data are unavailable for: Afghanistan, Andorra, Armenia, Belize, Iraq, Korea D.P.R., Kuwait, Lesotho, Libya, Lichtenstein, Monaco, Sierra Leone, South Sudan, Sudan, Tajikistan, Vatican.
Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 5: Target 3 – Percentage of Households with Internet, Developing Countries

RANK	ECONOMY	2011	RANK	ECONOMY	2011
1	Korea (Rep.)	**97.2**	41	Fiji	***22.1***
2	Singapore	**85.0**	42	Iran (I.R.)	***22.0***
3	Qatar	**83.6**	43	Panama	**20.7**
4	Hong Kong, China	***79.6***	44	Armenia	***19.5***
5	Macao, China	***78.0***	45	Paraguay	***19.3***
6	Bahrain	**76.8**	46	New Caledonia	***18.5***
7	Israel	**71.0**	47	Tuvalu	***18.0***
8	Brunei Darussalam	***69.0***	48	Jamaica	***17.8***
9	United Arab Emirates	**67.0**	49	Peru	***17.7***
10	Lebanon	**61.8**	50	Ecuador	**16.9**
11	Malaysia	**61.4**	51	Tunisia	***16.0***
12	Saudi Arabia	***60.5***	52	Venezuela	***16.0***
13	Kuwait	**57.7**	53	Algeria	***15.0***
14	Cyprus	**57.4**	54	Philippines	***15.0***
15	Barbados	***54.6***	55	Suriname	***15.0***
16	Kazakhstan	***48.0***	56	Viet Nam	***14.0***
17	Antigua & Barbuda	***45.0***	57	Thailand	**13.4**
18	St. Vincent & Grenadines	***45.0***	58	El Salvador	***12.0***
19	St. Lucia	***44.0***	59	Dominican Rep.	**11.8**
20	Turkey	**42.9**	60	Libya	***11.4***
21	Belarus	**40.3**	61	Tonga	***10.6***
22	Azerbaijan	***39.5***	62	Honduras	***10.0***
23	Uruguay	***39.4***	63	Namibia	***10.0***
24	Oman	***38.9***	64	South Africa	**9.8**
25	Chile	***38.8***	65	Swaziland	***9.5***
26	Argentina	***38.0***	66	Bolivia	***9.4***
27	Brazil	**37.8**	67	Mongolia	***9.0***
28	Mauritius	***36.4***	68	Cape Verde	***8.5***
29	Syria	***36.0***	69	Bhutan	***8.1***
30	Jordan	**35.4**	70	Sri Lanka	***8.1***
31	Morocco	**35.0**	71	Guyana	***8.0***
32	Trinidad & Tobago	***35.0***	72	Uzbekistan	***7.8***
33	Seychelles	***34.0***	73	Guatemala	***7.0***
34	Costa Rica	**33.6**	74	Indonesia	***7.0***
35	China	***30.9***	75	Gabon	***7.0***
36	Egypt	***30.5***	76	Kenya	***6.9***
37	Maldives	***28.9***	77	Pakistan	***6.7***
38	Mexico	***27.5***	78	Angola	***6.4***
39	Colombia	**23.4**	79	Botswana	***6.4***
40	Georgia	***23.3***	80	India	***6.0***

RANK	ECONOMY	2011	RANK	ECONOMY	2011
81	Turkmenistan	*6.0*	105	Comoros	*2.9*
82	Nicaragua	*5.6*	106	Cambodia	*2.8*
83	Gambia	*5.2*	107	Malawi	*2.5*
84	Kyrgyzstan	*5.0*	108	Mauritania	*2.5*
85	Rwanda	*5.0*	109	Papua New Guinea	*2.5*
86	Senegal	*5.0*	110	Zambia	*2.4*
87	Nigeria	*4.6*	111	Burkina Faso	*2.4*
88	Tanzania	4.5	112	Madagascar	*2.0*
89	Uganda	*4.5*	113	Central African Rep.	*1.9*
90	Lao P.D.R.	*4.2*	114	Benin	*1.8*
91	Ghana	*4.0*	115	Afghanistan	*1.7*
92	Yemen	*4.0*	116	Eritrea	*1.6*
93	Djibouti	*3.9*	117	Chad	*1.6*
94	Sudan	*3.8*	118	Ethiopia	*1.5*
95	Mozambique	*3.5*	119	Guinea-Bissau	*1.5*
96	Solomon Islands	*3.5*	120	Myanmar	*1.4*
97	Bangladesh	*3.3*	121	Mali	*1.4*
98	Lesotho	*3.1*	122	Liberia	*1.3*
99	Nepal	*3.1*	123	Côte d'Ivoire	*1.2*
100	Haiti	*3.0*	124	Guinea	*1.1*
101	Cameroon	*3.0*	125	Congo	1.0
102	Cuba	*3.0*	126	Congo (Dem. Rep.)	*1.0*
103	Tajikistan	*3.0*	127	Niger	*1.0*
104	Togo	*3.0*		**World Average**	20.5

Notes: The table includes ITU Member States.
Data are unavailable for: Bahamas, Belize, Burundi, Dominica, Equatorial Guinea, French Polynesia, Grenada, Iraq, Kiribati, Korea D.P.R., Marshall Islands, Micronesia, Nauru, Neth. Antilles, S. Tomé & Principe, Samoa, Sierra Leone, Somalia, South Sudan, St. Kitts & Nevis, Timor-Leste, Vanuatu.
Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 6: Target 4 – Percentage of Individuals using the Internet, Worldwide, 2011

RANK	ECONOMY	PERCENTAGE OF INDIVIDUALS USING THE INTERNET 2011	RANK	ECONOMY	PERCENTAGE OF INDIVIDUALS USING THE INTERNET 2011
1	Iceland	**95.0**	47	Italy	**56.8**
2	Norway	**94.0**	48	TFYR Macedonia	**56.7**
3	Netherlands	**92.3**	49	Brunei Darussalam	***56.0***
4	Sweden	**91.0**	50	Portugal	**55.3**
5	Luxembourg	**90.9**	51	Trinidad & Tobago	**55.2**
6	Denmark	**90.0**	52	Chile	**53.9**
7	Finland	**89.4**	53	Greece	**53.0**
8	Qatar	**86.2**	54	Lebanon	**52.0**
9	New Zealand	**86.0**	55	Uruguay	**51.4**
10	Switzerland	**85.2**	56	Dominica	***51.3***
11	Liechtenstein	**85.0**	57	Morocco	**51.0**
12	Korea (Rep.)	**83.8**	58	Bulgaria	**51.0**
13	Germany	**83.0**	59	Azerbaijan	***50.0***
14	Canada	***83.0***	60	San Marino	**49.6**
15	United Kingdom	**82.0**	61	Russia	**49.0**
16	Antigua & Barbuda	**82.0**	62	Albania	***49.0***
17	Andorra	**81.0**	63	Argentina	***47.7***
18	Austria	**79.8**	64	Saudi Arabia	**47.5**
19	France	**79.6**	65	Kazakhstan	***45.0***
20	Japan	**79.5**	66	Brazil	**45.0**
21	Australia	**79.0**	67	Romania	**44.0**
22	Belgium	***78.0***	68	Seychelles	***43.2***
23	United States	***77.9***	69	St. Vincent & Grenadines	**43.0**
24	Bahrain	**77.0**	70	Panama	**42.7**
25	Ireland	**76.8**	71	Serbia	**42.2**
26	Estonia	**76.5**	72	Costa Rica	**42.1**
27	Singapore	***75.0***	73	Turkey	**42.1**
28	Slovak Republic	**74.4**	74	St. Lucia	***42.0***
29	Kuwait	**74.2**	75	Colombia	**40.4**
30	Czech Republic	**73.0**	76	Venezuela	**40.2**
31	Slovenia	**72.0**	77	Montenegro	**40.0**
32	Barbados	***71.8***	78	Belarus	**39.6**
33	Latvia	**71.7**	79	Tunisia	**39.1**
34	Croatia	**70.7**	80	China	**38.3**
35	United Arab Emirates	**70.0**	81	Moldova	**38.0**
36	Israel	**70.0**	82	Georgia	***36.6***
37	Malta	**69.2**	83	Peru	**36.5**
38	Oman	**68.0**	84	Mexico	**36.2**
39	Spain	**67.6**	85	Egypt	**35.6**
40	Lithuania	**65.1**	86	Dominican Rep.	**35.5**
41	Bahamas	**65.0**	87	Viet Nam	**35.1**
42	Poland	**64.9**	88	Mauritius	***35.0***
43	Malaysia	**61.0**	89	Jordan	**34.9**
44	Bosnia & Herzegovina	***60.0***	90	Maldives	**34.0**
45	Hungary	**59.0**	91	Cape Verde	***32.0***
46	Cyprus	**57.7**	92	Guyana	***32.0***

RANK	ECONOMY	PERCENTAGE OF INDIVIDUALS USING THE INTERNET 2011	RANK	ECONOMY	PERCENTAGE OF INDIVIDUALS USING THE INTERNET 2011
93	Suriname	*32.0*	136	India	10.1
94	Jamaica	*31.5*	137	Kiribati	10.0
95	Ecuador	31.4	138	Lao P.D.R.	9.0
96	Ukraine	30.6	139	Nepal	9.0
97	Uzbekistan	30.2	140	Pakistan	9.0
98	Tuvalu	30.0	141	Gabon	8.0
99	Bolivia	*30.0*	142	Botswana	7.0
100	Philippines	*29.0*	143	Rwanda	*7.0*
101	Nigeria	28.4	144	Djibouti	7.0
102	Kenya	28.0	145	Eritrea	*6.2*
103	Fiji	28.0	146	Solomon Islands	*6.0*
104	Tonga	25.0	147	Congo	5.6
105	Paraguay	*23.9*	148	Comoros	5.5
106	Thailand	23.7	149	Cameroon	5.0
107	Cuba	23.2	150	Iraq	*5.0*
108	Syria	22.5	151	Afghanistan	5.0
109	South Africa	*21.0*	152	Bangladesh	5.0
110	Bhutan	21.0	153	Turkmenistan	*5.0*
111	Iran (I.R.)	*21.0*	154	Mauritania	4.5
112	S. Tomé & Principe	*20.2*	155	Mozambique	*4.3*
113	Mongolia	*20.0*	156	Lesotho	*4.2*
114	Kyrgyzstan	*20.0*	157	Benin	3.5
115	Sudan	*19.0*	158	Togo	3.5
116	Swaziland	18.1	159	Malawi	3.3
117	Indonesia	*18.0*	160	Cambodia	*3.1*
118	El Salvador	*17.7*	161	Burkina Faso	3.0
119	Senegal	17.5	162	Liberia	*3.0*
120	Libya	*17.0*	163	Guinea-Bissau	*2.7*
121	Honduras	15.9	164	Central African Rep.	*2.2*
122	Zimbabwe	15.7	165	Côte d'Ivoire	2.2
123	Sri Lanka	15.0	166	Mali	*2.0*
124	Yemen	*14.9*	167	Papua New Guinea	*2.0*
125	Angola	*14.8*	168	Chad	*1.9*
126	Ghana	*14.1*	169	Madagascar	1.9
127	Algeria	14.0	170	Guinea	1.3
128	Tajikistan	*13.0*	171	Niger	1.3
129	Uganda	*13.0*	172	Somalia	1.3
130	Namibia	*12.0*	173	Congo (Dem. Rep.)	1.2
131	Tanzania	*12.0*	174	Burundi	*1.1*
132	Guatemala	*11.7*	175	Ethiopia	*1.1*
133	Zambia	11.5	176	Myanmar	1.0
134	Gambia	*10.9*	177	Timor-Leste	*0.9*
135	Nicaragua	10.6		**World average**	32.5

Notes: The table includes ITU Member States.
Data are unavailable for: Armenia, Belize, Equatorial Guinea, Grenada, Haiti, Korea D.P.R., Marshall Islands, Micronesia, Monaco, Nauru, Samoa, Sierra Leone, South Sudan, St. Kitts & Nevis, Vanuatu, Vatican.
Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 7: Target 4 – Percentage of Individuals using the Internet (Least Developed Countries)

RANK	LDC	2011	RANK	ECONOMY	2011
1	Tuvalu	**30.0**	23	Mozambique	***4.3***
2	Bhutan	**21.0**	24	Lesotho	***4.2***
3	S. Tomé & Principe	***20.2***	25	Benin	**3.5**
4	Sudan	***19.0***	26	Togo	**3.5**
5	Senegal	**17.5**	27	Malawi	**3.3**
6	Yemen	***14.9***	28	Cambodia	***3.1***
7	Angola	***14.8***	29	Burkina Faso	**3.0**
8	Uganda	***13.0***	30	Liberia	***3.0***
9	Tanzania	***12.0***	31	Guinea-Bissau	**2.7**
10	Zambia	**11.5**	32	Central African Rep.	***2.2***
11	Gambia	***10.9***	33	Mali	***2.0***
12	Kiribati	**10.0**	34	Chad	***1.9***
13	Lao P.D.R.	**9.0**	35	Madagascar	**1.9**
14	Nepal	**9.0**	36	Guinea	**1.3**
15	Djibouti	**7.0**	37	Niger	**1.3**
16	Rwanda	**7.0**	38	Somalia	**1.3**
17	Eritrea	***6.2***	39	Congo (Dem. Rep.)	**1.2**
18	Solomon Islands	***6.0***	40	Burundi	***1.1***
19	Comoros	**5.5**	41	Ethiopia	***1.1***
20	Afghanistan	**5.0**	42	Myanmar	**1.0**
21	Bangladesh	**5.0**	43	Timor-Leste	***0.9***
22	Mauritania	**4.5**		**All LDCs**	**6.0**

Notes: The table includes ITU Member States.
Data are unavailable for: Equatorial Guinea, Haiti, Samoa, Sierra Leone, Vanuatu.
Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 8: Target 4 – Percentage of Individuals using the Internet (Developing Countries)

RANK	ECONOMY	2011	RANK	ECONOMY	2011
1	Qatar	**86.2**	48	Guyana	***32.0***
2	Korea (Rep.)	**83.8**	49	Suriname	***32.0***
3	Antigua & Barbuda	**82.0**	50	Jamaica	***31.5***
4	Bahrain	**77.0**	51	Ecuador	**31.4**
5	Singapore	***75.0***	52	Uzbekistan	**30.2**
6	Hong Kong, China	**74.5**	53	Bolivia	***30.0***
7	Kuwait	**74.2**	54	Tuvalu	**30.0**
8	Barbados	***71.8***	55	Philippines	***29.0***
9	Israel	**70.0**	56	Nigeria	**28.4**
10	United Arab Emirates	**70.0**	57	Fiji	**28.0**
11	Oman	**68.0**	58	Kenya	***28.0***
12	Bahamas	**65.0**	59	Tonga	**25.0**
13	Malaysia	**61.0**	60	Paraguay	***23.9***
14	Macao, China	**58.0**	61	Thailand	**23.7**
15	Cyprus	**57.7**	62	Cuba	**23.2**
16	Brunei Darussalam	***56.0***	63	Syria	**22.5**
17	Trinidad & Tobago	**55.2**	64	Bhutan	**21.0**
18	Chile	***53.9***	65	Iran (I.R.)	**21.0**
19	Lebanon	**52.0**	66	South Africa	***21.0***
20	Uruguay	**51.4**	67	S. Tomé & Principe	***20.2***
21	Dominica	***51.3***	68	Kyrgyzstan	***20.0***
22	Morocco	**51.0**	69	Mongolia	***20.0***
23	Azerbaijan	***50.0***	70	Sudan	***19.0***
24	Argentina	***47.7***	71	Swaziland	**18.1**
25	Saudi Arabia	**47.5**	72	Indonesia	***18.0***
26	Brazil	**45.0**	73	El Salvador	***17.7***
27	Kazakhstan	***45.0***	74	Senegal	**17.5**
28	Seychelles	***43.2***	75	Libya	***17.0***
29	St. Vincent & Grenadines	**43.0**	76	Honduras	**15.9**
30	Panama	**42.7**	77	Zimbabwe	**15.7**
31	Costa Rica	**42.1**	78	Sri Lanka	**15.0**
32	Turkey	**42.1**	79	Yemen	***14.9***
33	St. Lucia	***42.0***	80	Angola	***14.8***
34	Colombia	**40.4**	81	Ghana	***14.1***
35	Venezuela	**40.2**	82	Algeria	**14.0**
36	Tunisia	**39.1**	83	Tajikistan	***13.0***
37	China	**38.3**	84	Uganda	***13.0***
38	Georgia	***36.6***	85	Namibia	***12.0***
39	Peru	**36.5**	86	Tanzania	***12.0***
40	Mexico	**36.2**	87	Guatemala	***11.7***
41	Egypt	**35.6**	88	Zambia	**11.5**
42	Dominican Rep.	**35.5**	89	Gambia	***10.9***
43	Viet Nam	**35.1**	90	Nicaragua	**10.6**
44	Mauritius	***35.0***	91	India	**10.1**
45	Jordan	**34.9**	92	Kiribati	**10.0**
46	Maldives	**34.0**	93	Lao P.D.R.	**9.0**
47	Cape Verde	***32.0***	94	Nepal	**9.0**

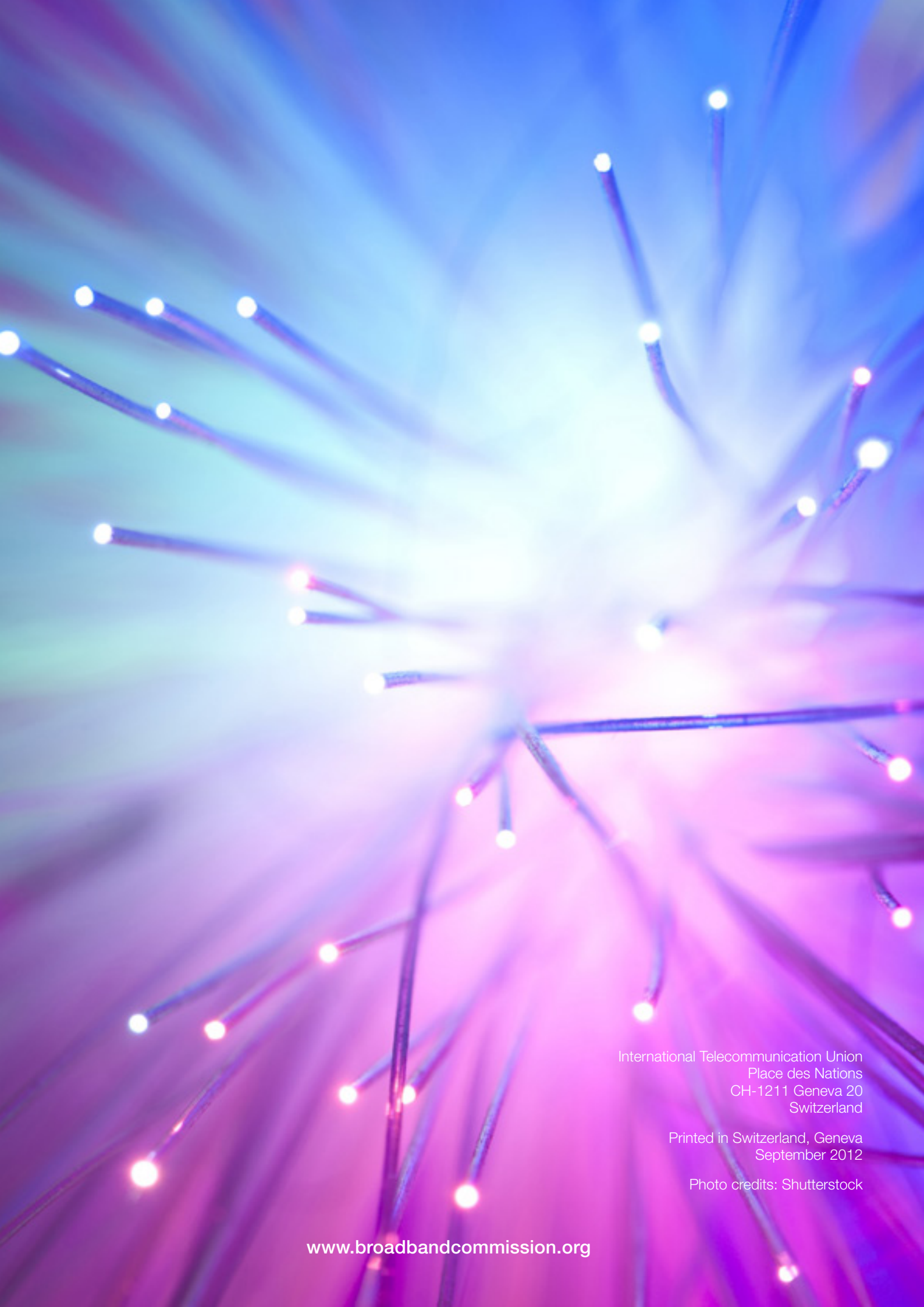
RANK	ECONOMY	2011	RANK	ECONOMY	2011
95	Pakistan	**9.0**	114	Malawi	**3.3**
96	Gabon	**8.0**	115	Cambodia	***3.1***
97	Botswana	**7.0**	116	Burkina Faso	**3.0**
98	Djibouti	**7.0**	117	Liberia	***3.0***
99	Rwanda	**7.0**	118	Guinea-Bissau	***2.7***
100	Eritrea	***6.2***	119	Central African Rep.	***2.2***
101	Solomon Islands	***6.0***	120	Côte d'Ivoire	**2.2**
102	Congo	**5.6**	121	Mali	***2.0***
103	Comoros	**5.5**	122	Papua New Guinea	***2.0***
104	Afghanistan	**5.0**	123	Chad	***1.9***
105	Bangladesh	**5.0**	124	Madagascar	**1.9**
106	Cameroon	**5.0**	125	Guinea	**1.3**
107	Iraq	***5.0***	126	Niger	**1.3**
108	Turkmenistan	***5.0***	127	Somalia	***1.3***
109	Mauritania	**4.5**	128	Congo (Dem. Rep.)	**1.2**
110	Mozambique	***4.3***	129	Burundi	***1.1***
111	Lesotho	***4.2***	130	Ethiopia	***1.1***
112	Benin	**3.5**	131	Myanmar	**1.0**
113	Togo	**3.5**	132	Timor-Leste	***0.9***
				All developing economies	**24.4**

Notes: The table includes ITU Member States.
Data are unavailable for: Armenia, Belize, Equitorial Guinea, Grenada, Guam, Haiti, Korea D.P.R., Marshall Islands, Micronesia, Nauru, Neth. Antilles, Samoa, Sierra Leone, South Sudan, St. Kitts & Nevis, Vanuatu.
Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

LIST OF ACRONYMS AND ABREVIATIONS

2G	Second-Generation mobile
3G	Third-Generation mobile
4G	Fourth-Generation mobile
ADSL	Asymmetric Digital Subscriber Line
ART	Anti-retroviral Therapy
BCG	Boston Consulting Group
CAGR	Compound Annual Growth Rate
CC	Creative Commons
ccTLD	Country Code Top Level Domain
CDN	Content Distribution Network
DSL	Digital Subscriber Line
€	Euro
EC	European Commission
EURid	European Registry for Internet Domains
FAO	Food and Agricultural Organization
FCC	Federal Communications Commission of the United States
FOSS	Free and Open Source Software
FTTB	Fibre-to-the-Building
FTTH	Fibre-to-the-Home
FTTx	Fibre-to-the-X
G8	Group of 8 Major Economies
G20	Group of 20 Major Economies
GB	Gigabyte
Gbps	Gigabit per second
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Global Information Systems
GPS	Global Positioning System
GSMA	Global Systems for Mobile Communications Association
GSR	Global Symposium for Regulators
GVA	Gross Value-Added
IC4D	Information and Communications for Development
ICT	Information and Communication Technology
IDA	Infocomm Development Authority of Singapore
IDB	Inter-American Development Bank
IDN	International Domain Name
IFFCO	Indian Farmers Fertilizers Co-operative
IMSO	International Mobile Satellite Organization
INSEAD	Institut Européen d'Administration des Affaires (European Institute of Business Administration)
IP	Internet Protocol
IP	Intellectual Property (in Featured Insight 24))
ISOC	Internet Society
IT	Information Technology
ITSO	International Telecommunications Satellite Organization
ITU	International Telecommunication Union
ITU – R	International Telecommunication Union Radiocommunication Sector
IXP	Internet Exchange Point
LAN	Local Area Network

LDC	Least Developed Country
LTE	Long-Term Evolution
M2M	Machine to Machine
MB	Megabyte
Mbps	Megabit per second
MDGs	Millennium Development Goals
MHz	MegaHertz
MMS	Multimedia Messaging Service
Mpixel	Megapixel
MPLS	Multi-Protocol Label Switching
NBN	National Broadband Network
NGA	Next-Generation Access
NGN	Next-Generation Networks
NGO	Non-Governmental Organization
OCW	Open Courseware
OECD	Organisation for Economic Co-operation and Development
OSI	Open Systems Interconnection
PC	Personal Computer
PPP	Public Private Partnership
QoS	Quality of Service
R&D	Research and Development
ROI	Return on Investment
SDGs	Sustainable Development Goals
SIM	Subscriber Identity Module
SME	Small- and Medium-sized Enterprise
SMS	Short Message Service
TASIM	Trans-Eurasian Information Super Highway Project
TCO	Total Cost of Ownership
TLD	Top-Level Domain
TMT	Technology, Media, Telecommunications
UAS	Universal Access and Service
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Cultural and Scientific Organization
UNPAN	United Nations Public Administration Network
UNSPECA	United Nations Special Programme for the Economies of Central Asia
UPE	Universal Primary Education
USD	United States Dollar
USF	Universal Service Fund
USO	Universal Service Obligation
VAT	Value-Added Tax
VDSL	Very High Bit Digital Subscriber Line
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminal
W-CDMA	Wideband Code Division Multiple Access
WIPO	World Intellectual Property Organization
WLAN	Wireless Local Area Network
WRC	World Radiocommunication Conference
WSIS	World Summit on the Information Society
WTIM	World Telecommunication/ICT Indicators Meeting



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