THE STATE OF BROADBAND 2013: UNIVERSALIZING BROADBAND

A REPORT BY THE BROADBAND COMMISSION
SEPTEMBER 2013

United Nations
Educational, Scientific and
Cultural Organization

ABOUT THE COMMISSION

The Broadband Commission for Digital Development was launched 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). Established in May 2010, the Commission unites top industry executives with government leaders, thought leaders, policy pioneers, 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, as well as providing a fresh approach to UN and business engagement. To date, the Commission has published a number of high-level policy reports, best practices and case studies.

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

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EXECUTIVE SUMMARY

Affordable broadband connectivity, services and applications are essential to modern society, offering widely recognized social and economic benefits. 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 for achieving social progress. In its work, the Commission has not defined 'broadband' in terms of specific minimum transmission speeds, in recognition of the range of market definitions in different countries. Rather, the Commission views broadband as a cluster of concepts: always-on, high-capacity connectivity enabling combined provision of multiple services simultaneously[1].

This Report has been written collaboratively, drawing on contributions from the Commission's leading array of executives, thought leaders and their organizations, foremost in their fields. And yet, the question persists – how best to connect everyone? This Report seeks to answer a number of questions (Figure 1), the answers to which can help us to realize the potential of broadband connectivity.

It explores the questions of whether, and how, everyone can be connected to broadband Internet, and if so, by when:

- Why should everyone be connected?
- Is there a viable business case to connect the last 5-10% of the population?
- How can we connect women, minorities, and disadvantaged groups?
- Have Universal Service Funds (USFs) been extended to include broadband?

1. "A 2010 Leadership Imperative: The Future Built on Broadband" (Broadband Commission, 2010), available at: www.broadbandcommission.org/Reports/Report_1.pdf

Figure 1: The Structure of this Report

How is broadband evolving?	→	Mobile Technologies (Chapter 2)
Why do we need it? Benefits of broadband	→	Broadband for Development & the MDGs (Chapter 3)
How far have we come? How far to go?	→	Evaluating Global Growth (Chapter 4)
How can we get there?	→	Universalizing Broadband (Chapter 5)
How can we generate demand for broadband?	→	Content Driving Demand & Freedom of Content (Chapter 6)
How can we universalize broadband?	→	Policy Recommendations (Chapter 7)

Source: ITU/UNESCO Broadband Commission for Digital Development.

Chapter 2 explores key trends and developments in broadband, especially growth in mobile broadband as today's fastest-growing Information and Communication Technology (ICT). Over the last two years, the mobile industry has added one billion more subscriptions, with hundreds of millions more people learning to use a mobile phone. This Chapter explores the implications of putting mobile phones into the hands of every person on the planet, as well as embedding wireless connectivity into the environment around us in a growing 'Internet of Things'. It finds strong implications for broadband accelerating innovation.

Chapter 3 examines the all-important benefits of broadband in accelerating development and achieving the Millennium Development Goals (MDGs). Broadband enables the introduction of innovative new services, but it can also enhance the delivery of existing services in many areas, including education, healthcare, and banking. The Chapter finds that broadband connectivity is not a panacea, and that the best results may be achieved when broadband is integrated carefully and effectively into existing systems.

Chapter 4 tracks progress towards universalizing broadband using the Commission's advocacy targets for 2015. It finds good progress in the first target of making broadband policy universal, with 134 countries having a National Broadband Plan (NBP) in place by mid-2013. Progress in Target 2, making broadband services affordable, is mixed – the number of countries with affordable services is static, but there is good progress with a rising number of countries approaching the target. Targets 3 and 4 (Internet usage and household connectivity) are unlikely to be achieved by the target date of 2015 at current growth rates. In March 2013, the Commission introduced a new advocacy target calling for gender equality in access to broadband by 2020. Despite difficulties in measurement, indicators imply good progress.

Chapter 5 explores the means by which broadband can be made universal. The commercial costs of broadband provision rise significantly for connecting final subscribers, for a range of reasons (e.g. remote areas, identifying last subscribers etc). There are different mechanisms for achieving universal broadband, including universal

service regulations, Universal Service Funds (USFs), national targets and other incentives, as well as new and improved technologies, such as latest-generation satellite. For best results, government and industry and other stakeholders should work in partnership.

Supply-side considerations are important, but demand-side considerations are also vital. Competition is still widely recognized as the most effective mechanism to date to lower prices and increase affordability for the majority of the population. Ultimately, however, there is no single recipe that is likely to work for all countries – instead, countries need to relate the options which they choose for universalizing broadband to their market needs.

Chapter 6 examines issues relating to content as an all-important driver of demand. It considers trade-offs between freedom of expression, privacy and filtering, as both societies and individuals get to grips with the emerging issues of a hyperconnected society. It also considers the role of Internationalized Domain Names (IDNs) and multilingual content in boosting demand. The chapter finds that there is a strong correlation between local infrastructure and local content, and that multilingual content plays a vital role in driving demand for broadband services.

Chapter 7 concludes the Report with policy recommendations on how broadband can be extended. The Broadband Commission for Digital Development advocates digital inclusion for all, on the basis that the benefits of broadband for improving people's lives should also be universal.

Finally, the Annexes provide detailed data for each target, and vividly demonstrate the incredible progress countries are making towards universalizing broadband and achieving digital inclusion for all.

The Report finds that, in our converged broadband environment, the roles of the public and private sectors are changing rapidly, and that all stakeholders must work together towards a common vision to achieve universal broadband.

2 THE PROMISE OF MOBILE

2.1 The Internet Marries Mobile

Today, we are embarked on a journey – a journey from a past where ICT infrastructure operated on instruction, to a world where ICTs and the Internet are integrated into the fabric of the environment surrounding us – invisible, embedded, exchanging data and information, constantly and automatically. Historically, technology followed the lead and instructions of users. In the future, whether locating ourselves, navigating a route, parking, accessing messages, users will increasingly follow the lead of technology.

Globally, we are embarked on this journey, although progress is uneven across countries, across regions, and even across user groups or generations. Mass connectivity via basic and advanced data access technologies seems assured, with the number of mobile subscriptions set to exceed 7 billion[1] and overtake the total world population in 2014[2]. Mobile subscriptions in Africa and the Middle-East alone exceeded one billion in Q1 2013[3]. The industry has added one billion mobile cellular subscriptions to the global mobile market over the last two years[4] – equivalent to hundreds of millions more people learning to use, love, and live with their mobile phones, for everything from talking and sending texts, to buying goods and services, or transferring money.

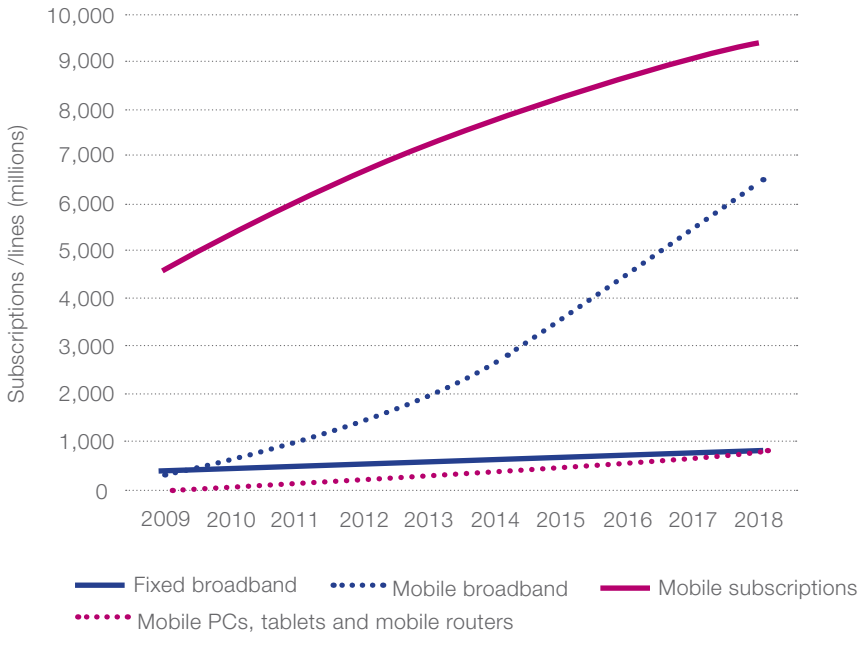
The marriage of mobile with modern-day Internet via mobile broadband is opening up new vistas of opportunity – mobile broadband may well 'bridge the gap' between the connected and the unconnected (Figure 2). Mobile broadband subscriptions overtook fixed broadband subscriptions in 2008[5], and show an astonishingly high growth rate of some 30% per year, the highest growth rate of any ICT, exceeding fixed broadband subscriptions by a ratio of 3:1 (up from 2:1 just two years ago). By the end of 2013, ITU predicts there will be 2.1 billion mobile broadband subscriptions, equivalent to one third of the total global stock of mobile cellular subscriptions (up from one fifth in 2011 – Table 1 & Figure 2).

The implications are far-reaching. Mobile phone users will no longer be physically constrained by location. Instead of having to physically attend work, banks, post offices or clinics, mobile phones now act as a gateway to money and communication services, as well as the online world of content,

bringing services, books, education and work to mobile phone users, wherever they are. The Internet and mobile were widely credited with the death of distance[6] – in future, mobile broadband may be credited with the death of location, as our societies become as mobile as our devices and users.

Nevertheless, our future is undoubtedly based on broadband. Although some end-users may believe broadband is about downloading bigger files more rapidly, broadband actually represents so much more[7]. Broadband is introducing new ways of doing things across our personal and professional lives, in the many and varied ways we communicate – integrating information infrastructure into the world around us through seamless, always-on connectivity delivering a range of services simultaneously. Governments, health managers, businesses, consumers and teachers are all getting to grips with the positive and transformational impact of broadband for improving economic and social welfare.

Figure 2: Mobile Broadband Bridges the Gap: Fixed Broadband and Mobile Subscriptions, 2009-2018



Source: Ericsson Mobility Report, June 2013.

This stellar growth in mobile is helping bridge the basic digital divide in access to ICT services (Figure 2). However, the World Economic Forum (2013) notes a lack of progress in bridging the "new digital divide", extending basic ICT access to the networked readiness of the whole ICT ecosystem[8]. Indeed, the number of unique mobile users is estimated to be considerably lower than the total number of mobile subscriptions for various reasons – for example, mobile phone subscriptions may be shared between two or more users in low-income communities (Table 1).

Morgan Stanley (2012) estimates that the number of unique smartphone users is around 1.5 billion in 2013[9], with smartphone subscriptions estimated to exceed 4 billion by 2018 (Ericsson, 2013[10]). The industry is now shipping 700 million smartphones a year[11], with around 40% of all handsets shipped in 2012 being smartphones[12]. Looking to the future, mobile broadband is projected to reach 7 billion subscriptions in 2018[13]. Long-Term Evolution (LTE) Advanced alone may account for 500 million subscriptions by 2018[14], while Pyramid (2013) projects that, globally, 4G subscriptions are expected to grow tenfold over five years, from 88 million in 2012 to 864 million in 2017[15]. In 2012, sales of smartphones outstripped the sales of all other phones for the first time in some countries (e.g. Argentina and Chile – Pyramid Research, 2013[16]). Informa (2013) predicts that basic entry-level and super-smartphones will continue growing steadily in popularity, while middle 'core smartphones' are expected to peak in popularity around 2014, and subsequently be squeezed[17].

Table 1: Summary Statistics for High-Speed Connectivity, 2013 (unless otherwise indicated)

	Total end 2013	Broadband Total, end 2013	% Global Total high-speed, end 2013
Internet users	2.749 billion	-/-	-/-
Fixed Internet subscriptions	-/-	696 million (2013)	-/-
Mobile subscriptions	6.835 billion	2.096 billion	30.7%***
Unique mobile users *	3.3* - 5 billion**	1.5 billion**	30%
Handset shipments	1.736 billion (2012)****	712.6 million smartphones (2012)****	41.1%[18] (2012) 44.5%[19] (2012)

Sources: ITU. Smartphone shipments from IDC 2013

** GSMA*

*** Morgan Stanley estimates quoted in Internet Trends 2013[9].*

**** Mobile-broadband subscriptions are not strictly a sub-category of mobile-cellular subscriptions, as they include USB/ dongles (which are excluded from mobile-cellular).*

***** The difference between stock of handset shipments and smartphones is attributable to feature phones.*

Even more significantly, by the end of 2013, the number of broadband subscriptions in the developing world will exceed the number of broadband subscriptions in the developed world for the first time, in both fixed and mobile, respectively. Much of this fresh growth is located in emerging markets – Budde Communications (2013) notes that Africa is the region with the largest remaining growth potential in the world, and estimates that the market in telecom services will grow by 1.5 billion people, almost half the remaining market worldwide, by 2050[20].

Such strong global growth in mobile broadband is also evident in national markets. In China, 75% of all Internet users now access the Internet via a mobile device, exceeding the proportion of users accessing the Internet via a fixed connection (at 71%) for the first time in 2012[21].

Even if the future is mobile, fixed broadband will still play a vital role. For operators, fixed networks and backhaul networks are helping accommodate growth in mobile traffic (Featured Insight 23), with a third of all mobile data traffic offloaded to fixed networks in 2012, according to Cisco (2012)[22]. For consumers, fixed broadband subscriptions worldwide have been growing more slowly, but steadily, and will reach 696 million by end 2013[23], corresponding to a global penetration rate of 9.8%[24], with over one hundred million subscriptions added over the last two years, and three times the total number of subscriptions in 2005 (220 million). Much of this growth is located in developing countries, which now account for over half of all fixed broadband subscriptions. However, overall, fixed broadband penetration rates remain low, at 6.1% in developing countries, compared with 27.2% in developed countries in 2013[25].

These global statistics do not do justice to the far-reaching change brought about by the smartphone. Combining the functions of navigation, address book, wallet, camera, personal organizer, notepad, email and social conversation, broadband-enabled devices are already indispensable to modern lifestyles, especially in industrialized countries. Now, however, mobile Internet promises to be a significant ‘game-changer’ in countries around the world, driving far-reaching social and economic transformations through new services and changes in consumer habits in developing and developed countries alike (Featured Insights 1 and 2).

FEATURED INSIGHT 1: MOBILE INTERNET AS A GAME-CHANGER

The impact of mobile over the past decade has been nothing short of a game-changer. By 2012, the mobile industry had created a connected world with global mobile penetration touching nearly 100%[26]. Ubiquitous mobile connectivity is driving tectonic cultural changes, with 2.7 billion people using the Internet, but there is a unique prospect of creating something much larger. The marriage of mobile and the Internet will transform how we do things, and help many economies leapfrog the PC era.

The Internet is now driving change through 'network effects' and pervasive smartphones, tablets and other new devices with Internet access – we are moving swiftly from the era of voice to that of the mobile Internet. Mobile Internet subscriptions have increased nearly tenfold over the last six years, from 268 million in 2007 to 2.1 billion in 2013[27]. With developing countries accounting for over half or 1.16 billion of these subscriptions, many citizens are gaining their first experience of the Internet through a mobile device – a significant shift in consumer habits. Since 2007, the mobile Internet has driven far-reaching social and economic benefits, helping transcend the resource deficiencies by which many economies are constrained. Whether in health, education, retail, payments, public services or improved productivity, the impact of mobile Internet is universally evident. McKinsey (2013) estimates the annual economic benefit of the mobile Internet as between US$3.7 trillion to US$10.8 trillion globally by 2025[28].

An excellent showcase of this potential is the education system in India. India has one of the largest education systems in the world, with over one million schools and 18,000 higher education institutes. With quality a growing concern, Internet connectivity offers a unique platform for new service delivery. The Airtel Classroom is a virtual learning platform that can be accessed by customers via mobile. India is one of the first countries to launch LTE, which will accelerate service delivery in sectors ranging from health to public infrastructure, and drive a significant structural shift in consumer behavior over the next few years, given that nearly 200 operators in 75 countries may offer LTE services by the end of 2013[29].

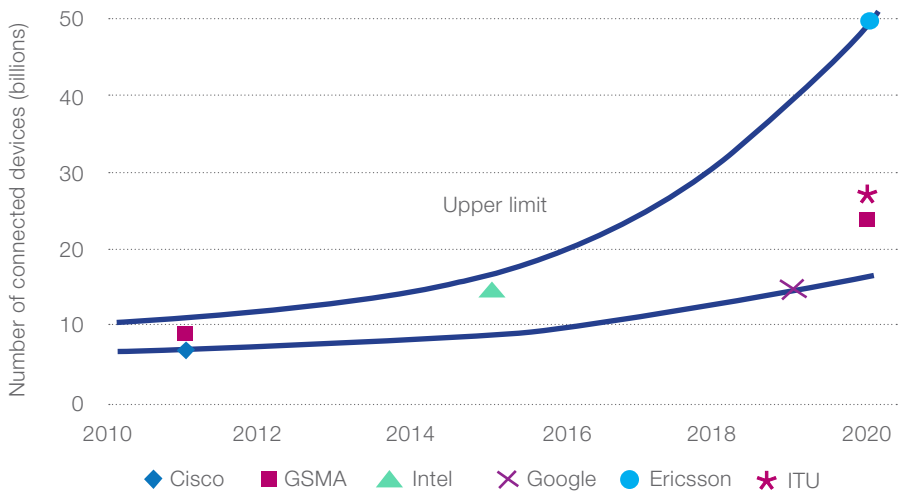
As we continue to make advances in network management and connectivity, we are paving the way for the 'Internet of Things'. Today, there are around 9 billion connected devices, which could reach a trillion connected devices by 2025. Although in its early stages, the 'Internet of Things' has the potential to tackle a wide range of applications. To ensure this vision becomes a reality, it is vital to ensure affordability and create the necessary supportive ecosystem, including: a conducive regulatory environment; reduced disparities in access, speed, and functionality; improved availability of spectrum at reasonable cost; affordable devices; more local language content; and a range of new apps. At Mobile World Congress 2012, I urged manufacturers to introduce a US$ 50 smartphone (when the average price was around US$150) to bring the next billion people into the digital sphere. One year on, this is a distinct reality. I believe the mobile Internet revolution presents new vistas of economic opportunity and a pragmatic approach to addressing fundamental social issues of improving equity and promoting inclusive growth.

Sunil Bharti Mittal, Chairman, Bharti Airtel Ltd.

There is growing diversity in devices in terms of both dimensions and functionality, with laptops shrinking in dimensions and with the tablet form factor becoming popular. There is most likely an important role for the various devices (such as smartphones, tablets, netbooks, PCs, fixed devices), with consumers choosing the most appropriate device according to their needs and mobility. In fact, the strongest growth in connected devices may not even be visible, as we are now moving towards a pervasive 'Internet of Things', with specialized devices 'vanishing', as they become embedded across different sectors (Figure 3). McKinsey (2013) estimates the economic impact of the 'Internet of Things' as US$ 2.7-6.2 trillion by 2025[30], significantly less than that of the mobile Internet (Featured Insight 1).

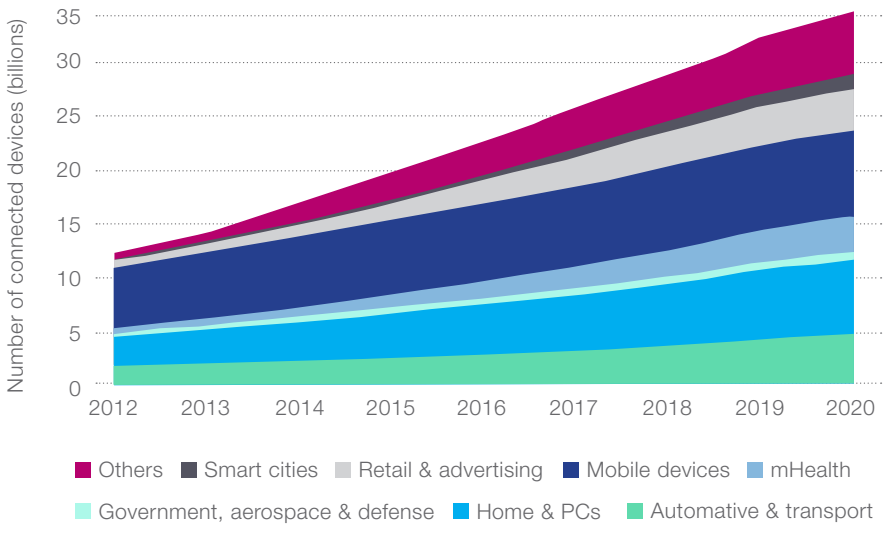
According to industry forecasts, the number of networked devices (mobile plus connected objects) overtook the global population in 2011 and will potentially reach 50 billion connected objects by 2020 (Ericsson, 2010[31]) (see Figure 3, top). Although mobile phones and PCs will clearly remain large and important market segments (Figure 3, bottom), there will be growing connectivity across other sectors in m-health, connected homes and automobiles, transportation and logistics, as our whole environment becomes as smart as our phones.

Figure 3: The Internet of Things – Invisible, but Connected



Projected Estimates of Number of Connected Devices, 2010-2020

Source: ITU, based on various.



Installed Base of Wireless Connected Devices by Vertical Market, World Market Forecast, 2012-2020

Source: ABI Research, Business Insider, 15 May 2013.

FEATURED INSIGHT 2: INVENTING CONNECTIVITY, IMPROVING THE LIVES OF BILLIONS

Nowhere is the impact of mobile broadband more important than in the developing world. We have already reached a point where wireless connections have surpassed fixed connections, and by 2016, over 80% of broadband is expected to be mobile. For many people, their first and only access to the Internet will be via a mobile device. Such connectivity, combined with low-cost but advanced devices, provides unprecedented opportunities to empower individuals across society. With 3G devices, doctors are remotely monitoring cardiac patients in rural villages; farmers are accessing weather information and sales prices to increase their income and improve their standard of living; women entrepreneurs are lifting themselves out of poverty by harnessing the economic benefits of wireless to start businesses and access banking services; and children everywhere can access educational content in and out of the classroom, 24 hours a day.

While we are seeing tremendous benefits in key areas such as education, healthcare and commerce, more needs to be done. For example, many women in the developing world are still not fully benefitting from mobile technology. Women in many countries suffer from an "access gender gap" – lacking access to skills, education, technology, networks and capital. A woman in the developing world is 21% less likely to own a mobile phone than her male counterpart, while a woman in South-East Asia is 37% less likely to own a phone (GSMA/Cherie Blair Foundation for Women, 2010). Closing the gender gap would bring the benefits of wireless to an additional 300 million women, linking them with the tools, mentors and opportunities to fully participate in the economy and unlock their potential.

The cellphone is the largest technological platform in history, and its potential to significantly improve people's lives is just starting to be realized. We need to remember the underpinnings of this 'invisible technology' transforming our world – spectrum and the protection of inventions. Without sound spectrum policy and a regulatory environment that supports and encourages the inventors of today and tomorrow, the promise of mobile cannot be fully realized. At Qualcomm, we know wireless is changing lives, and we look forward to working with organizations around the globe to bring the benefits of mobile broadband to everyone.

Dr. Paul Jacobs, CEO, Qualcomm.

2.2 The Growing Demand for Spectrum

The explosive growth of mobile and wireless, in both the number of connections and the sophistication of devices for accessing advanced data-heavy applications and services, is leading to strong and continuing growth in mobile data traffic. Cisco (2012) estimated that global mobile data traffic grew 70% in 2012, reaching 885 petabytes per month at the end of 2012. Mobile data traffic will increase 13-fold between 2012 and 2017, growing at a compound annual growth rate (CAGR) of 66% from 2012 to 2017, reaching 11.2 exabytes per month by 2017[32].

This strong growth in mobile data traffic is generating growing demand for mobile bandwidth and spectrum resources, which are in finite and fixed supply, necessitating an increase in spectrum efficiency by up to a factor of ten to accommodate

the present growth in demand[33]. ITU is conducting technical studies to see how this step-increase in spectral efficiency can best be achieved. The extent of growth in demand for spectrum varies between different regions[34].

For the international allocation of spectrum, ITU organizes the World Radiocommunication Conference (WRC)[35], held every three to four years. At the WRC, ITU Member States debate, review and, if necessary, revise by consensus the Radio Regulations, the international treaty governing the use of radio-frequency spectrum and the geostationary satellite and non-geostationary satellite orbits, on the basis of technical and regulatory studies and expert advice.

ITU is the guardian of this international treaty, which represents the international agreement for the allocation and harmonization of spectrum to ensure the smooth operation of wireless, mobile and radiocommunication devices, free from harmful interference. This treaty also signifies a commitment on the part of ITU Member State Governments and regulators that spectrum will be used for the purposes and under the conditions stated, to ensure security of tenure. Harmonization of spectrum enables economies of scale in the use of spectrum. The allocation of spectrum for mobile services will be considered in Agenda Items 1.1[36] and 1.2[37] of WRC-15, to be held in Geneva on 2-27 November 2015.

Although licensed spectrum has underpinned the growth of the mobile industry to date and most global connections for mobile broadband still operate through licensed spectrum (Featured Insight 3), important new developments are now happening directly in mobile and spectrum, to the benefit of development projects (Featured Insights 8 and 9). One key development is the use of and growth in WiFi offload to fixed networks to accommodate growth in mobile data traffic. Different definitions of offloading exist. Cisco (2012) estimates that a third of traffic to mobile devices is offloaded[38], while the OECD (2013) cites studies suggesting that up to 80% of traffic to all wireless devices (mobile + WiFi only devices) may be offloaded[39].

Furthermore, innovation in the use of unlicensed and unused spectrum (or so-called 'white spaces'[40]) is now in early trials – Featured Insight 8 describes a pilot being undertaken by the Kenyan Government in partnership with Microsoft and other partners. Dynamic Spectrum Access (DSA) is based on access to spectrum not in use in real-time, usually via intelligent cognitive radio, or using a database (an approach being trialed in some municipalities in the U.S. and elsewhere, including the UK[41]).

In one example, the FCC is conducting a rulemaking that would utilize an "incentive auction" to offer broadcasters the opportunity to sell their licenses to clear broadcast spectrum and repurpose it for mobile broadband use. Featured Insight 4 examines how the U.S. is responding to the growing need for spectrum.

In any (and every) country, spectrum is a vital part of a coordinated broadband policy for universalizing broadband, and deserves careful consideration at the national and international levels, in addition to other aspects of broadband policy (Chapter 7).

FEATURED INSIGHT 3: TOWARDS UNIVERSAL BROADBAND – THE CASE FOR EXCLUSIVE LICENSING FOR MOBILE SPECTRUM

The licensed use of spectrum, on an exclusive basis, is a time-tested approach for ensuring that spectrum users — including mobile operators — can deliver a high quality of service to consumers without interference. As mobile technologies have proliferated, demand for access to radio spectrum has intensified, generating considerable debate and advocacy for new approaches to spectrum management, including proposals for the use of TV 'white spaces' and other spectrum-sharing arrangements. While these innovations may find a viable niche in future, pursuit of these options today risks deflecting attention from the release of sufficient, licensed spectrum for mobile broadband.

Exclusive licensing is a model that works, and it underpins the undeniable benefits of mobile technology. Through mobile, whole societies are being transformed, putting connectivity into the hands of office workers and farmers, salespeople and schoolchildren — raising productivity and closing the digital divide. Globally, the mobile industry supports nearly 7 billion mobile connections, representing nearly 3.3 billion people, as many consumers use multiple devices and/or multiple SIM cards. These numbers are growing rapidly, particularly as mobile penetration in developing economies catches up with more developed markets. Mobile connections in Asia, for example, are increasing at 49% a year, while Africa is experiencing 80% year-on-year growth in mobile (GSMA Intelligence, 2013).

By 2017, around half or 4.25 billion of 8.5 billion mobile connections will be 3G or 4G (GSMA). To maintain this momentum and expand the impact of broadband access everywhere, the mobile industry requires access to sufficient spectrum in harmonized bands and a regulatory framework that creates the certainty needed to attract further investment in networks. Spectrum licenses provide this certainty.

In mobile, broadband service is not simply about giving people access to search engines and social networks – mobile broadband is about enabling mobile solutions that can change entire sectors. In healthcare, mobile solutions are connecting doctors and patients through wireless devices (such as heart monitors), enabling elderly people to live at home, self-sufficiently, for longer. Automotive applications are beginning to save lives through automated emergency call services. Smart meters are raising sector efficiency and could potentially save millions of tonnes of carbon emissions. Mobile broadband is fundamental in a world where everything connects intelligently.

Dr. Anne Bouverot, Director General, GSMA.

FEATURED INSIGHT 4: FEEDING THE GROWING NEED FOR SPECTRUM IN THE UNITED STATES

In 2009, the iPad hadn't been introduced. Tablets and e-readers are being adopted faster than any communications or computing device in history, with one-third of Americans now using one, boosting demand for spectrum. U.S. mobile data traffic grew by 300% in 2012, and mobile traffic is projected to grow an additional 16-fold by 2016. In 2010, the U.S. National Broadband Plan set aggressive targets for freeing up licensed and unlicensed spectrum for broadband, and new ideas (e.g., the use of incentive auctions to encourage the repurposing of broadcast spectrum). The FCC's Incentive Auction is anticipated in 2014. Meanwhile, the FCC is looking at new ways to unleash the airwaves for broadband.

In 2012, the FCC made progress on several major policy and technology innovations, such as small cells, spectrum-sharing and flexible use. Small cells are key elements of mobile NGN, providing additional coverage in underserved areas and additional capacity where macro networks are overburdened, and improving the user experience for consumers and businesses. In future, millions more small cells will be deployed, adding capacity

and addressing increased data demand. The FCC has put forward a comprehensive spectrum-sharing proposal that sets out a three-tiered spectrum access model for sharing between government and commercial users. The three tiers of service are Incumbent Access, Priority Access, and General Authorized Access. The General Authorized Access tier will permit innovative uses of small-cell technology by the general public. The quality-assured Priority Access tier will be available on a hyper-local basis to important facilities (such as hospitals, utilities, government facilities), and public safety entities for applications such as private broadband networks. Application of this three-tiered access model would be managed and controlled by a geo-location enabled dynamic spectrum access (DSA) system, building on database technology used in TV White Spaces.

The FCC is making every effort to remove regulatory barriers to mobile broadband use in certain spectrum bands (e.g., 2 GHz Band), and adopt service, technical, and licensing rules that encourage innovation and investment in mobile broadband, and provide certainty and a stable regulatory regime in which broadband deployment can rapidly occur. Pursuant to its National Broadband Plan, the U.S. hopes to free up 500 MHz of spectrum by 2020.

Source: FCC.

2.3 Broadband and Innovation

As technology enters the lives of many more people for the first time, innovation and the rate of technological change are accelerating. Today, internally-focused, proprietary approaches to Research and Development (R&D) are competing with more open, networked methods of innovation, as useful knowledge becomes more dispersed (both within and outside firms), while the speed of doing business has increased. In models of open innovation, partners, customers, researchers and even competitors find new ways to collaborate, with firms using external, as well as internal, ideas and paths to market to advance technology (for example, the use of social media to accept suggestions from customers – most famously, Lego's crowdsourced site for suggestions[42]). To capitalize on fresh opportunities, innovators must find ways to integrate their ideas, expertise and skills with those of others outside the organization to deliver the best results to the marketplace[43].

Collaborative approaches to innovation also offer new ways to create value, especially in fast-changing industries. On the one hand, broadband is itself accelerating innovation, by facilitating the exchange of ideas in the broad ecosystem for innovation (Featured Insight 5). On the other hand, there is growing innovation within broadband itself – in technologies, devices, throughput speeds, business models and spectrum.

Policy-makers need to support innovation, entrepreneurship and talent, through educational measures, fiscal incentives and industrial policy. Public-Private Partnerships (PPPs) can also transfer skills, capabilities and technologies: by creating local ICT ecosystems with technology hubs and innovation incubators; by supporting long-term innovation capacity through the enhancement of skills and knowledge; by empowering citizens through access to information and apps; or by opening up new financing for start-up businesses. Featured Insight 5 explores how broadband is acting as an 'accelerator', driving change across all four major pillars of innovation – people, ideas, finance, as well as markets.

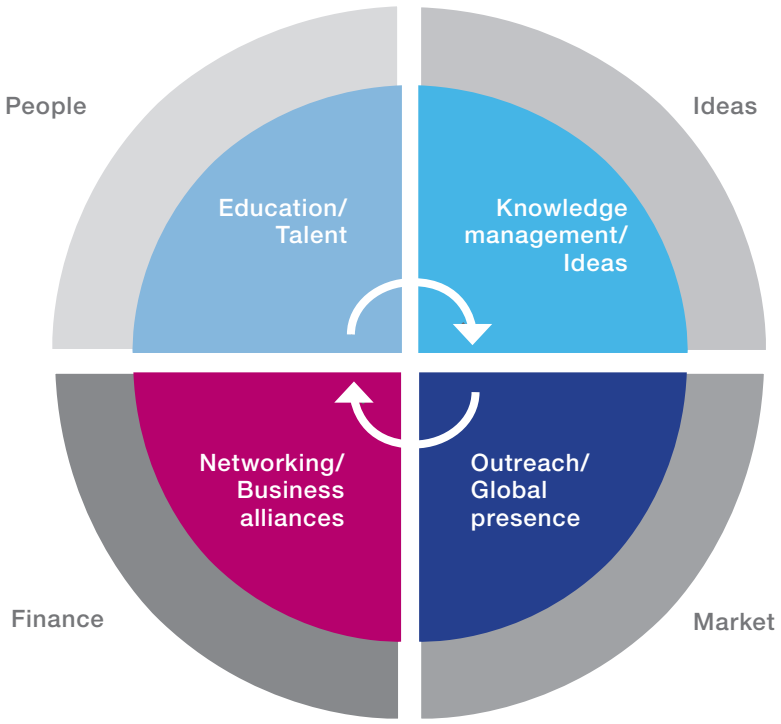
FEATURED INSIGHT 5: BROADBAND DRIVING INNOVATION

Successful innovation is based on a complex eco-system in which investments in R&D take place against a background of efficient infrastructure, talent, and a socio-economic environment rewarding creativity and risk as paramount. Where such an eco-system is lacking, investments in R&D do not generate their full returns. Indeed, the 'middle-income trap' risks becoming a 'middle innovation ranking trap': many emerging economies that had made spectacular progress in innovation rankings over the last few years have proved unable to maintain their rate of progress, despite continuing or accelerating investments in R&D (Cornell University, INSEAD & WIPO, 2013[44]). Ecosystems of innovation do not happen overnight. Efficient financial, educational, legal and regulatory frameworks are needed, which typically take more than a generation to build. Innovation is a four-facetted mindset, involving people, ideas, finance, and market. Yet, history often provides 'accelerators' which have proven beneficial to innovation. Broadband is one such accelerator, driving rapid change across the four pillars of innovation (see Figure below).

Broadband deployment can accelerate innovation by promoting academia-business alliances, leadership across borders, metrics and local dynamics. For people, ubiquitous broadband will benefit first and foremost the education sector, by contributing to the detection, stimulation and blossoming of talent. Combined with cloud computing, broadband could generate 'innovation-as-a-service' in ideas across emerging economies via telepresence, crowd-sourcing and remote collaboration. Broadband also improves financing by allowing innovators to reach venture capitalists in other regions more easily. Broadband enables firms and individuals to 'move beyond mere web presence' and reach consumers worldwide through secure platforms, interactive virtual shop-windows, local and targeted advertising.

Dr. Bruno Lanvin, Executive Director ECI, INSEAD.

Box Figure: The Four Pillars of Innovation



Ultimately, despite accelerating innovation and technological advances, mobile technologies are still predominantly used and owned by people. As noted above, people are the users and innovators of new technologies and applications. There is a risk, however, that people's mindsets may not always develop in pace with the technological developments. Today, there are growing concerns about consumer data protection and freedom of expression online. In a mobile and hyperconnected world, there is much that is known – and knowable – about Internet users, in both communities/ groups and as individuals, and consumers need to be increasingly aware of this dawning reality, as explained in Chapter 6.

Consumers are just beginning to realize the predictive power and potential of new media – including the opportunities of tailored advertisements on the basis of cookie information and location-based mobile advertising, or the possibility to track down and reunite with old school-friends from decades back through social networks. Consumers, Governments, policy-makers and industry all need to assess the implications. It is not entirely clear whether consumers will fully control the technology, or what influence the technology may have over consumers.

However, our broadband future is undoubtedly a future worth fighting for, and privacy and the protection of users (and their data) should form the core values of an interconnected future to maximize the benefits of broadband to consumers and citizens. Privacy and user protection are fundamental and core values, which concern not only high-income countries at the forefront of the broadband revolution; these values need to be integrated into the design of broadband policy for all countries, regardless of their level of development. The next Chapter examines the evolving relationship between broadband and development, and the important uses of broadband for achieving the MDGs.

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3

BROADBAND FOR ACHIEVING THE MDGS

In the year 2000, when the MDGs were established[1], broadband was in its infancy, and little tangible evidence existed with regard to how broadband would impact social and economic development. Today, ICTs have grown considerably, more and more people are connected, and broadband is improving people's lives, expanding their choices, and accelerating progress towards achieving the MDGs.

As prices drop, the mobile revolution means that more people are now connected – people in the poorest parts of the world are gaining access to knowledge and beginning to participate in the global economy, to learn from others, and to solve their own problems[2]. This Chapter explains WHY broadband should become universal, and why connecting more people with broadband (and potentially, richer and improved education and healthcare services) benefits the economy, as well as society.

Broadband is helping deliver a wide range of services, from services directly related to the MDGs (Table 2), to services in support of broader citizen participation (such as e-government), or services leveraged across different sectors to bring more people into the formal economy, or earn money from different sources/abroad (such as m-money and m-commerce). Broadband services and smartphones link health workers to the national health system and allow for real-time disease surveillance, child and maternal health monitoring, and supply chain management, resulting in the delivery of quality healthcare to underserved rural communities. Going forward, the challenge is to find sustainable business models to leverage broadband in a way that helps accelerate development where it is most needed.

The previous Chapter noted that mobile solutions are key for extending broadband, with mobile broadband subscriptions already exceeding fixed broadband subscriptions in most developing countries. In addition to GDP growth, mobile broadband services provide significant social and development opportunities. Featured Insight 6 underlines how mobile broadband can improve people's lives, through applications in education, health and rural development. Featured Insight 7 describes recent research into the socio-economic impact of upgrades to broadband speed for individuals and their households, as well as at the level of the national economy.

FEATURED INSIGHT 6: SOCIO-ECONOMIC BENEFITS OF MOBILE AND BROADBAND SERVICES

Mobile services generate significant economic and social benefits, in both developed and developing countries, either directly by investment in infrastructure deployment, or through the use of the infrastructure to start new business activities, improve efficiency and productivity. Internet infrastructure contributes towards economic development by facilitating access to information, IT literacy, news, current events and links to remote markets.

The use of digital dividend spectrum for mobile broadband will boost accessibility and speed. These bands offer attractive propagation characteristics and an optimal balance between transmission capacity and coverage, of great advantage for remote and poorly connected rural areas. In developing nations, mobile broadband can connect remote populations and strengthen health, education, livelihoods, financial inclusion and access to government services for marginalized populations:

- Education – Awareness is growing of the possibilities offered by m-learning. The falling cost of smartphones, the advent of lower priced tablets, cloud-computing and the rise of Open Education Resources (OERs) can increase access to education in underserved areas.
- Health – Health applications available via mobile broadband can reduce costs (e.g., through access to health records); allow physicians to provide care remotely via remote monitoring and diagnosis; and support preventative care[3]. GSMA/PWC (2013) estimate that mobile health could save developed countries US$400 billion in 2017 and save one million lives over five years in Sub-Saharan Africa.
- SME growth, entrepreneurship and job growth – Mobile broadband can open up regional and global markets to local entrepreneurs. SMEs can generate more revenue, lower costs, higher productivity, and jobs. SMEs which spend more than 30% of their budget on web technologies grow their revenue nine times as fast as SMEs spending less than 10% (McKenzie, 2012[4]).

- Agriculture – Vodafone & Accenture (2011) note that mobiles boost revenue by improving access to financial services/agricultural information and by promoting supply chain efficiencies.
- Financial Inclusion – Mobile technologies offer a way to access banking services which have been traditionally unavailable to large parts of the population. It is estimated that 2.5 billion individuals are unbanked worldwide. Mobile financial services represent an opportunity for many nations to achieve financial inclusion of the poor.
- Government Services – Local and national governments can keep citizens up-to-date with new and events and offer immediate and interactive access to services (e.g. for licenses or voting).

Source: Alcatel Lucent.

FEATURED INSIGHT 7: THE SOCIO-ECONOMIC EFFECTS OF BROADBAND SPEED UPGRADES

Interest in the economic impact of ICT is increasing as governments seek new paths to growth. Ericsson therefore initiated a joint research project with Arthur D. Little and Chalmers University of Technology to quantify the economic impact of broadband speed upgrades, at both the country and household levels, using a comprehensive scientific method based on empirical data from both OECD and BRIC countries.

On a country level, the main finding was that doubling the broadband speed for an economy can increase GDP growth by 0.3% on average in OECD economies. This study confirmed that broadband speed is an important factor to spur economic growth in the overall economy. Findings from the household level show that, after controlling for different factors influencing income (e.g. age, sex/gender, education, household size, skills and type of occupation):

- The average increase in household income for a broadband speed upgrade of 4 - 8 Mbps is US$120 per month in OECD countries.
- BRIC households benefit most by upgrading from 0.5 to 4 Mbps, at US$46 per month.

For households in OECD countries, there is a threshold broadband access speed to increase in earnings, somewhere between 0.5 Mbps and 2 Mbps on average. The greatest expected increase in income is for the transition from being without broadband to gaining 4 Mbps, the difference being around US$2,100 per household per year (equivalent to US$182 per month). For BRIC country households, the threshold level seems to be 0.5 Mbps. Around US$800 additional annual household income is expected to be gained by introducing 0.5 Mbps broadband connection in BRIC country households, equivalent to US$70/ month per household.

Thus, both governments and households should keep up investments to continue to gain benefits and stay competitive in a globalized economy and on the labor market. This study supports that broadband speed upgrades are a real opportunity for economic development, for households, access providers and regulators.

Source: "The Socio-economic Effects of Broadband Speed Upgrades" (2013), Ericsson.

Although access networks may be mobile, backhaul networks may be based on wireless, fibre, WiFi or satellite, or a combination of other technologies to provide services lower income communities in remote areas. OECD (2013) notes that "fixed networks have, in effect, become the backhaul for mobile and wireless devices, with some studies claiming that 80% of data used on mobile devices is received via Wi-Fi connections to fixed networks"[5].

Today, low-speed connectivity and Short Message Service (SMS) systems are improving development work, but even more could be achieved with broadband connectivity, partly due to higher throughput and new services, but also due to improvements in existing education and health systems. Broadband connectivity is not a panacea, but when integrated with existing systems, it can facilitate new services and deliver effective results for achieving the MDGs.

Broadband solutions tailored to address the MDGs need to be relevant and appropriate for users in any given setting. Davis (2013) notes that it is easy to be seduced by high-tech solutions, but calls for enthusiasm to be anchored in reality[6] — technologies are used by people, and hence embedded in a psychological and social setting at any point in time.

Davis (2013) calls for development solutions to invest in local innovation. Although poor and marginalized people may not have attended school, they can still be experts in innovating local solutions to their own, local problems. For any situation in which technology is used, the human dimensions also need to be taken into consideration, and technological solutions should remain sensitive to the uncertainty of new innovations, (such as replacing tangible microfinance paper passbooks with digital money). In some cases, low-tech piecemeal solutions may go further — and may be more easily scaled-up — than high-tech solutions by R&D-centric outsiders.

Ultimately, however, representing technology as an "either - or" choice between broadband or lower tech, low-speed solutions is a false distinction – often, the combination of broadband and other technologies can yield the best results. Broadband connectivity in the backhaul network can underpin lower tech solutions in access networks. Table 2 outlines some of the ways in which broadband is underpinning progress towards achieving the MDGs. Featured Insights 8 and 9 describe how rural communities can be connected to benefit from broadband, through innovative uses of spectrum, including the use of TV white spaces and 'long-distance' WiFi.

Table 2: Broadband ICTs and the Millennium Development Goals (MDGs)

 End Poverty & Hunger	Growing evidence suggests that broadband can boost GDP, jobs and incomes, helping to combat poverty and hunger. In the Dominican Republic, a 10% increase in broadband penetration could reduce unemployment by 2.9%[7]. In Indonesia, mobile broadband could boost GDP by 2.9% or US$22.6 bn[8]. In India, broadband has already generated nearly 9 million direct and indirect jobs[9], while a 1% increase in broadband penetration could add US$2.7 bn or 0.11% to Indian GDP in 2015[10]. In South Africa, wireless broadband and related industries may generate US$7.2bn and a further 28,000 jobs by 2015[11].
 Universal Education	Governments and NGOs are providing schools with PCs and connectivity to foster primary education. In Turkey, the FATIH project will equip 42,000 schools, 17 million students and 1 million teachers with computers[12]. In Nigeria, the USF has teamed up with Intel to deploy computers in over 1,000 schools since 2008, helping improve exam results[13]. In Argentina, San Luis Province established an All Kids Online Initiative to deliver a PC and educational software to every child of 6-12[14]. In Uruguay, there is a policy of one computer per child in primary and secondary education. In Singapore, Infocomm@All Schools[15] promotes ICT usage by deploying teaching, learning and assessment systems, with 17 apps deployed in 95% of schools.
 Gender Equality	Closing the mobile gender gap and bringing 600 million more women online could increase global GDP by US$13-18 billion[16]. Connect To Learn (CTL) has equipped 10,000 students (especially girls) in schools in Brazil, Chile, China, Djibouti, Ghana, India, Malawi, Kenya, Senegal, South Sudan, Tanzania and Uganda[17]. In the Democratic Republic of Congo, IFDAP has trained women on Internet research so they can learn about diseases affecting their crops, improving yields.
 Child Health	Mobile applications are also assisting parents in adding and monitoring information such as immunizations, height, weight, and other development milestones. Aggregated data collected through public health applications are allowing health professionals to access child health and wellbeing, compare indicators across localities and regions, and make better-informed public policy decisions. Online communities of parents and/or pediatricians[19] facilitate exchange between experts and parents and contribute to the attainment of physical, mental and social well-being for infants. The One Million Community Health Workers Campaign (1mCHW) is making strides in accelerating CHW programmes in sub-Saharan Africa to meet the health-related MDGs.
 Maternal health	Ultrasound tests through telemedicine can play a key role in the monitoring[20] of maternal health via text[21], voice messaging and mobile apps[22]. Online platforms[23] are also serving as an information and communication hub for health facilities and supporting conversations between community health workers, midwives, clinicians, and expectant mothers. The Mobile Midwives project allows healthcare workers to monitor records of expectant mothers in Ghana via mobiles[24].
 HIV/AIDS	For healthcare workers, web-based applications are hubs for HIV information and capacity building[25]. Computer-based surveys are changing the scope of HIV research and prevention[26]. Broadband allows collaborative research of scientists around the world by integrating data[27] much faster than previously, where repositories were isolated. Patients can share stories and experiences[28], support each other[29], reach counselors[30], manage their personal health records and receive reminders for appointments/medication via mobile[31].
 Environment	Smart use of ICTs can reduce GHG emissions by up to 25% (Broadband Bridge report[32]). Mobile technology alone could lower GHGs by 2% by 2020[33]. E-commerce could lower energy consumption and GHG emissions by 30% over traditional retail[34]. Teleconferencing and telecommuting could replace air and land travel via video/audio conferences. ICTs could potentially save up to 7.8 Gigatons of carbon dioxide emissions by 2020 (GESI, 2012[35]). Shifting newspapers online could potentially save 57.4 million tons of CO2 emissions over the next decade (ACI, 2007).
 Partnership	The benefits of new technologies, especially ICTs, should be made available by Governments in cooperation with the private sector[36]. ICTs are facilitating and enabling new global partnerships, including crowd-sourcing, collaborative authoring, teleconferencing and teleworking[37]. The UN Secretary-General's Panel of High-Level Eminent Persons recently renewed calls for global partnerships as part of the post-2015 development agenda.

FEATURED INSIGHT 8: INNOVATION IN SPECTRUM HELPING PROMOTE DEVELOPMENT

Even in developed economies, there are gaps in wireless coverage, access points and base stations may become overloaded in busy areas, and broadband may be unaffordable for many. Hundreds of millions of wirelessly-connected devices are coming online, needing wireless connectivity and bandwidth and increasing the demand for spectrum resources. Microsoft believes innovation in Dynamic Spectrum Access (DSA) and TV White Spaces can help connect billions more people and devices to the Internet. In February 2013, a partnership was announced between Microsoft, the Kenyan Ministry of Information and Communications, Indigo Telecom (a Kenyan ISP), and Adaptrum, a pioneer in white space technologies. The Mawingu project (or "cloud" in Swahili) will deliver low-cost, high-speed wireless broadband to locations unserved by even electricity, connecting poor, remote or low population areas.

While they have ample unused radio spectrum, the areas of Kenya chosen for the Mawingu pilot lack access to affordable or reliable broadband. Most of these locations also lack basic infrastructure (such as electricity and paved roads) and are difficult to serve with existing wireline and wireless technologies. To serve these areas more affordably, a new approach is needed. The Mawingu network relies on 'unlicensed' or 'license-exempt' wireless technologies (e.g., Wi-Fi and TV white space base stations/end-user devices). To maximize coverage and bandwidth, while reducing costs, radios use complementary spectrum bands available to license-exempt devices, including 13 GHz, 5 GHz, 2.4 GHz, and unused UHF TV band spectrum. When complete, the network will cover some 67,000 people. To reduce operating costs and to introduce power, with 75% of Kenyans lacking access to electricity, the project uses solar energy to power base stations and charge devices.

Availability and affordability gaps affect people in Africa, Asia, and Latin America disproportionately. Mawingu aims to reduce access costs, so more people can come online affordably. Project partners are working to identify the most crucial services and ensure their delivery and deployment via low-cost, affordable Internet access. The social impact will also be significant. From e-health to education to improved communications, Mawingu is delivering teacher training and other educational benefits via computer labs and tablets. Since February, broadband has now reached three remote schools, a Red Cross outpost, a health clinic near Nanyuki, an Internet kiosk, and local government offices. Students at Gakawa School now have a computer lab, teacher training, and can connect with the world.

Source: Microsoft.

FEATURED INSIGHT 9: DELIVERING THE BENEFITS OF BROADBAND TO THE UNCONNECTED

Connecting the 4-plus billion people not yet connected to the Internet will require creativity, greater investment in wireless networks and innovation in service delivery. Most of the unconnected live in rural emerging economies. To bridge the connectivity gap in rural areas, more wireless networks are needed to extend the reach of the Internet. Organizations such as Inveneo, a non-profit social enterprise, are demonstrating that with creative and innovative design, implementation and management, remote wireless networks can bring the promise of the Internet to rural areas.

Inveneo has successfully connected distant communities to the Internet,

such as the remote island of Mfangano located at the mouth of the Winam Gulf on the Kenyan side of Lake Victoria. There, Inveneo partnered with a local NGO, Organic Health Response (OHR), to design, build and support wireless connectivity that relies on a 90 kilometer wireless highly directional 5.8 GHz WiFi link (travelling mostly over water) and powered by a hybrid solar/wind electrical system[38], serving the Ekialo Kiona (EK) center, a computer center, library and training facility available for use by all of the island inhabitants.

Inveneo has engaged in similar remote wireless network deployments around the world, including connecting schools over long-distance Wi-Fi across islands in Micronesia; connecting a network of 100 ICT centers in rural Uganda providing ICT data services, agricultural education and crop pricing information; and an initiative to connect over 20% of Haiti's population outside Port-au-Prince to 1+ Mbps enterprise-grade broadband. In the Dadaab region in northern Kenya, Inveneo partnered with NetHope (a consortium of NGOs) and Cisco to bring better, more reliable Internet and inter-agency communications to the many humanitarian agencies working in relief efforts in what was the largest refugee camp in the world with close to 500,000 refugees. The partnership designed the "DadaabNet", extending Orange's licensed service with Inveneo's long-distance WiFi to connect relief agencies allowing them to employ bandwidth-intensive applications (such as file-sharing, video conferencing and VOIP).

Source: Cisco.

A holistic approach should be adopted to face the different challenges of the telecom sector, taking into account infrastructure deployment and also the feasibility of acquiring devices such as tablets and smartphones, and ensuring that those accessing the networks have the right skills to access content that adds value. A good example of this approach is the free Digital Libraries programme launched in Latin America, which has proved a very successful experience in terms of digital inclusion, and is still expanding and growing in different countries.

Education is the foundation stone for development and other goals. The Broadband Commission's Working Group on Education, chaired by UNESCO, noted the vital role of ICTs in improving and enhancing educational outcomes: "in the twenty-first century, education can no longer be separated from technology… Access to quality education for all – which includes access to ICT – is an imperative for building inclusive and participatory knowledge societies"[39].

As the digital world surrounds us, technological literacy is increasingly vital for participation in everyday life. Education should empower learners to interpret and actively engage in the new formats and content of digital culture. Although these benefits are far from automatic, given the right conditions, broadband can help enhance the quality of education, create more interactive learning opportunities and contribute to lifelong learning (Featured Insights 10 and 11). Featured Insight 12 details the experience of the Millennium@EDU programme involving some of the largest firms in education and technology for improving education through broadband.

FEATURED INSIGHT 10: BROADBAND FOR EDUCATION

Broadband connectivity alone will not improve the quality of education. Governments need to enable the conditions for technology use in schools (i.e., networking classrooms, training teachers and supplying educational resources). The real challenge is to help teachers and students use ICTs and broadband in relevant and authentic ways that actually improve learning and foster the knowledge and skills necessary for participation in knowledge societies. As new ICTs are introduced, governments must support educators while they explore what works best in the context of their classrooms, schools and regions, and help them share their knowledge to contribute to the body of evidence regarding best practices for ICT in education. Teachers should be the first beneficiaries of this opportunity to get support. As Open Educational Resources (OERs) expand, the availability of free quality resources increases.

While many countries have broadband policies in place and many Ministries of Education have called for broadband in all schools, progress towards reaching these goals is difficult to track, especially because many developing countries do not distinguish between connection types when collecting data related to ICT access and use. One study that used this level of precision was conducted by the UNESCO Institute for Statistics (UIS) in Latin America and the Caribbean in 2010/2011, and in Arab States in 2013. Of the twenty-two countries and territories in the region that provide data disaggregated according to bandwidth, the study found some with impressive strides in broadband connectivity in schools. Several small Caribbean countries (including Barbados, the British Virgin Islands, Saint Kitts & Nevis, Saint Lucia & Saint Martin) report that now all primary and secondary schools have fixed broadband connections (UIS, 2012). Uruguay has provided fixed broadband to 95% of primary schools and 100% of secondary schools. Connectivity remains a challenge for several larger countries in the region, however. For example, in Colombia, 75% of primary and secondary schools have Internet connectivity, but only 9% of all schools are connected via fixed broadband.

Data on ICT in schools in the Arab region show a contrasting picture. While several countries in the Gulf region have achieved high rates of ICT access in schools, other countries in the region face significant barriers to access ICT in education. For instance, in Egypt, only 25%, 25% and 11% of computers in primary, lower secondary and upper secondary schools respectively are connected, constraining Egypt in its efforts to spread a culture of ICT-assisted instruction by a basic lack of devices and Internet connectivity[40].

Source: Broadband Commission Working Group on Education, chaired by UNESCO.

FEATURED INSIGHT 11: THE EXPERIENCE OF THE DIGITAL CULTURE PROGRAMME

Digital inclusion is crucial for sustained economic growth and social development. Telmex, through the Education and Digital Culture Programme coordinated with the Slim Foundation, is pioneering the digital inclusion agenda in Mexico, through initiatives such as the Technological Institute of Telmex. This Institute offers free education and digital inclusion activities and has benefited more than 3.6 million people of all ages, levels of education, and socio-economic segments of the population.

Major categories of the Programme include (among others):

Aldea Digital (Digital Village)
This is an inclusive and open access

space, where people belonging to all sectors of society develop skills for the digital era. The last event in March 2013 was visited by over 154,000 people and 103,011 of them were trained in 4,292 workshops. It obtained the Guinness World Record as the "Largest Digital Inclusion World Event".

Digital Classrooms and Libraries
These classrooms and libraries (more than 3,600) are located in schools and public places, where best practices for digital education are applied and innovative ICT projects implemented. These spaces provide developmental and educational opportunities for children, youth and adults through computers, with specialized software in education and connectivity. Additionally, they offer the possibility to borrow computer equipment for free, just as traditional libraries operate with books. This promotes the inclusion of students, teachers and parents in the digital culture. The programme contributes to the education of a new generation of highly qualified people in science, technology and other sectors.

Innovation Hub
This is a technological innovation space where digital and face-to-face human networks can meet and interlink, with next-generation equipment and very high connectivity, aiming at youth and adults interested in generating and sharing knowledge in active participation with virtual communities. This programme also encourages entrepreneurship and innovation in the digital age.

Source: Technological Institute of Telmex.

FEATURED INSIGHT 12: *MILLENNIUM@EDU* PROGRAMME

The Millennium@EDU Programme was launched in January 2013 at the Education World Forum in London and it will last until end 2015. It aims to touch the life of 15 million students around the world, 1% of the total student population, by providing a comprehensive solution that encompasses specific education hardware, two choices of operating systems, productivity tools, educational software, and services, including the Intel Teach Elements Online Professional Development Courses. Millennium@EDU is a multi-stakeholder initiative led by the private sector including large multinationals involved in education and technology to help achieve the MDGs. The initiative includes the establishment of National Projects led by local promoters from the public and private sector to boost the local tech industry with the support of global companies by responding to the needs of communities.

Promoters of Millennium@EDU include: Intel, SanDisk®, Pasco®, ECS Elite Group, Video Net, Microsoft, JP, Triple C, 1 Global Economy, Converge, and Be Bright, which are participating with a full range of complementary solutions that constitute the 'Millennium@EDU Educational Package'. Education devices and productivity tools offer two operating systems, educational content, a warranty, a deployment plan and transport to destination. In the Philippines, 'Philippine Normal' helps teachers to integrate technology into classrooms. A local education solutions provider delivered Millennium packages and financing through a local bank to make them affordable. Launched in June 2013, the programme reaches at least 1,000 students and will roll out to 13,000 students. The Advanced Science Technology Institute (ASTI) runs pilots of hardware, software, content, and infrastructure solutions to introduce a new curriculum and personalized learning approaches. Intel provides a robust Intel Celeron Dual Core processor plus respective chipset, the Intel Education Software Suite, and Intel Education Resources, which include Classroom Mgmt., British Council and Khan Academy educational videos. Intel's professional courses provide teacher training to over 10 million teachers across the globe.

Source: Intel.

Cisco has developed a low-cost solution to deliver education activities, skills training and healthcare services to remote regions. The low-cost, low power consumption platform supports the delivery of educational content and services developed by partner education facilities and healthcare institutions. Already pilot projects in several States in India have resulted in over 600,000 student hours of education delivery, 10-12% improvement in attendance and a 19% increase in the performance of nine schools across three districts of the state of Karnataka. Healthcare services have been delivered via twenty centers, across eight districts in three states (Karnataka, Rajasthan and Madhyapradesh), resulting in over 50,000 patient consultations, with hundreds of treatments for malnourished children and consultations with expectant mothers.

Perhaps one of the most pivotal recent developments in broadband is the use of m-commerce and mobile money. Exclusion from formal financial systems is often identified as a major obstacle to development[41]. At its most basic level, mobile money is the provision of financial services through a mobile device, but it can also include payments, remittances and transfers, financial services (e.g. insurance products) and banking (e.g. checking account balances). By 2012, there were already 110 mobile money deployments, with over 40 million users, and some US$240 billion worth of items had already been purchased worldwide using mobile payment systems in 2011, rising to US$670 billion by 2015 (Juniper Research[42]).

In areas where it has proved successful, mobile money has created a platform for start-ups to build on, and promises to bring many more of the world's unbanked people into the formal economic sphere of activity (Featured Insight 13). Enabling cash transfers over large distances (and between countries) could prove a major transformation in modern economic activity, and another building block in growing the global economy.

FEATURED INSIGHT 13: M-COMMERCE DRIVING SOCIO-ECONOMIC DEVELOPMENT

Today, around three-quarters of all transactions in the world are still made in cash. Credit and debit cards are common payment methods in industrialized countries, but not in developing countries, where access to financial services is limited. Mobile phones are transforming the way people live, and are a driving force for socio-economic development (Featured Insight 7). Mobile penetration stands at 96% globally, and higher in emerging markets such as the Middle East (109%) and Latin America (114%)[43]. There is growing acceptance of mobiles as enablers of access to credit and banking services for improving livelihoods and digital and financial inclusion, and creating new financial ecosystems.

Interoperability and regulation affect the uptake of mobile services, as they can help interconnect mobile money services, boost transaction volumes, and grow the market, as long as different mobile money services are compatible. Interconnected networks increase the value of mobile financial services, as they add more connections. Ericsson is trying to establish a new open ecosystem, with the common goal of making mobile money services ubiquitous and valuable for end-users.

Since the 2010 earthquake in Haiti, various initiatives have been tested to distribute financial aid to reach the people that need it the most. In Haiti, with fewer than two bank branches per 100,000 people, four different electronic distribution solutions have been tried. Mobile money has been

successful in the Haiti, where since 2010, some US$6 million in transfers have been disbursed to 24,000 beneficiaries via mobile money by six NGO programmes (Bill & Melinda Gates Foundation). Mobile money can help bridge gender gaps in developing countries, and address key constraints to women's access to financial services. Illiterate, rural women are perfectly able to learn to use and appreciate such services.

Ericsson aims to connect banks, money transfer organizations, payment service providers and ISPs to form a flexible, interoperable ecosystem through its Open Money vision, and has negotiated agreements with Western Union, EuroGiro and others. Ericsson's M-Commerce solutions (e.g., Ericsson Converged Wallet, Ericsson Wallet Platform, and Ericsson M-Commerce Interconnect) create a seamless platform integration with money transfer networks, enabling mobile operators to offer money transfers and other mobile financial services. It is our vision that one day everyone with access to a mobile phone will be able to spend, send and receive money, as easily as sending a text message.

Source: Ericsson.

Satellite technology also offers strong potential to support attainment of the MDGs, including across large and/or remote areas (Featured Insight 14). Today, satellite service providers are playing a vital role in enabling e-Services to be converted into mobile services, such as m-Health, m-Education, m-Government, and m-Commerce. Satellite broadband also provides for safety and security services, such as early warning and disaster relief services, ocean or sky surveillance services, Earth observation and meteorological services, for example.

FEATURED INSIGHT 14: SATELLITE AT THE SERVICE OF DEVELOPING COUNTRIES

Satellite solutions can bridge vast distances to bring knowledge and assistance where they are most needed. Today, for example, Intelsat's fleet of 50+ satellites and robust terrestrial infrastructure enables students in outlying areas to access the same educational opportunities as people in urban sites.
Intelsat and Mindset (a developer/ distributor of educational materials in Africa) have partnered to offer distance learning, conferencing and telemedicine via satellite through high-speed Internet access and educational materials to schools, hospitals and clinics in South Africa, as well as homes across Africa[44].

Intelsat provides satellite capacity for telemedicine in Morocco, enabling doctors at the Children's National Medical Center in Washington D.C., U.S., to conduct consultations and training with healthcare professionals in Morocco. Intelsat's satellite technology is also supporting the fight against HIV/AIDS in Africa in Burundi and Burkina Faso[45]. Remote clinics can be connected by the Internet using DVB/SCPC technology from Intelsat's gateway hub-station in Fuchsstadt, Germany, to gain access to medical databases, training and remote diagnosis. Bush doctors can access high-throughput IP two-way connectivity with leading hospitals in Africa and worldwide, while patients can be monitored regularly.

SES supports a joint SAHEL-ESA telemedicine project for e-health initiatives and has established a pan-African satellite-enhanced e-Health platform to bring training and tailored content to nurses, establish communications between remote healthcare facilities and medical centers of excellence, and collect health data from pilot sites.

SES is developing a satellite ICT solution to overcome isolation and lack of terrestrial infrastructures

among African communities through:

- Rural radio: e.g. assisted radio services to support agriculture in the Democratic Rep. of Congo;
- Space4Edu: e.g. eLearning service to support education in rural schools in South Africa;
- Electoral e-Training: e.g. online services and courses for the electoral management bodies of the Economic Community of Central African States (ECCAS) to support more transparent elections.

For example, SES facilitated satellite broadband connectivity during recent elections in Burkina Faso, connecting up the Independent Electoral Commission in Burkina Faso (CENI) to support local and legislative elections in December 2012. SES provided satellite broadband connectivity to election HQ and 45 district offices, allowing for the secure collection and transfer of data. SES is supporting the NGO, Development Alternatives Inc., and USAID in Malawi on the 'Feed the Future' project, equipping three villages with satellite broadband to educate agricultural communities in Malawi.

José Toscano, Director-General of ITSO; Esteban Pacha, Director-General of IMSO; Christian Roisse, Executive Secretary of EUTELSAT IGO.

As the 2015 timeline defined to reach the MDGs approaches, a global discussion has started on how to shape the global post-2015 development agenda, building on the lessons learned in the continuing implementation of the MDGs. The UN is currently conducting global consultations, including online consultations, to take into account the views of as many stakeholders as possible on how to build "The Future We Want", drawing on the outcome of the 2012 Conference on Sustainable Development[46] (Rio+20), and ongoing discussions on the future international framework for development.

In March 2013, the Broadband Commission established a Task Force on Sustainable Development and the Post-2015 Development Agenda to explore how broadband can best contribute to achieve development goals. In 2013, the Broadband Commission issued an Open Letter to the UN Secretary-General's High-Level Panel of Eminent Persons, calling for broadband to be prominently recognized in the post-2015 framework for sustainable development, in recognition of the pivotal role broadband will play in our connected future[47].

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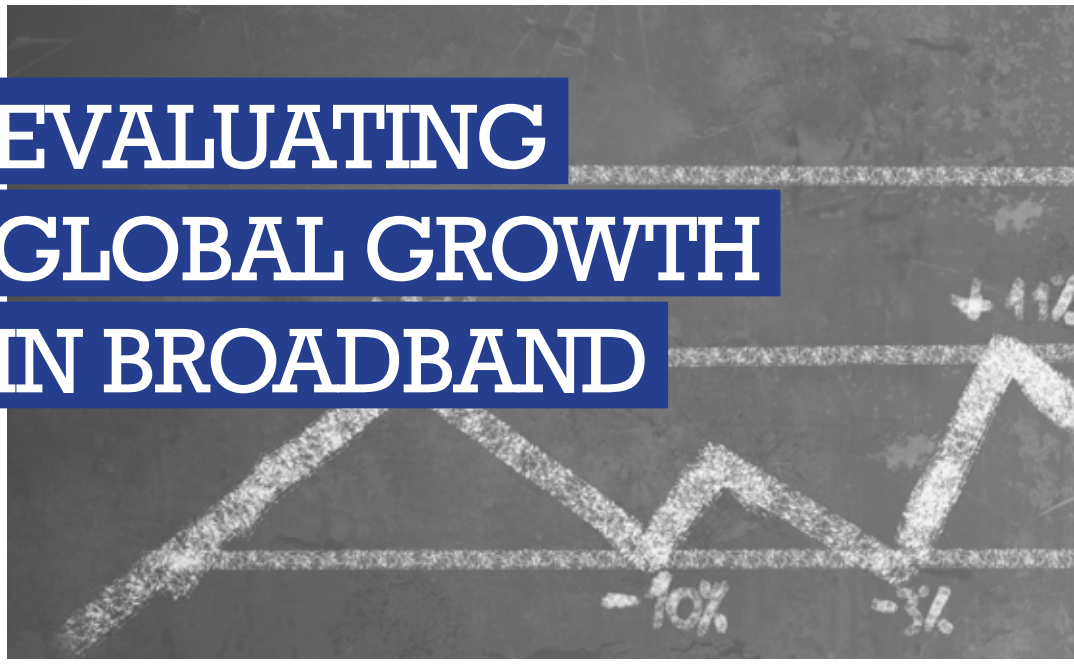
4 EVALUATING GLOBAL GROWTH IN BROADBAND



In October 2011, the Broadband Commission for Digital Development established four targets for tracking universal access to broadband and digital inclusion for all at the Broadband Leadership Summit. In March 2013, the Commission added a fifth target calling for gender equality in access to broadband by 2020. This chapter tracks progress towards achieving these targets to answer the important question, "How universal is broadband today?".

4.1 Advocacy Target 1: Making broadband policy universal – by 2015, all countries should have a NBP or strategy or include broadband in their UAS Definition

The vital importance of national policy leadership is now increasingly understood by ICT stakeholders around the world. Policy leadership provides a clear vision to identify opportunities, constraints and actions around the supply and demand of broadband.

Although in many countries, broadband deployment has been realized through the efforts of the private sector, Governments play an essential role in ensuring a stable regulatory and legal framework to foster and incentivize investments, create a level playing-field amongst the different actors present in the market, establish adequate spectrum policy and reasonable spectrum allocation, and ensure long-term and sustainable competition. Governments can also implement programmes such as e-government, digital literacy initiatives and connected public institutions and locations.

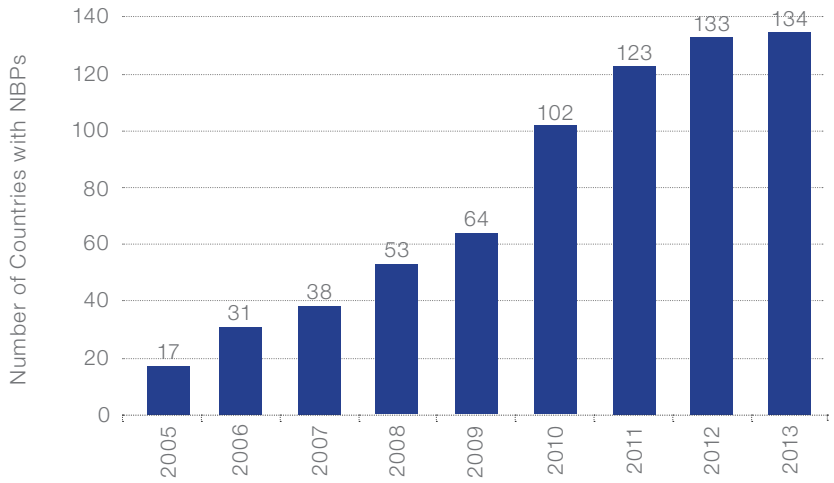
Progress on policy leadership is relatively recent, with an explosion in the number of countries introducing broadband plans in 2009-2010 (Figure 4). Prior to 2006, most plans focused on information society issues, with broadband coming to the fore from 2008 onwards. More recently, Digital Agendas have grown in popularity, incorporating a cross-sectoral perspective. By mid-2013, some 134 or 69% of all countries had a national plan, strategy, or policy in place to promote broadband, and a further 12 countries or 6% were planning to introduce such measures in the near future (Figure 5). However, some 47 countries (or nearly a quarter of all countries) still do not have any plan, strategy or policy in place. Even when

countries have plans, achieving progress in implementation may prove challenging or slow.

Recent ITU/Broadband Commission/Cisco research (2013)[1] suggests an opportunity cost associated with the absence of a broadband plan. Factoring out the impact of average income per capita, market concentration and urbanization, this research suggested that countries with Plans are associated with fixed broadband penetration some 2.5% higher on average than countries without Plans – a significant margin of advantage.

In mobile, the impact of a Plan may be even greater – countries with Plans are associated with mobile broadband penetration some 7.4% higher on average than countries without Plans[2], suggesting that national policy leadership can help establish a positive vision for the development of broadband within a national market. Featured Insight 15 offers insight into Qatar's experience with its National ICT Plan 2015, while Featured Insight 16 describes Malaysia's High-Speed Broadband (HSBB) project. Annex 1 provides the list of National Broadband Plans.

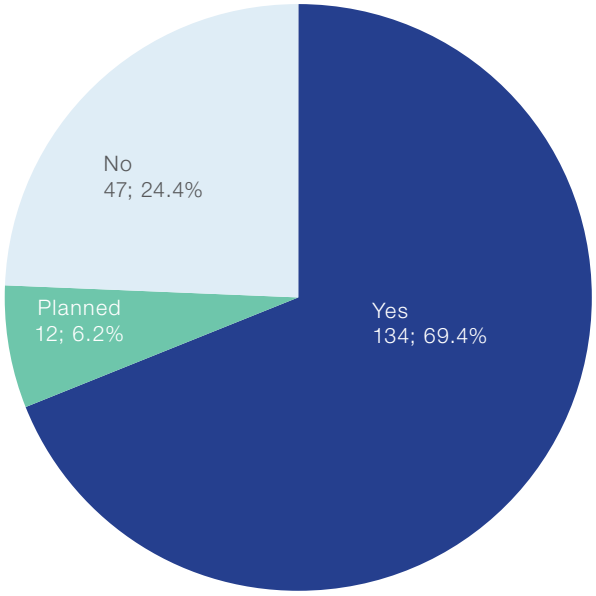
Figure 4: Growth in National Broadband Plans, 2005-2013



Source: ITU/UNESCO Broadband Commission and ITU Telecommunication/ICT Regulatory Database.

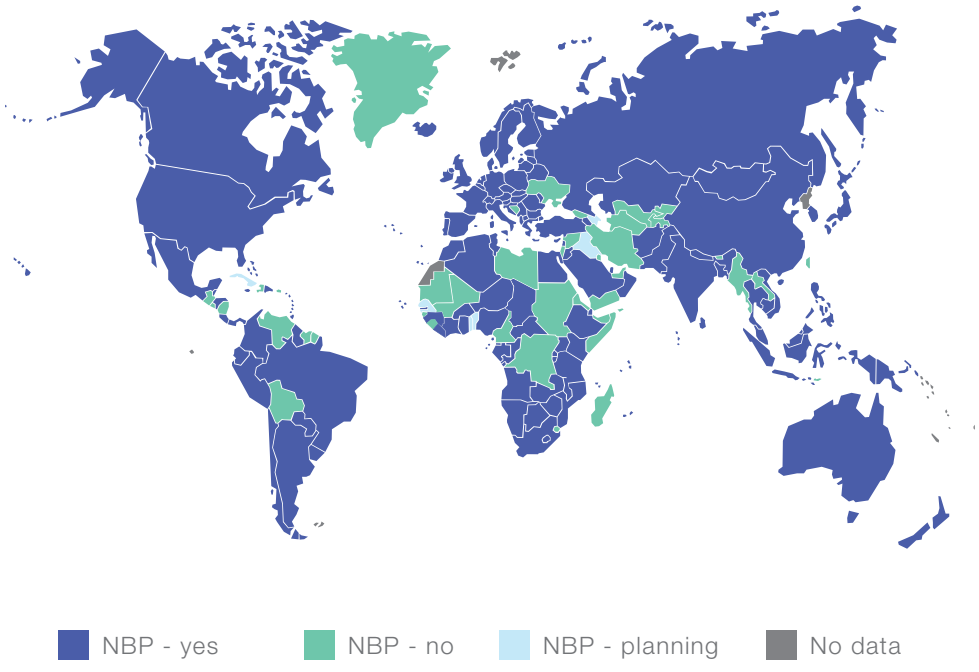
Figure 5: Status of National Broadband Plans, mid-2013

Number of Countries with Plans, mid-2013



Notes: Based on data for 193 countries. National broadband plan includes: a plan, strategy or policy specific to broadband; digital plan, agenda, strategy or policy; or an ICT plan, strategy, or policy.

World Map, according to status of National Broadband Plan (NBP)



Source: ITU/UNESCO Broadband Commission and ITU Telecommunication/ICT Regulatory Database.

FEATURED INSIGHT 15: QATAR'S NATIONAL ICT PLAN 2015 AND ITS EXPERIENCE WITH QNBN

Over 100 Governments have now adopted broadband plans identifying opportunities, constraints and actions around the supply and demand of broadband. Governments can play a critical role in driving deployment and adoption by ensuring fair competition, with low barriers to entry and encouraging private investment. A holistic approach to developing broadband is most likely to engender success. Qatar's "National ICT Plan 2015: Advancing the Digital Agenda" is based on five strategic thrusts:

- Improving Connectivity – ensuring the deployment of advanced, secure infrastructure.
- Boosting Capacity – enhancing digital literacy and developing skills to enable innovation.
- Fostering Economic Development – creating an environment for an innovative & vibrant ICT industry.
- Enhancing Public Service Delivery – ensuring the use of innovative apps to improve public services.
- Advancing Societal Benefits – leveraging ICT to improve the ways society and government provide education, healthcare and services to Qatar's people.

Over the next five years, Qatar will build a world-class broadband ICT infrastructure with the capacity and speeds needed to achieve Qatar Vision 2030. Qatar will invest US$550 million to accelerate the roll-out of a nationwide high-speed, open, reliable, secure and affordable broadband fibre network to Qatari homes, businesses and Government. A number of regulatory instruments will help equip locations (including sports venues) and mega-projects with tools for open and reliable access in preparation for the expected growth in new developments and FIFA 2022-related venues.

Furthermore, ten programmes have been developed to unleash the potential and benefits of broadband, while realizing the positive transformational impact on social and economic welfare: modernizing the legal and regulatory framework; cybersecurity; digital inclusion; ICT human capital; innovation and entrepreneurship; digital content; second generation i-Government; e-Education; e-Health; and Internet and society. These programmes demonstrate Qatar's belief that a holistic approach can positively impact all walks of life – from work and education through to leisure, health and wellbeing. Qatar topped the rankings for Arab States in ITU's IDI Index and ranked 30th globally. Qatar's first National Broadband Plan is due to be released in 2013, and reflects the Government's commitment to broadband while providing guidance to the market to ensure broadband opportunities are realized and maximized. The Plan provides policy actions to maximize the use of broadband in view of human, social, economic and environmental development in Qatar. Qatar ranks in the top ten countries worldwide for individual Internet user penetration in Annex 5.

Source: ICT Qatar.

FEATURED INSIGHT 16: POLICY-DRIVEN BROADBAND INNOVATION IN MALAYSIA

In 2009, with total broadband penetration at 9.4%, the Malaysian Government announced a subsidy of RM 2.4 billion (US$0.75 billion) for Telekom's High-Speed Broadband (HSBB), aiming to transform Malaysia into a knowledge society and a high-income economy. Huawei is extremely proud to have been chosen as the broadband infrastructure partner. The active involvement of Government and other public policy-makers is crucial for broadband innovation. Governments can create the appropriate conditions and ensure universal service for all citizens, including a level playing-field for competition. Once these conditions are ripe, the development of innovation clusters can gather momentum.

Malaysia's HSBB project aims to "expand the communications network to ensure more equitable access to Information and Services", and to "bridge the digital divide". HSBB service offers special packages for low-income households in both urban and rural areas. To ensure fair play and competition for all operators and providers, the Government subsidy for Telekom Malaysia, issued under a PPP agreement, committed Telekom Malaysia to open its network up to competitors. This competitive, open market will help to create innovation clusters over the long-term.

To improve education and ICT skills, the Malaysian Government and Telekom Malaysia introduced partial waivers for the cost of broadband, as well as tablets for first- and second-year university students – over 100,000 students have benefited. By February 2013, broadband penetration in Malaysia had doubled, and the HSBB project may also increase national GDP by 0.6% and create 100,000 jobs by 2018.

Source: Huawei.

4.2 Advocacy Target 2: Making broadband affordable – by 2015, entry-level broadband services should be made affordable in developing countries.

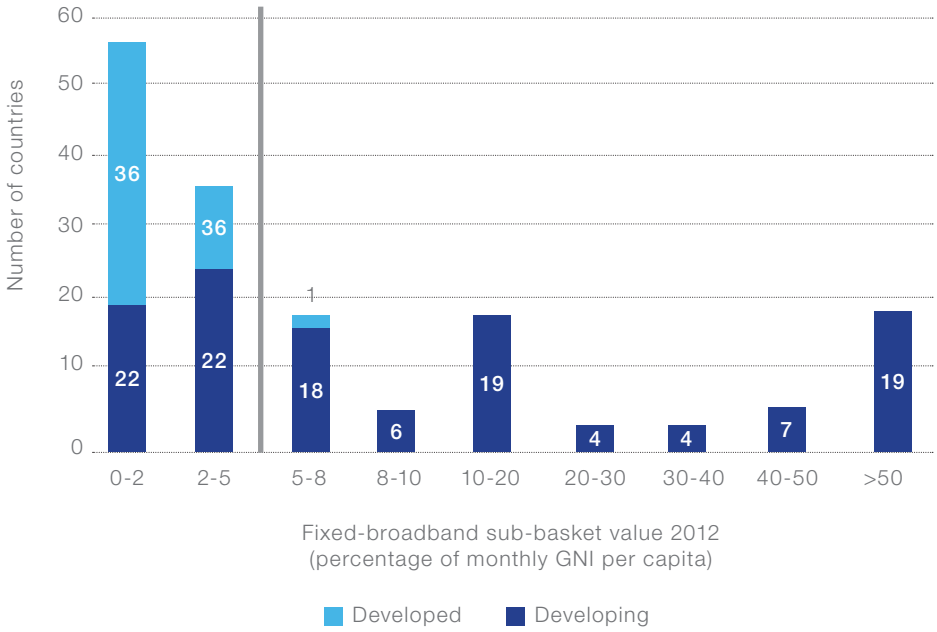
The affordability of broadband access plays a critical role in broadband diffusion and it can prove a key barrier to extending access to broadband in developing countries. Broadband is becoming more affordable around the world – over the past five years, fixed-broadband prices as a share of GNI per capita have dropped by 82%[3]. By 2012, the majority of countries had reached the Commission's target of offering basic fixed-broadband services at <5% of monthly GNI per capita, but broadband remains unaffordable in many parts of the developing world.

Huge discrepancies in affordability persist. By 2012, fixed broadband services remain expensive, accounting for 30.1% of average monthly incomes in developing countries (compared to just 1.7% in developed countries)[4]. In 2012, the number of developing countries where broadband cost less that 5% of average income remained the same as in 2011, at a total of 48 (with 22 developing countries in 0-2% and 26 in 2-5% in Figure 6). Assuming that people can afford broadband when it costs less than 5% of their annual income, fixed broadband access is unaffordable

for 3.9 billion people, and mobile broadband unaffordable for over 2.6 billion people around the world[5]. Availability and affordability gaps are disproportionately impacting people in Africa, Asia-Pacific, and Latin America.

However, more developing countries are approaching the target threshold – the number of developing countries where broadband cost between 5-10% of average income has increased from 15 in 2011 to 24 in 2012 (with 18 developing countries in 5-8% and 6 in 8-10% in Figure 6). Policy-makers can address affordability by regular monitoring, regulation, potential subsidies, increased competition, and tiered services. Many plans recognize affordability as a key priority. Nevertheless, effective competition is still widely recognized as the most effective mechanism to date to lower prices and increase affordability for the majority of the population. Effective competition reduces the need for other interventions in the long-term and can facilitate technology neutrality, letting markets decide the dominant technology for the future. Countries can develop pro-competitive policies – for example, through: eliminating potential distortions in termination rates; promoting fair and non-discriminatory access to essential facilities (such as the local loop or submarine cables); and facilitating the entry of new operators in the market, among other options.

Figure 6: Fixed Broadband Sub-Basket for Developing Countries, 2012



Source: ITU.

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

Access to broadband or the Internet at home is one of the most 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, elderly, or have a disability. Research has shown that children with Internet access at home perform better in school. Globally, 41% of all households will be connected to the Internet by end 2013; in the developing world, 28% of households have Internet access (Figure 7), compared with over three-quarters or 78% of all households in the developed world. Of the 1.1 billion households still not connected to the Internet, 90% are in the developing world.

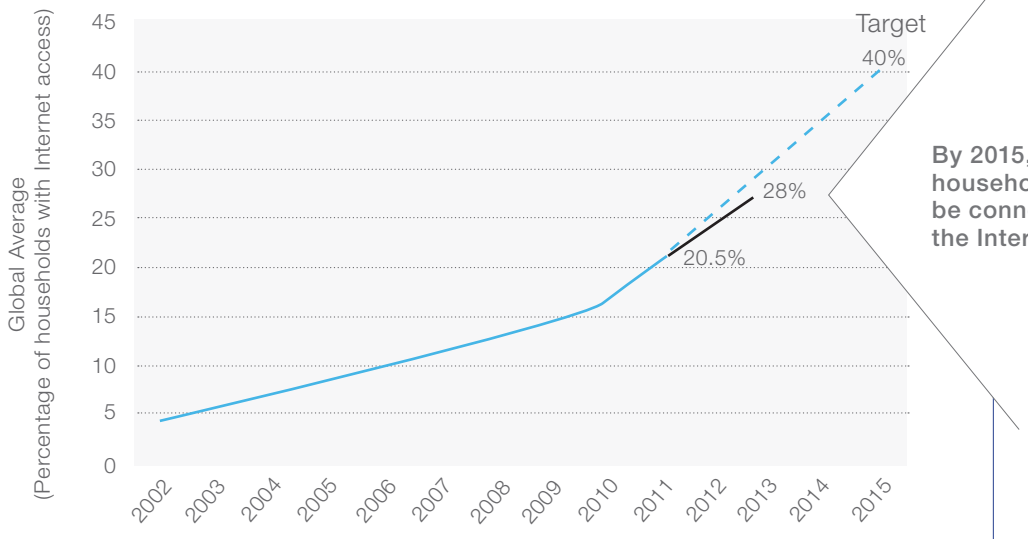
At current growth rates, the 40% target will not be achieved by 2015, but with the rise of the mobile Internet, access may improve very quickly. Annex 4 presents national rankings. A number of NBPs specifically include a focus on household access as a key national priority – for example, Singapore revised the Code of Practice for Info-comm Facilities in Buildings ('COPIF') in May 2013, to require new residential homes to be pre-installed with optical fibre (Featured Insight 17).

In terms of technologies by which these households are connected, a growing number of national surveys accommodate broadband connectivity via mobile, but a major target for many NBPs is percentage of households passed by fixed broadband technology. In terms of fixed broadband technology, Point Topic (2013)[6] suggests market shares have remained remarkably stable over recent quarters, with Digital Subscriber Lines (DSL) accounting for nearly six out of ten fixed broadband subscriptions, while fibre optic FTTx and FTTH account for over 22% of the global market for fixed broadband (Figure 8). This implies that many countries and operators are still continuing to engage in upgrades to their existing copper-based networks, to maximize the returns on their investments.

For fixed broadband penetration, the top ten countries are all located in Europe, except the Republic of Korea, which ranks fifth for fixed broadband penetration per capita globally. The only non-European entrants into the top twenty rankings are Canada (12th), Hong Kong (China) (16th), and the United States (20th).

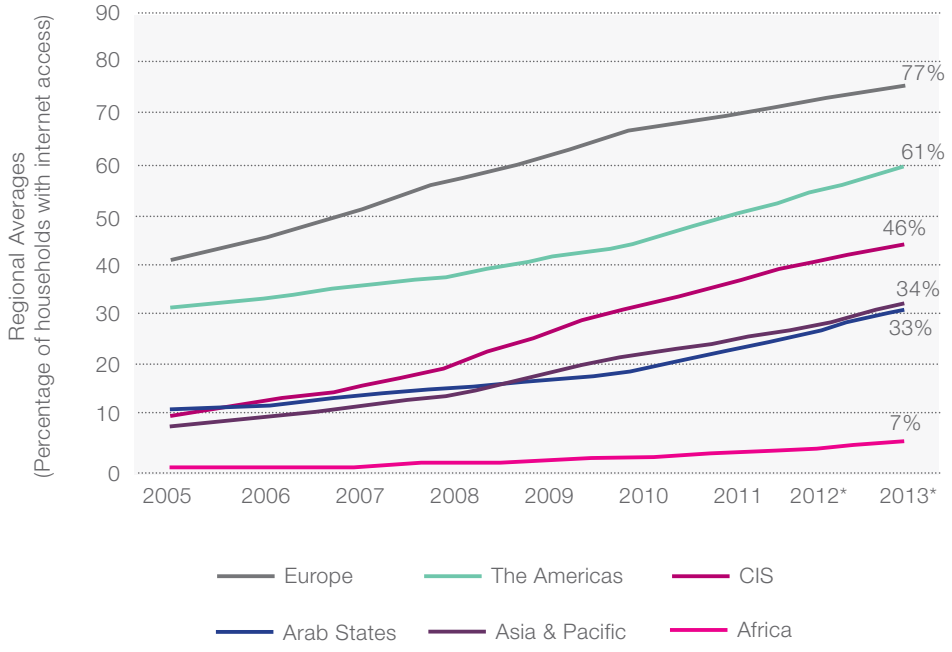
Mobile broadband is today connecting many more homes. Five countries have a mobile broadband penetration in excess of 100 connections per capita - Singapore, Japan, Finland, Republic of Korea and Sweden. Thirty countries have mobile-broadband subscriptions in excess of a ratio one per two inhabitants, compared to just thirteen last year. Our mobile broadband future discussed in Chapter 2 is being realized more quickly than anticipated.

Figure 7: Proportion of Households with Internet Access in Developing Countries, 2002-2015



Households with Internet Access, Global Average

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

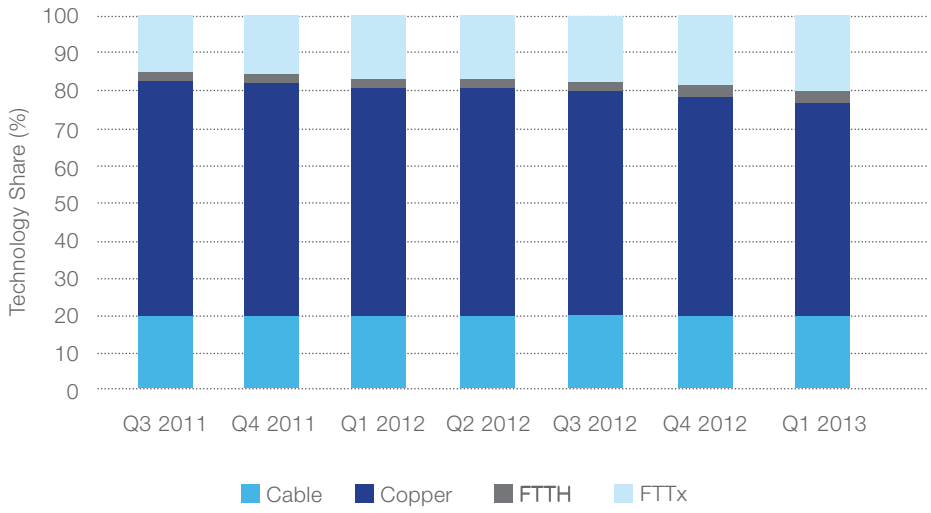


Households with Internet Access, Regional Averages

Source: ITU.
*Note: * Estimates.*

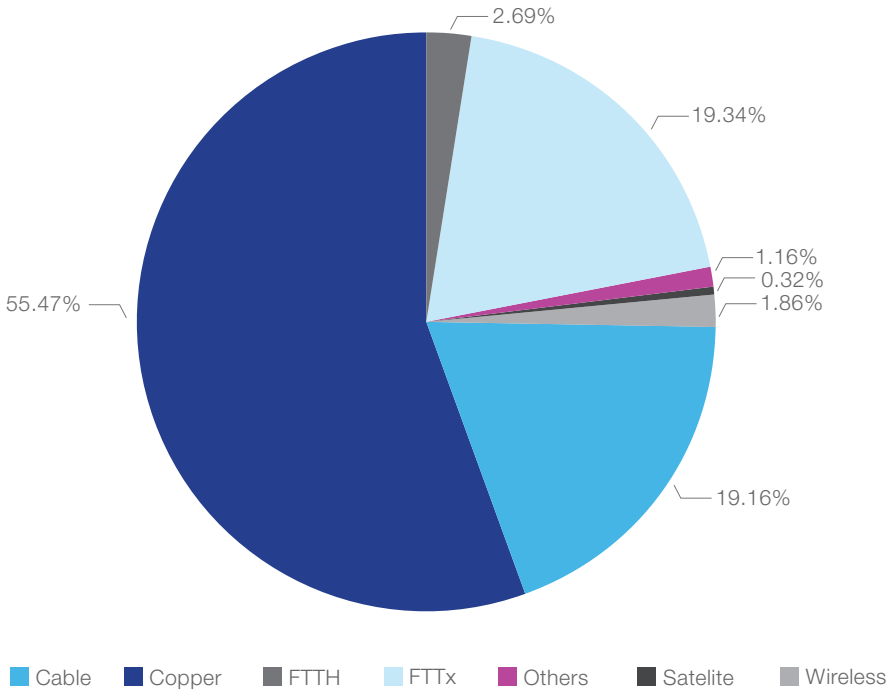
Figure 8: Global Fixed Broadband Market Share by Technology, 2011-2013

Broadband Market Share by technology, 2011-2013



Source: Point Topic (www.PointTopic.com).

Broadband Market Share by technology, Q1 2013



Source: Point Topic (www.PointTopic.com).

FEATURED INSIGHT 17: NEW HOMES IN SINGAPORE TO HAVE IN-BUILT FTTH BROADBAND

The Rep. of Singapore boasts a population of 5.3 million people[7], and ranks among the Top 3 in surveys of networked readiness[8] and e-government efforts[9]. In 2011, 85% of households had broadband access and by Q1 2013, there were over 10.3m broadband subscriptions[10]. Singapore views the prevalence and adoption of new and emerging technologies as critical to the long-term development of its economy.

In 2006, Singapore embarked on its sixth masterplan, Intelligent Nation 2015 ("iN2015"), earmarking broadband network connectivity as a priority area to meet Singapore's economic and social development needs. This led to the development of Singapore's ambitious "Next-Gen NBN", a new, all-fibre network delivering speeds of up to 1 Gigabit per second ("Gbps") to homes and businesses. To achieve this vision, an ultra-high speed broadband network is needed everywhere, as well as an enabling infrastructure for Singapore to become a smart nation. Robust infocomm infrastructure could spur the development of new knowledge-based sectors, including R&D, business and social analytics, and creative industries. To enhance Singaporeans' quality of life, broadband-enabled innovative services are being deployed to homes, schools and businesses. Today, Next-Gen NBN has achieved over 95% coverage nationwide, with 20 providers serving more than 330,000 fibre-optic subscribers. Besides competitive pricing, operators offer new ultra-high speed services, such as interactive TV applications, cloud services, and learning resources.

To ensure new homes are ready for Next-Gen NBN, IDA revised the Code of Practice for Info-comm Facilities in Buildings ("COPIF")[11] in May 2013, to require new residential homes to be pre-installed with optical fibre, and each living room and bedroom to be provided with Category 6 cabling capable of carrying data speeds of more than 1 Gbps. The revised COPIF means that homeowners will no longer be inconvenienced by fibre installation after they move in, and can now order services over fibre on demand. The provision of Category 6 cabling in-premises also facilitates ultra-high speed home-networking and access to fibre services, so a greater variety of services can be delivered to all parts of the home. The revised COPIF in 2013 should ensure homes are built for infocomm needs and benefit consumers with a richer broadband experience. These efforts are working - in Annex 4, Singapore ranks third in the world for household Internet penetration.

Mr. Leong Keng Thai, Deputy Chief Executive/Director-General (Telecoms and Post), IDA Singapore.

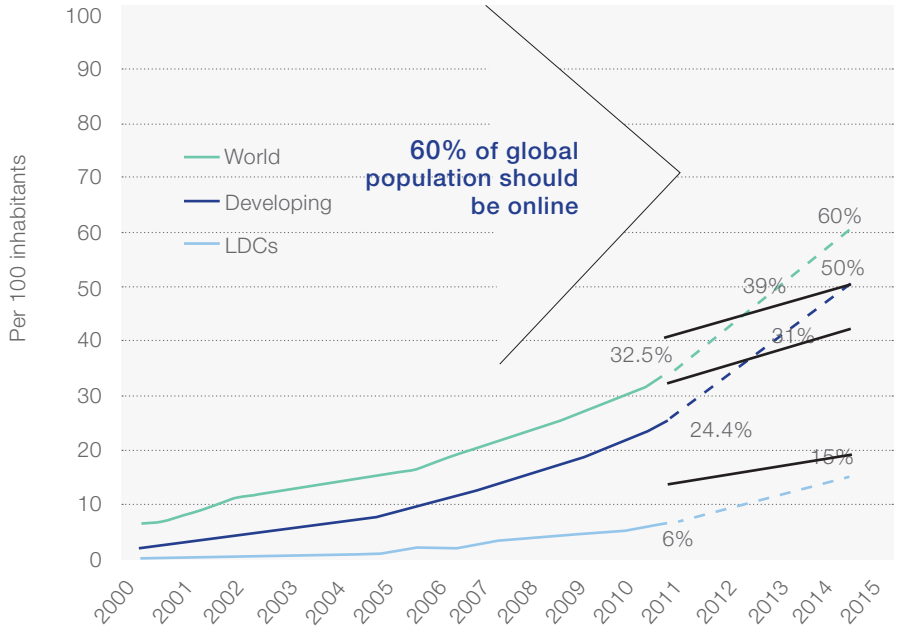
4.4 Advocacy Target 4: Getting people online – by 2015, Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in LDCs.

By the end of 2013, some 2.7 billion people will be online, equivalent to a global penetration rate of 39% (up from 32.5% or 2.27 billion Internet users at the end of 2011). In the developing world, Internet penetration will reach 31% by the end of 2013 and 10% in the LDCs (Figure 9).

At current growth rates, this target looks unlikely to be achieved. By 2015, the Broadband Commission predicts that despite the growth of mobile broadband, global Internet user penetration will reach 45% worldwide, far short of its target of 60%, while Internet user penetration will reach 37% in developing countries, far short of its target of 50%. Based on ITU data, Intel (2013) forecasts that at current growth rates, Internet user penetration in developing countries will climb above 40% by 2014[12]. Annexes 5, 6 and 7 give national rankings. The top ten countries for Internet usage in Annex 5 are all located in Europe, except for New Zealand (8th) and Qatar (10th).

Policy-makers can help stimulate demand in many developing countries, with a clear plan of digitalization in public services (education, health, city services, etc.) that can enable citizens to become familiar with and use new technologies. Public consultations and public-private cooperation are also essential, so actors can work towards the same priorities. Chapter 7 provides some policy recommendations to universalize broadband as quickly as possible, while Featured Insight 18 details the efforts Government and industry are making in the Rep. of Korea to connect the entire population to high-speed broadband, including rural communities.

Figure 9: Internet User Penetration, 2000-2015



Source: ITU.

FEATURED INSIGHT 18: CONNECTING PEOPLE IN KOREA

The Republic of Korea has fostered solid infrastructure by building a nationwide 100 Mbps broadband convergence network from 2004 to 2010, necessary to deliver broadcasting, telecommunications and Internet services, to wired and wireless subscribers.

Of 15 million high-speed Internet subscribers, 95.9% or 14 million subscribers have access to the ultra-fast broadband converged network. In contrast, only 2.2%, or 30,000 subscribers in rural areas have access to a network at only 2 Mbps, limiting the delivery of high-speed services. Various telecom and broadcasting services such as IPTV, e-learning and e-health have become common for those living in urban areas, thanks to a 100 Mbps network. So far, delivery of such services to small rural communities has been nearly impossible. Considering the relatively low quality of the educational, medical and cultural environment in rural communities, the need to improve the network as a way to deliver high-quality education and healthcare services to farmers and fishermen is vitally important. To bridge the digital gap between rural/urban areas and revitalize the rural agricultural and maritime economy, Korean central and local governments and a telecom provider have invested in a matching fund (1:1:2) in 2010 to build a 100 Mbps broadband network in towns with fewer than 50 households in rural areas. By 2012, the network had been built in 2,530 towns, and will soon be extended to 13,200 towns, eventually achieving nationwide coverage.

Korea works continuously to upgrade its wired network to prepare for the future. The Korean Government launched the Gigabit Internet project in 2009, providing Internet service at speeds up to 1 Gbps, ten times faster than the current 100 Mbps. By 2012, 8,300 households in ten cities used Gigabit Internet service, and the Government aims to achieve 90% nationwide Gigabit Internet coverage by 2017.

To ensure all people have Internet access, the Government initiated a public WiFi project in 2012, providing free-of-charge WiFi service in public places such as parks, museums and libraries. In cooperation with operators, the Government is implementing WiFi networks in public places and shares the networks to reduce service costs, and manage mobile data traffic. In 2012, three mobile carriers in Korea built 2,000 public WiFi zones nationwide, and are planning to deploy 10,000 zones in total by 2017. Korea ranks in the top five countries for both fixed and mobile broadband penetration in Annexes 2 and 3, and has the highest household penetration in the world in Annex 4.

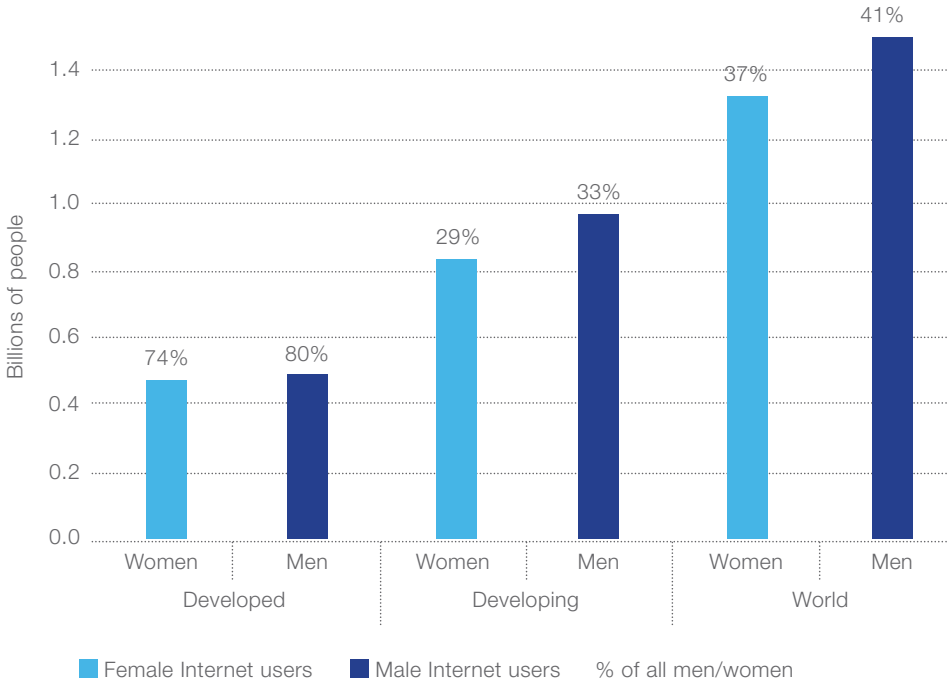
Source: National Information Society Agency (NIA), Rep. of Korea.

4.5 Advocacy Target 5: Achieving gender equality in access to broadband by 2020.

Sex-disaggregated data are not yet available for broadband connectivity. Based on Internet usage data as a proxy indicator, by the end of 2013, however, ITU estimates that some 1.3 billion Internet users will be women[13] (37% of all women worldwide will be using the Internet – Figure 10), compared with 1.5 billion men online (41% of all men), equivalent to a global Internet gender gap of 200 million fewer women online. The report of the Commission's Working Group on Broadband and Gender, "Doubling Digital Opportunities" (2013), examines the different methods for estimating Internet gender gaps[14].

This gender gap is more pronounced in the developing world, where 16% fewer women than men use the Internet, compared with only 2% fewer women than men in the developed world (ITU, 2013). Without further action, Intel (2013) forecasts that the Internet gender gap could grow to a total gender gap of 350 million in three years' time. This suggests that, in many countries, women are coming online more slowly and later than men, with serious implications for the ability of women to use the Internet to access information and develop the vital ICT skills needed to participate and work in today's digital economy.

Figure 10: The Gender Gap: men and women online, totals and penetration rates, 2013



Source: ITU World Telecommunication/ICT Indicators database

Note: ITU estimates.

ENDNOTES

1. "Planning for Progress: Why National Broadband Plans Matter", ITU/Broadband Commission for Digital Development/Cisco, 1 July 2013 – available from www.broadbandcommission.org
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9. Waseda University World E-Government Ranking 2013: Singapore topped the Waseda rankings for a fifth consecutive year.
10. IDA Infocomm Usage, Households and Individuals: http://www.ida.gov.sg/Infocomm-Landscape/Facts-and-Figures/Infocomm-Usage-Households-and-Individuals
11. IDA Singapore: The COPIF was introduced in 2000 to ensure that developers and/or owners of buildings and developments provide adequate space and facilities for the deployment and operation of installation, plant and systems which are used for providing info-communication services to the buildings. The COPIF also specifies the duties to be observed by developers and/or owners of buildings and developments, and telecommunication licensees in relation to the provision, maintenance and utilization of the relevant space and facilities provided, as required under COPIF.
12. Page 25, "Women and the Web", Intel, January 2013, available at http://www.intel.com/content/dam/www/public/us/en/documents/pdf/women-and-the-web.pdf.
13. ITU ICT Facts and Figures 2013.
14. "Doubling Digital Opportunities", Broadband Commission Working Group on Broadband & Gender, forthcoming, September 2013, available from www.broadbandcommission.org

5

UNIVERSALIZING BROADBAND

According to ITU, Internet users are projected to reach 2.75 billion in 2013 (Table 1), up from 2.27 billion in 2011, with around a third of all humanity now online[1]. However, this still leaves some two-thirds of the planet's population to be connected. How can this be best achieved? This Chapter explores some of the means and mechanisms by which broadband can be universalized by government and industry and other stakeholders working in partnership[2].

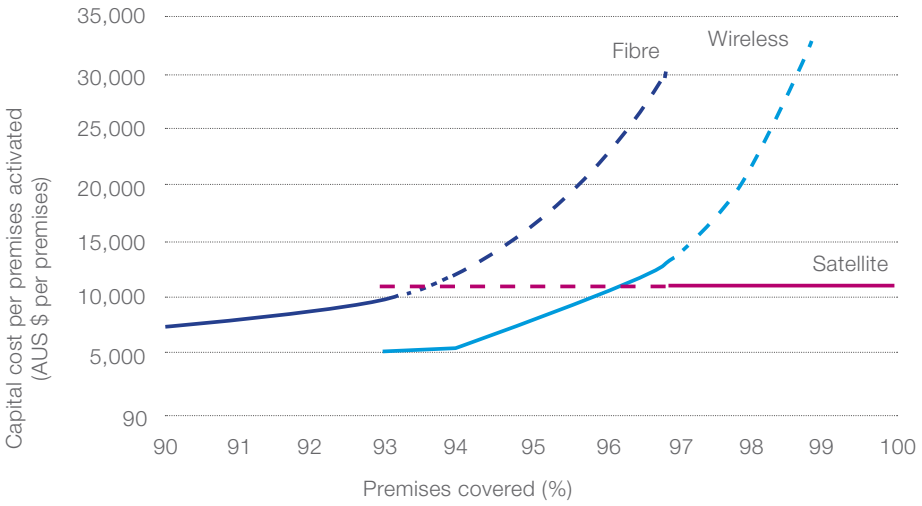
There is a significant body of evidence to suggest that private and competitive markets have successfully accelerated service delivery to a large customer base, boosting market growth, enhancing innovation, increasing subscriptions and reducing prices[3]. However, evidence is growing that private, competitive market provision does not always provide last-mile access to every subscriber, mainly due to the higher marginal costs of providing access to remote users. Costs increase dramatically for connecting the last subscribers, threatening the commercial viability of serving these areas (Figure 11). ITU defines universal service as every household or individual in a country having the opportunity to access telephone and/or ICT services[4].

Although satellite may have higher overall costs per subscriber for connecting subscribers initially, the marginal costs of connecting additional subscribers are relatively low, and increase in a 'bit-step function' (although there are obviously still capital costs associated with all technologies). Conversely, fibre and wireless may have lower costs for the bulk of first subscribers to be connected, but for the last subscribers to be connected, marginal costs escalate quickly. Figure 11 demonstrates the step changes in incremental roll-out costs once fibre-to-the-curb/cabinet (FTTC) and fibre-to-the-home (FTTH), wireless and satellite reaches 60-70% population coverage.

The key to unlocking universal service is solid consideration of how to fund the last 5-10% of subscribers, and who should bear these additional costs.

Boosting deployment of broadband networks and increasing penetration of telecommunication services in rural and isolated areas require huge investments. Governments have an important role, but should avoid inappropriate interventions and distorting or setting negative incentives for commercial players. More investments are needed to service remote areas, relative

Figure 11: The Costs of Connecting the Last Subscribers



Source: Australia, National Broadband Network Implementation Study, 6 May 2010, Library of Parliament, at: http://data.dbcde.gov.au/nbn/NBN-Implementation-Study-complete-report.pdf.

Note: Amounts quoted in Australian dollars.

to large and highly populated cities. It is important not to punish operators for having "market power" in towns and small villages, where other operators may not invest sufficiently. Competition regulation should take into account the special features and characteristics of different markets.

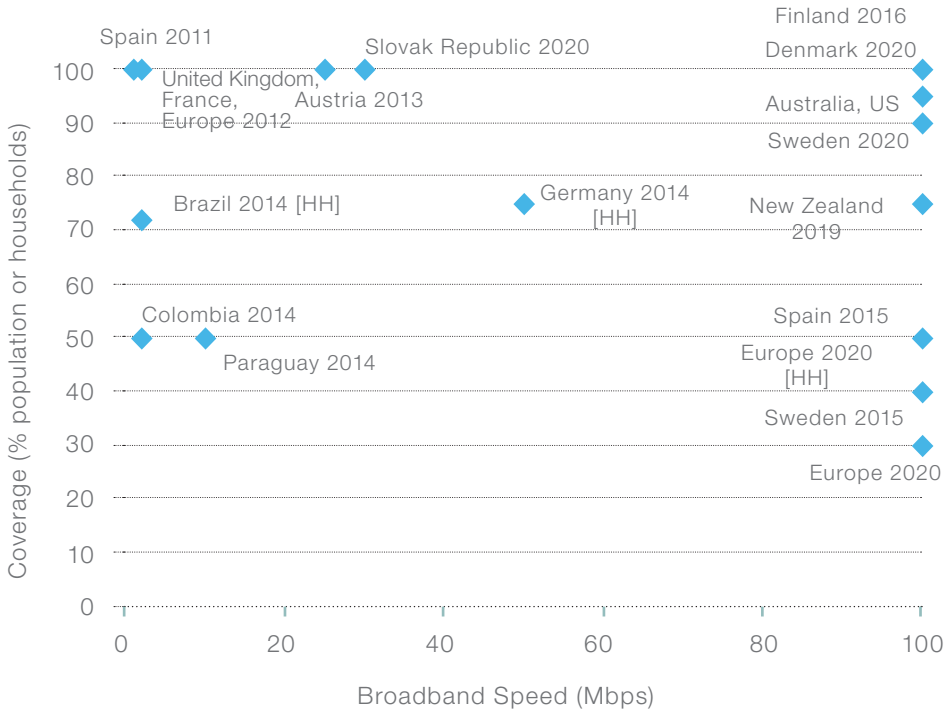
Countries vary in the boldness of their targets: in fact, not all countries currently envisage connecting the last 5-10% of their population or households. To date, NBPs have often contained benchmarking or global targets for rolling out broadband to populations or priority groups and communities – often in phases with rolling targets for specified years; often with specified speeds; sometimes with specified technologies. A number of countries have specified universal access service (UAS) as a national policy priority – e.g., Denmark and Finland (Figure 12).

One advantage of setting national targets for coverage and broadband speed is that

targets can 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 fails to take into account the needs and geography of certain areas (e.g. for remote or rural areas, or other marginalized populations). Global targets may fail to take into account the on-the-ground needs of specific areas, local geography or the needs of local population. Targets need to remain relevant and realistic, rather than abstract or overly ambitious.

NBPs are sometimes formulated in addition to existing Universal Service and Access (UAS) definitions, although not all countries actually have USOs in force (e.g., Afghanistan, Lebanon, Libya, and South Africa do not impose USOs on incumbent carriers). In Mexico, specific obligations have been imposed on the incumbent, Telmex, for the deployment and operation of "public telephone booths" in some rural villages, as well as telephone lines in villages with few inhabitants, to be funded by the incumbent. In Switzerland, broadband has been included in the scope of the country's USOs since 2008 – the operator charged with USO must provide a broadband connection to the whole population, via DSL or satellite or other technologies (at least 600 Kbps downloads and 100 Kbps uploads, and monthly subscription < CHF 69). Finland recognized every citizen's right to access a 1 Mbps broadband connection in July

Figure 12: Targets set by National Broadband Plans



Source: ITU.

Note: Australia's targets specify 100% geographic coverage, with 93% at 100 Mbps and 7% at 12 Mbps.

EU objectives are 30 Mbps for all EU households and 100 Mbps for 50% of EU households, by 2020, shown as [HH].

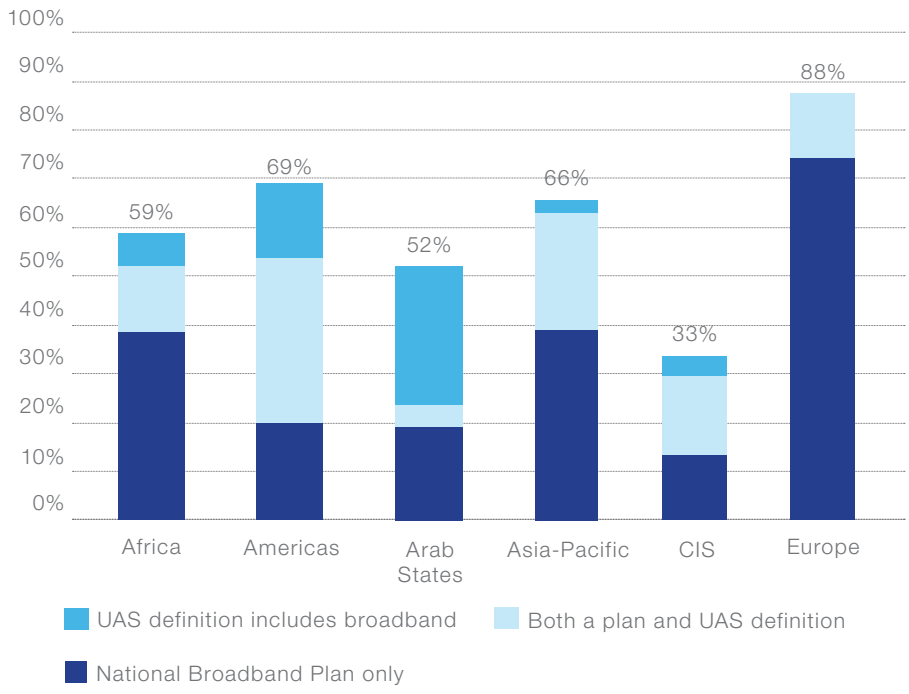
2010 as a legal right, while recent national legislation extended USO to broadband, with the objective of a basic 1 Mbps broadband connection available to all by 2011.

Different regions have adopted different approaches to extending universal access. Europe has a marked preference for Plans, with a total of 38 countries or 88% of European countries having a Plan and/or UAS definition (Figure 13). Africa was well-endowed with NBPs from early in the first decade of the new millennium, partly because ICTs have been included in IMF/World Bank Poverty Reduction Strategy Papers (PRSPs). The region with the fewest National Broadband Plans is the Arab States, which have generally revised their USOs to include broadband. The Americas and Asia-Pacific are the regions most likely to make use of a Plan, in combination with a UAS definition (Figure 13).

More developing countries are including broadband in their definitions of universal service. In 2010, two-thirds of the 144 developing countries had a UAS definition. Of those, 49 had included Internet dial-up within their definition, and 36 out of the 99 countries included broadband in their definition of UAS. This is a large increase on the situation five years earlier, in 2005, when just 21 developing countries included Internet dial-up in their UAS definitions and only one included broadband. Including broadband in UAS definitions is one key policy commitment to digital inclusion for all; the choice of policy instrument is also important.

Whether via a national plan, USD or as part of the operations of the USF, various strategies are available to overcome different barriers to access (Table 3).

Figure 13: Choosing a Policy Instrument



Source: ITU World Telecommunication/ICT Regulatory Database.

Table 3: Barriers to Access and Strategies to Overcome Barriers

Barrier/obstacle	Examples of strategies to overcome the barriers
1. Low levels of purchasing power in certain rural and sub-urban areas	• Subsidies to the benefit of end-users, to ensure broadband adoption, once access is secured • Discounted offers from operators to end-users • Telecentres for shared use to kick-start broadband markets • Public-private partnerships (PPPs)
2. Limited financial resources available via some USFs	• Policy-makers should work with operators, depending on local needs and government funding, to ensure USF is properly sourced and effective. • Support (e.g. from international agencies) for ad-hoc projects. • Priority given to UAS projects based on strict and clear criteria
3. The low levels of ICT skills of some of the population	• ICT training • Connecting up educational establishments • ICT lessons in schools and universities, and ICT equipment furnished at low or no cost
4. The lack of basic commodities (water, electricity, etc.)	• Telecentres open to the public where access to commodities is guaranteed • Wi-Fi access in public spaces where access to commodities is guaranteed
5. The limited availability of consumer electronic equipment	• Distribution of equipment directly, or subsidies for consumer electronic equipment by poor households • Review import duty regimes to ensure they are effective. • Equipment approval (supply) policies should not be too onerous or restrictive.
6. High tax rates on telecom services or equipment	• Targeted tax and import duty reductions on broadband services and devices, including removal of luxury taxes.
7. Lack of infrastructure/ high costs of deployment	• National broadband plan, including roll-out of a mutualized national backbone, as well as in-building infrastructure • Grants to operators to build out infrastructure • Sharing of infrastructure and works

8. Administrative delays in authorizations to deploy new infrastructure	• Involve relevant agencies and Ministries early • Streamline licensing procedures • Eliminate red-tape and delays • Remove barriers and obstacles to owning land
9. Limited economic growth in certain areas	• Ongoing subsidy programmes on the demand side, following investment on the supply side
10. Limitations in amount of spectrum available	• Streamline spectrum licensing and re-farming practices • Implementation of the digital switch-over • More effective policies for spectrum allocation/assignment
11. Limited availability of relevant local content	• Subsidies and awards for the development of local content • Development of e-government services, open government / freedom of information policies.

Source: Inter-American Development Bank (IDB).

As established, broadband deployment is a very important element for telecommunications development and private operators have a key role to play in this regard. However, some operators today face legal and regulatory barriers hindering investments that could help to develop the networks, such as over-regulation and lack of legal certainty. Governments should encourage investments in broadband networks including rural and isolated areas through appropriate incentives, with the main purpose of improving penetration and digital inclusion.

Various firms now run connectivity programmes under their corporate social responsibility (CSR) initiatives. For example, Intel's Reaching the Third Billion (R3B) programme is designed to increase access to technology for all citizens, help improve education quality, increase access to online services, and spur economic growth by applying the pre-paid miracle to broadband access. In two years, R3B has reached over 50 countries. Over 20 million more people have now joined the digital era due to the R3B programme. Ericsson has been working with Communication for All and Technology for Good since 2007, and participates in numerous initiatives in many countries, including the Millennium Villages Project.

Many operators are also developing initiatives to broaden access to broadband in developing countries. For example, Telefónica launched its competition, 'ConectaRSE para crecer' ('Be connected to growth'), in 2012 to identify the best ICT initiatives in rural

areas with social and economic impact on their communities. The 'Intégrame de Telefónica Perú programme' (Make Me Part of Telefónica Peru) provides telephone, Internet and satellite digital TV in poor rural areas in 11 regions and 19 provinces in Peru, to 103,617 people benefiting from new ICTs. Telefonica also runs an incubation programme, Wayra, to fund promising entrepreneurs and provide them with communication facilities throughout Latin America and Europe (Featured Insight 19). The challenge now with many corporate initiatives is to achieve greater scale.

FEATURED INSIGHT 19: WAYRA – SUPPORTING ENTREPRENEURSHIP

Wayra (meaning 'wind' in Quechua) aims to act as an accelerator for the development of future Silicon Valleys in countries where Telefónica is present. Growth opportunities come from ideas, but talent does not always find the right channel, financing and support and may sometimes emigrate, as the only way forward. Wayra was created in Latin America in April 2011 to identify ideas with strong potential in ICT and to boost their development, providing them with the technology, mentoring and financing they need. Entrepreneurs are invited to submit their projects to Wayra, which then selects a number to take forward. Successful projects gain financing (in exchange for a 10% share), access to Telefónica resources (including management and technical expertise) and a place to work.

Wayra is present in countries throughout Latin and Central America, including Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela, as well as Spain, and has recently also been launched in Europe in the UK, Ireland and Germany and the Czech Republic. Wayra aims to achieve a significant impact on the economy of those countries where it operates:

- A total of 13,748 projects were submitted in 2012, of which some 180 start-ups have been selected.
- Wayra hosts 12 academies in 7 Latin American countries (Brazil, Argentina, Colombia, Mexico, Peru, Chile & Venezuela) and 5 European countries (Spain, United Kingdom, Germany, Ireland and Czech Rep).
- More than 17,000 ideas and projects have been received.
- Over 230 new companies have been selected for acceleration with investment of €7.5 million by Telefónica.

Source: Telefonica.

USFs can also play a role in extending access, usually overseen by Ministries or regulators. Typically funded through a levy on operator revenues, Funds finance projects in certain areas and/or technologies. A GSR 2011 Discussion Paper notes that first-generation USFs often funded universal service through cross-subsidization from monopoly revenues derived from higher margin international and long-distance calls before rate rebalancing, mainly for basic voice and public telephony in developing countries (e.g., Peru and Chile)[5]. Often, as competition has increased, access deficit charges and interconnection charges have not proved sustainable for rural operators.

Many modern USFs recognize the important role of competition, and no longer assume that the fixed line incumbent is the sole (or even necessarily a) universal service provider (USP), and have typically broadened their scope to enable the Fund to take a converged approach (e.g. India, Chile, Brazil, and the U.S.). These 'second-generation funds' rely increasingly on an output-based approach to funding to ensure transparency, fairness and the efficient and effective delivery of services. However, there is evidence to suggest that, in many countries, USFs have made only limited disbursements[6], while the World Bank has noted that well-resourced USFs have become a target for meddling, obstruction and bureaucracy in some countries[7].

UAS programmes may also include demand-side initiatives. Thorough gap analysis is required to understand what UAS programmes should focus on – some countries are considering shifting their ICT development focus from voice to broadband. India was one of the first countries to extend the mandate of its USF to include broadband in 2008. The downside is funding broadband from operator levies may mean that these levies need to be raised, thereby increasing the cost of services, and potentially pricing the programme out of the market. An effective balance has to be achieved.

The governance structure of USFs should be adapted to the local context and ensure coordination and viability checks. UAS programmes funded by USFs should be based on clear criteria (Featured Insight 20). Featured Insight 21 details how USFs can be used to promote broadband adoption. Featured Insight 22 describes the experience of the U.S. with universal service reform.

FEATURED INSIGHT 20: UNIVERSAL ACCESS & SERVICE (UAS) PROGRAMMES

UAS programmes must address both the supply and demand sides with some degree of flexibility (e.g. technology choice). The implementation of UAS programmes requires centralized control and close monitoring of progress. Given the broad scope of areas to be covered by universal access programmes and the typically limited amount of resources available to fund these programmes, prioritization of programmes is difficult but, at the same time, necessary. Attention must be given to the impact of a programme, the time needed to achieve a return on investment, and

a sound cost-benefit analysis. There is no single way to identify the most suitable projects, as this depends directly on market specificities, on the one hand, and on universal access policy objectives, on the other hand.

UAS programmes need to be resilient to changes in technology, to ensure broadband is provided in the most efficient and cost-effective way during implementation. This is vital in the case of implementations lasting 3-5 years, a significant timeframe in the continuously changing ICT sector.

The most suitable technology for providing broadband is relatively country- and locally-specific. The choice must be made based on criteria including affordability, QoS, geographic conditions, compatibility with end-user devices and estimated traffic. Selection of projects can be based on the following:

- Compliance with overall UAS policy objectives.
- Economic impact: economic growth through direct and indirect effects, and poverty reduction.
- Economic sustainability in the long-term: the total costs, potentially quantified in terms of costs per capita and when needed, the nature and level of subsidies required.
- The overall economic benefits versus the costs of the projects. Two useful financial indicators are the net present value (NPV) of the project and its internal rate of return (IRR) based on expected revenues and costs.
- Social impact: the extent of the needs of the population that is affected by the project, the total size of the population affected, a reduction in the digital divide in societal terms (e.g. access to health and education services in remote areas) are a few examples. Quantitative impacts can be coupled with cost-benefit analysis.

Source: The Inter-American Development Bank (IDB).

FEATURED INSIGHT 21: UNIVERSAL SERVICE FUNDS (USFs) & OTHER SUBSIDIES TO PROMOTE BROADBAND ADOPTION

USFs and similar subsidy programmes can help improve the availability and affordability of broadband for unserved or underserved citizens, so people everywhere can enjoy the benefits that broadband can bring. Historically focused on basic telephony services in remote areas, USFs are today being adapted to promote the adoption of broadband, by subsidizing content, devices, services, and digital training, as well as infrastructure. In many cases, USFs can kick-start the market and encourage operators to expand their reach, and provide connectivity to underserved citizens around the world.

Despite these benefits, many USFs remain underutilized or are diverted for other uses. To achieve their aims, USFs should be distributed in a competitive and technology-neutral way. 21st century education is a new goal – for example, Turkey is equipping all schools with broadband, and students and teachers with computers, electronic whiteboards, and educational content, transforming education delivery and providing vital digital skills for the young emerging workforce. In Portugal, 3G auction proceeds were used to provide high-speed connectivity, notebooks, curricula and teacher training. Broadband penetration has risen from 13% to 50%, household PC penetration to 70%, and teacher ICT certification to 90% over two years[8]. Malaysia's USF has provided over a million netbooks to students from low-income families and driven broadband deployment to underserved areas, helping meet the goal of 50% household broadband penetration in 2010[9]. Colombia has used millions of dollars of USF

funding to provide broadband connectivity to schools, hospitals and telecenters. India has developed a national ICT policy aiming to have at least one member of each household become digitally literate[10].

To help more countries take advantage of broadband and optimize the use of USFs, Intel has launched a series of USF workshops, bringing together government leaders, NGOs and strategic partners to share best practices and help unlock the benefits of broadband and ICTs to all global citizens. With participants from ITU, USAID, World Bank, AHCIET, Regulatel, telecentres.org and delegates from Africa, Eastern Europe, Middle East, Asia, and Latin America, these workshops have maximized discussion and interaction among leaders to close the digital divide. This dialogue shows how the public and private sector can come together to unlock the benefits of broadband and ICT through effective use of USFs.

Source: Intel.

FEATURED INSIGHT 22: UNIVERSAL SERVICE REFORM IN THE UNITED STATES

In 2011, the U.S. regulator, the FCC, initiated an overhaul of its first-generation universal service programmes in order to promote broadband deployment and adoption. Specifically, the FCC replaced its 'High Cost Fund' with the Connect America Fund, which will make up to US$4.5 billion a year available for unserved areas, with two sub-funds: a Mobility Fund which supports mobile voice and broadband services; and a Remote Areas Fund to support alternative platforms (e.g., satellite, unlicensed wireless services) in areas where terrestrial broadband network deployment is expensive.

Initial mobility funds were awarded through a nationwide reverse auction held in September 2012. Carriers specified the amount of support they would need to provide 3G or better voice and broadband mobile service to a previously un-served area, and support was awarded to the lowest bidder, with winners announced in October 2012. Carriers choosing to deploy 3G-based services must complete their project within two years of receiving funding; those providing 4G services must do so within three years. A second phase of the Mobility Fund will provide US$500 million annually for mobile services.

The FCC is modernizing programmes to extend broadband to the un-served and underserved. In January 2012, the FCC adopted comprehensive reforms to its Lifeline universal service programme, to ensure that broadband and voice services are available to all low-income Americans. The FCC also announced a Broadband Adoption Pilot Program to test how Lifeline can be used to increase broadband adoption among low-income consumers, and sought comment on using universal service funds for expanding digital literacy training. In December 2012, the FCC announced 14 pilot projects to field test various approaches to using Lifeline to increase broadband adoption and retention among low-income Americans, which will provide broadband to 75,000 low-income consumers in 21 States and Puerto Rico.

The FCC has also challenged industry to help close the broadband gap. Industry has responded by sponsoring the *Connect to Compete* programme, dedicated to providing low-cost broadband, computer equipment, and digital literacy training to low-income families. In 2012, leading ISPs, tech companies and non-profits committed US$6.5 million and thousands of dollars

through in-kind support (e.g., training, computers, discounts in broadband connectivity) to empower millions of families; all at zero cost to taxpayers. Qualifying families are eligible for broadband service for US$9.95/month and a computer for US$150.

Other recent FCC programmes include the launch of a Healthcare Connect Fund to encourage the construction of broadband networks dedicated to healthcare providers. Under this programme, the FCC is offering significant discounts to healthcare providers (up to 65%) for broadband services, equipment and connections to research and education platforms to improve access to healthcare services, particularly in rural areas. Healthcare providers are urged to form regional and State-level consortia to save costs on dedicated services to enhance the delivery of e-health solutions.

Source: FCC.

Universal access and service is not just about access networks, but also about backhaul networks. Backhaul networks have a unique role to play in connecting more end-users, as they practically connect thousands of access network elements, as well as aggregating the traffic across the mass market, enterprise and government usage. Featured Insight 23 shows how service providers are creating their own converged backhaul networks, and realizing economies of scale by integrating mass-market fixed and mobile, and enterprise traffic over a single backhaul transport.

FEATURED INSIGHT 23: THE BACKHAUL GAP TO REACH THE NEXT BILLION BROADBAND USERS

Significant attention has been devoted to national backbone and LTE spectrum, while backhaul is often taken for granted. Alcatel Lucent believes backhaul deserves more attention, when considering the challenge of the next billion broadband users. The backhaul network is the part of the network that connects the termination points of the optical fiber backbone or Points of Interconnection (POI) to the elements of the access network, which could be either wireless (such as LTE's eNodeBs) or wireline (broadband access nodes for coaxial, copper or fiber access). Backhaul connects thousands of access network elements to hundreds of POIs. The backhaul network grooms and aggregates traffic and should be flexible, scalable, simple and reliable to accommodate the different service requirements coming from mass-market, enterprise and governmental services running through wireless and wireline networks.

Backhaul networks include a wide variety of equipments and solutions: from wired access technologies based on copper (e.g. VDSL) or Fiber (e.g. GPON) to point-to-point links (such as 6 to 52 GHz microwave links, 60 and 80 GHz millimeter waves), non-line-of-sight links, and point-to-multi-point (operating below the 6GHz frequency range). By the end of 2013, it is expected that 80% of all this equipment will be Ethernet-compatible[11]. All-IP backhaul is now a reality, effectively creating a single backhaul network, coping with all transport and service requirements. The market for IP backhaul is difficult to evaluate, given its spread, but the market for enterprise Ethernet services alone is expected to reach US$47 bn by 2016, growing at 13% annually from 2010[12].

The data explosion[13] is driving the single IP backhaul transformation. Alcatel-Lucent's primary research on the demand for 4G services

suggests that there is strong interest in entertainment services among consumers and in new services among business customers. Consequently, greater capacity mobile transport networks and cost-effective delivery infrastructure will be needed.

Some service providers are creating their own converged backhaul networks, to realize economies of scale by integrating growing fixed and mobile, and enterprise traffic under a single backhaul transport. Legacy transport services (such as Time Division Multiplex (TDM) and Asynchronous Transport Mode (ATM)) and new transport services (such as Ethernet/IP traffic) can be combined into a single backhaul network by monitoring QoS-related parameters (such as jitter and delay) to meet the 'deterministic behavior' of TDM circuits when transported over fully-loaded packet links. New Ethernet backhaul transport providers are also emerging, offering Ethernet backhaul services across regions or countries[14]. They offer flexible and Ethernet-friendly schemes based on peak/committed flexible price schemes linked to service level agreements, independent of access media and distance.

Legacy service migration is costly and complex. However, the scale of growth in broadband access nodes – particularly in small cells paired with value propositions from the new backhaul equipment and backhaul transport service providers – is driving legacy service migration. It took the telecom industry fifteen years to broadly agree on a single IP network. Now, backhaul is flourishing and needs to be nurtured with the help of policies and regulation that incentivize backhaul traffic consolidation.

Service migration implies that not all legacy transport services will be sustained forever. Policy and regulation can help drive tough decisions (such as definitively leaving the long-lasting E1 transport service) and can provide incentives and benefits to move to Ethernet-based connectivity. Policy and regulation can also incentivize more backhaul transport wholesale offers competing in service value and innovation, and help accelerate backhaul transport network deployments and enable their profitability by easing rights of way, simplifying and providing transparency in site rentals and collocation requirements. Deploying backhaul transport networks is vital for obtaining better broadband services, as well as for unleashing economic growth.

Source: Alcatel Lucent.

Satellite technology is also playing a very important role in overcoming isolation and the lack of terrestrial infrastructures and in providing broadband services around the world for different applications and services. Today, nearly one-half of the world's population lives in rural, hard-to-reach areas and satellite technology can play an important role for the delivery of broadband services in those areas.

Both developed and developing countries rely on satellite technology for the delivery of broadband (there are still several countries which rely exclusively on satellite communication services to deploy broadband connectivity, such as Chad, Eritrea, Guinea, Liberia, and Sierra Leone[15]). Satellite broadband can prove crucial in coordinating crisis management and relief work during natural disasters or humanitarian crises, when terrestrial infrastructure may be unavailable. Satellite technology plays a key role universalizing broadband coverage, either on its own or as a complementary technology. Featured Insight 24 explores the impact of next-generation satellite on both developed and developing countries alike.

FEATURED INSIGHT 24: NEXT-GENERATION SATELLITE NETWORKS

Eutelsat Broadband (ex Skylogic) operates High Throughput Satellite (HTS) in Europe which can provide high-speed Internet to 2 million households in 55 nations within continental Europe, as well as cities in Maghreb, Libya, Egypt, Turkey, UAE, Ukraine and Russia. The Eutelsat Ka Sat satellite delivers 20 Mbps in the downlink [reception] and 6 Mbps in the uplink [emission], with antenna which can be adapted for triple-play Internet, TV channels and IP phone for users.

Ka Sat is the first HTS of its generation with its steerable beams - it has been in service since 2011 and has already proved a significant advance. Ka Sat has demonstrated its value in managing emergency situations: medical teams serving hundreds of refugees in Syria are connected via medical units and mobile hospitals to services provided by Ka Sat through the work of the NGO, Telecom without Borders.

Education also benefits from Ka Sat in remote areas. In Turkey, 4800 schools are already connected and the Ministry of Education is extending coverage to build a nationwide network. Projects to provide Internet services using satellites similar to Ka Sat are now being developed in Africa – for example, a Libyan operator is leasing a full-beam capacity of Ka Sat to strengthen its infrastructure.

Inmarsat Ltd provides mobile satellite FleetBroadband services which include satellite Internet, telephony, SMS Texting and ISDN Network for all modes of transport using portable domed terminal antennas capable of 500 kbit/s broadband speeds. Fleet Broadband is not only fundamental for shipping, aviation communications and other public or governmental communications, but also for emergency and humanitarian communications. Through Telecom Without Borders, Inmarsat facilitates emergency and humanitarian communications around the world. From 2014, new satellites of the Inmarsat fifth-generation will provide broadband downlink at speeds of up to 50 Mbps in Ka-band through its new Global Xpress network satellite. Iridium has announced a programme to operate a new generation of satellites from 2015 to respond to the demand of customers across an increasing range of industries including enhanced data services through satellite broadband.

José Toscano, Director-General of ITSO; Esteban Pacha, Director-General of IMSO; Christian Roisse, Executive Secretary of EUTELSAT IGO.

This Chapter has reviewed issues concerning the supply of broadband and infrastructure provision. However, it is essential to pay attention also to the demand side. An examination of end-user strategies to promote universal access is critical if objectives are to be achieved. Such strategies include subsidies for user equipment or ongoing usage fees, including models of sponsored connectivity that support government e-services. Creation of appropriate content is also a key enabler.

The following Chapter examines some of the new and emerging issues concerning content in an increasingly broadband-connected world. There is no single recipe that is likely to work for all countries, but countries should instead relate their choices for universalizing broadband to their market needs and circumstances.

ENDNOTES

1. http://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2013/ITU_Key_2005-2013_ICT_data.xls
2. Traditional universal service laws have tended to define a set of minimum telecom services to be made available to all end-users in a country (e.g., the EU's Universal Service Directive). This Chapter examines the broader concept of "universalizing broadband" on the basis that expanding access to broadband services is beneficial, regardless of whether 100% population or geographical coverage is achieved.
3. ITU "World Telecommunication Development Report 2002: Reinventing Telecoms", at: http://www.itu.int/ITU-D/ict/publications/wtdr_02/.
4. ICT Regulation handbook, Chapter 5 dealing with Universal Access and Service www.ictregulationtoolkit.org/en/Section.3116.html
5. "Strategies for Financing Universal Broadband Access", Global Symposium for Regulators (GSR) 2011, available from: http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR11/documents/06-Universal-broabdand-access-E.pdf
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7. World Bank studies of Telecommunication Services in Ghana and Senegal, 2003.
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10. http://defindia.net/national-digital-literacy-mission/
11. Worldwide Macrocell Mobile Backhaul Equipment Revenues, Infonetics, September 2012.
12. Differentiating Wholesale Ethernet Access Services (TE012000443) OVUM Mar 2013
13. Alcatel Lucent expects a x25 growth of mobile broadband traffic by 2016, with reference to 2012 Alcatel Lucent data.
14. Telia Sonera, Colt and GTS offer regional wholesale Ethernet backhaul services while ATT, BT wholesale and Telstra are examples of national Ethernet backhaul services.
15. "Another Kind of Poverty – www.africa.slow – The last continent without fast, easy and cheap Internet access", The Economist, August 27 2011.

6 TRENDS IN EXPRESSION VIA CONTENT[1]

This Chapter has been authored by UNESCO.

6.1 Freedom of Expression on the Internet

Greater access to the Internet has major societal implications, as the use of the Internet reshapes global access to information, communication, services, markets and technologies (Dutton 1999, 2004). The global availability of the Internet, along with new innovations (such as the ease with which users can create, as well as consume, text, sound and images) are making the Internet increasingly pivotal to the communicative power of individuals, groups and institutions with access to networks, as well as the skills to use them effectively (Dutton 2005; Castells 2009).

Issues ranging from freedom of the press to the balance of world information flows in all sectors, from across the media to the sciences, will be tied to the Internet as the 'network of networks' – an interface between individuals and news, information, stories, research, cultures and entertainment flowing worldwide (Baer et al 2009).

However, freedom is not the inevitable by-product of technological innovation and change. In parallel to the growth of the Internet, more controls and regulations have been applied in many countries. In many cases, these controls do not conform to international standards for justifiable limits on freedom of expression. Too often, they are not transparent, not intended for legitimate purposes, and not proportional to the types of speech they seek to limit.

For example, filtering methods can be applied at points throughout the network[1] (Box 1). Considerable attention has been devoted to State- or Government-sponsored or enforced filtering, but even State filtering can be implemented at different levels and by various parties acting on behalf of the State: individuals, institutions, service providers, or directly by government. Generally, those concerned about the civil liberties of Internet users would like filtering decisions to be made at the lowest possible level – as close as possible to the individual user. In all cases, decisions should be informed by international standards which view limitations as exceptions, rather than the norm, and where definite parameters are respected.

Box 1: The Locus of Filtering Technologies

The most common points at which various approaches to filtering can be applied include:

- **Internet Service Providers**: ISPs may be mandated, encouraged, or incentivized to filter content deemed by certain stakeholders as illegal or immoral, or prevent search results from specified websites. This filtering may be the result of individual actor or industry decisions, and/or as a result of the wishes of a regulator or other government actor, or the public. ISPs also routinely filter spam and attempt to prevent infection by malware for reasons of stability and user protection.
- **Gateways to the Internet Backbone**: State-directed implementation of national content filtering schemes and blocking technologies may be carried out at the backbone level, often with filtering systems set up at links to the Internet backbone (such as international gateways) in order to eliminate access to content throughout an entire country.
- **Institutions**: Companies, schools, libraries and households may filter on the basis of their own criteria or on behalf of State authorities.
- **Individual Computers**: Filtering software can be installed on individual computers, such as a personal computer, that restricts the ability to access certain sites or use certain applications.
- **Users**: comprising actions taken to exclude users deemed to engage in activities characterized as unlawful (e.g. file sharing of music, malicious hacking, fraud, etc.).

Source: Zittrain (2006) and Callanan et al (2009).

Content control legislation authorizing filtering has become more prevalent around the world. In democratic societies, issues of copyright infringement, hate speech, defamation, privacy protection, and child protection are at times a basis for Internet filtering or other content control. In a number of jurisdictions (but by no means all), ISPs need a legitimate basis prior to monitoring or filtering any kind of content, as they may otherwise be in breach of national protections or international conventions to which their country is party. For example, EuroISPA claims that any restriction of an individual's fundamental rights should only be taken following a prior judicial ruling[2].

Internet freedom is complex: a balance must be found between sometimes conflicting imperatives – including freedom of expression, rights to dignity and reputation, rights to safety, intellectual property rights, respect for privacy, freedom of association and belief, among others. Significantly, today is a time when fundamental freedoms are increasingly being tied to the Internet[3].

Internet stakeholders (ranging from government and regulatory bodies to ISPs and civil society advocates) are increasingly addressing the issues tied to freedom of expression online in their work. This reflects the prominent function of the Internet in human communications, and also the way that the state of freedom of expression can be seen as both a barometer of, and a contributor to, other rights and freedoms.

Online freedom of expression around the world is shaped by a multiplicity of policy issues, and not only those which directly address its concerns. For example, the control of spam and viruses is one well-accepted rationale for ISPs to justify monitoring of online traffic to protect users. However, other areas such as libel, defamation and intellectual property protection, are providing reasons for greater control of online content in ways that can fundamentally affect freedom of expression for multiple actors, ranging from users, webmasters and bloggers to ISPs. The disproportionate application of such controls can have more general repercussions and further constrain freedom of expression.

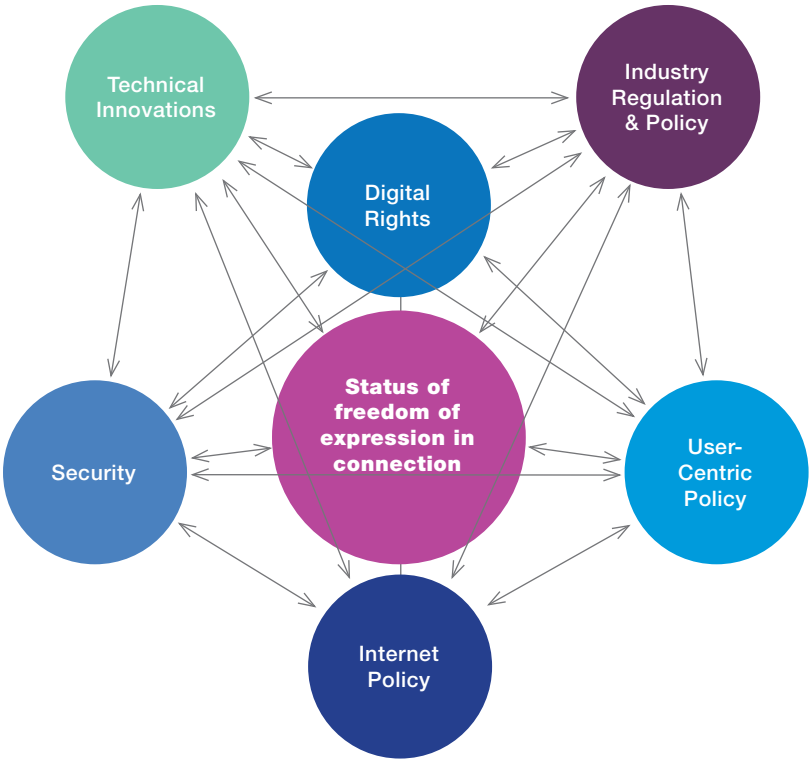
Figure 14 introduces a broad conceptual framework for assessing the legal and regulatory trends that are shaping online freedom of expression around the world. This conceptual framework focuses attention on:

1. identifying and clarifying the diversity of associated actors, goals and strategies that affect freedom of expression and connection; and
2. facilitating more comprehensive and coherent discussion and debate on the ecology of legal and regulatory choices affecting freedom of expression on the Internet; and
3. establishing areas in which empirical research can inform debates over policy and practice.

Figure 14 indicates the different considerations which impact upon each other, and upon the actual situation of freedom of expression at the centre:

- Technical Innovations: refers to a host of measures, both hardware and software, that can bear on 'digital footprints' and anonymity, for example.

Figure 14: The Ecology of Freedom of Expression on the Internet



Source: UNESCO.

- Digital Rights: means the application of all human rights (including freedom of expression, children's rights, etc.) on digital platforms. Such platforms encompass, but may also go beyond, the Internet into cellular communications and offline devices.
- Security considerations: relate to integrity of the network.
- Internet Policy: designates government and intergovernmental interests (including national security).
- User-Centric Policy: points towards usage and literacy online.
- Industry Regulation and Policy: refers to practices and protocols within the many institutions which provide the infrastructure and services which enable Internet operations.

To understand the state of freedom of expression on the Internet at any given time, it is necessary to factor in the interactive effects of these six surrounding considerations.

Censorship of the Internet, as evidenced by national filtering of online content, appears to be becoming more widely practiced, even within States with liberal democratic traditions. Thus, concerns over issues such as

child protection, spam and fraud are overriding issues regarding freedom of expression. These considerations are important to address in the digital age; however, disproportionate reliance on disconnecting users or filtering content could seriously undermine essential aspects of freedom of expression. The larger ecology of policies and regulations needs to be taken into account in balancing conflicting objectives - and even tensions - between freedoms. Balancing these conflicting values and interests is only likely to be resolved through multi-stakeholder sensitive negotiation and legal and regulatory analyses. This will probably vary across nations, as well as locally. Resolution of these balancing issues requires putting them within the broader view of the larger ecology of policies and regulations shaping freedom of expression.

Industry has an important role in this debate. By engaging with the entire industry, as well as focusing on their own power to influence and shape the debate, ICT companies can better identify concrete steps that each actor in the ICT ecosystem can take to avoid or mitigate risks to human rights. Clearly defining respective roles and responsibilities is critical for developing a successful ICT ecosystem-wide approach in respect of human rights. For example, the Ericsson Discussion Paper (2013), "ICT and Human Rights, An Ecosystem Approach"[4], debates how the positive role of ICTs in fulfilling human rights can be enhanced, while misuse of ICTs by public authorities can be minimized. It presents measures to prevent misuse of ICT, without inhibiting the growth opportunities of ICTs. It examines how industry can meet the core expectations of stakeholders, as well as the roles and responsibilities of each member of the ICT ecosystem, and how they can best collaborate to promote positive human rights outcomes.

Today, two types of filtering of content are emerging, variously applied in different nations and regions: 1) filtering for the protection of other rights (such as privacy or child protection); and 2) filtering to impose a particular political or moral regime. While these intentions are not always explicit or distinguishable, confusing them can lead to violations of freedom of expression.

Box 2: Privacy and Freedom of Expression on the Internet

The rights to privacy and freedom of expression relate to each other in complex ways. In many instances, respect for the right to privacy supports the right to freedom of expression, as it does other democratic rights. To give an obvious example, respect for privacy of communications is a prerequisite for trust by those engaging in communication, which is a prerequisite for the exercise of the right to freedom of expression. In other cases, however, respect for privacy can clash with the right to freedom of expression – for example, where a newspaper wishes to publish private details about a leading politician, perhaps because the newspaper believes this is in the public interest.

These relationships are evident in both traditional and new ways on the Internet, as is evident from the two examples above with online communications systems and online media. Indeed, these issues have come into far greater relief, with the massive changes in freedom of expression brought about by the Internet and other digital communications systems (such as mobile phones). For example, the power of the State to track individuals' activities via communications has increased hugely, in line with the massive increase in the data mining potential that digital systems enable.

The right to privacy underpins other rights and freedoms, including freedom of expression, association and belief. The ability to communicate anonymously without anyone knowing a citizen's identity, for instance, has historically played an important role in safeguarding free expression and strengthening political accountability, with people more likely to speak out on issues of public interest, if they can do so without fear of reprisal. The right to privacy can also compete with the right to freedom of expression, and in practice, a balance between these rights is called for. Striking this balance is a delicate task, and not one that can easily be anticipated in advance. For this reason, it has long been a concern of the courts to manage this relationship.

Source: UNESCO Global Survey on Internet Privacy and Freedom of Expression, available at: http://www.unesco.org/new/en/communication-and-information/resources/publications-and-communication- ns/full-list/global-survey-on-internet-privacy-and-freedom-of-expression/

Besides issues of freedom of expression, practically speaking, in many people's daily lives, some of the most common challenges users are likely to encounter include the challenges of finding out about and understanding the terms and conditions relating to digital content products (Featured Insight 25). Featured Insight 26 explores some of the issues relating to protecting Intellectual Property in a broadband world.

FEATURED INSIGHT 25: DIGITAL CONTENT PRODUCTS

The OECD is examining trends and challenges in consumer purchases of digital content products. A report[5] published by the Committee on Consumer Policy (CCP) shows that, with the development of broadband, products such as e-books and "apps" are increasingly supplied electronically over the Internet and other ICT channels through streaming, downloads or cloud computing platforms. Consumers today can readily access large files containing high-quality products. As the market matures, various consumer issues have emerged, requiring the attention of governments and other stakeholders. For example, a study carried out in the E.U. found that consumers had experienced over 2 billion problems over one year during 2010-2011, resulting in EUR 29.6 bn losses. Key consumer challenges include:

- Contracts for digital content products often contain complex and lengthy terms and conditions; consumers often have difficulty understanding what they can do with their products (e.g. copying or sharing) and the extent to which they can play such products on different devices.
- Consumer ability to access products offered by businesses located in other jurisdictions is sometimes limited.
- The conditions under which consumer personal data may be collected, used and shared with third parties when consumers acquire/use digital content products, are not always understood.
- Unauthorized charges have been reported, associated with "apps" and related products ("in-app purchases"), as well as misleading or unfair commercial practices (e.g., product updates).
- Consumer ability to obtain redress in the case of problems with products (such as refunds, price reductions or product replacements) is usually more limited than for other types of products; in most countries, legal and private sector voluntary remedies vary, or are unavailable for streamed or downloaded products, depending on their treatment as a good, service, or sui generis product.

Drawing on these findings, the OECD CCP is developing policy guidance to address the above issues.

Source: OECD.

FEATURED INSIGHT 26: INTELLECTUAL PROPERTY AND BROADBAND

The role of intellectual property is central for the development of broadband e-infrastructures. Current efforts at the World Intellectual Property Organization (WIPO) impact on five main areas:

Content – Copyright infrastructure services need broadband to operate in the online environment, while broadband needs the support of effective copyright infrastructure (such as online registries and databases). WIPO works to ensure the international legal framework is an effective tool for the stimulation

and wide diffusion of creativity and knowledge in the digital environment.

IP infrastructure – IP infrastructure needs to be updated for creativity to help stakeholders and users to identify, distribute and share content. Broadband can help copyright to facilitate the exercise and management of digital rights. WIPO is working on innovation infrastructure (TTOs, TMOs, IP hubs, incubation centers, technology parks & business centers) and the establishment of innovation networks (R&D networks/ IP hubs, TTO networks).

IP awareness – Opportunities to raise awareness on intellectual property to promote creativity and innovation. WIPO is working on an Interactive Platform for Open Collaborative Projects, Innovation and Technology Transfer Support Structure for National Institutions and a planned innovation network.

Public/private partnerships – Links between the public and private sectors will be enabled through the pipes as they facilitate easier and faster end-to-end delivery of services across multiple domains. The WIPO University Initiative connects ideas, technologies and partners from public and private sectors.

Networked innovation – Innovation can arise from the nodal connections in the network. Using e-infrastructure, actors at different locations can create an intelligent network to collaborate.

Mr. Francis Gurry, Director-General, WIPO.

6.2 Multilingualism and IDN uptake

Internationalized Domain Names (IDNs)[6] play a vital role in fostering the growth of local languages online, which needs to be more fully understood. Within a dataset of 200 million domain names (or 90% of the total registered domains), only 3.9 million, or 2% were IDNs[7]. There is a strong link between IDN scripts offered in a country or territory, and the languages spoken in that country or territory (with 95% of registries limiting their deployment to cover local languages only). Challenges to basic usability need to be overcome, such as use in e-mail, support in browsers and mobile devices. UNESCO's Director-General recently called on the technical community to "untangle these issues and release the full power of the Internet".

Internationalization of email depends, in large part, on the successful deployment of IDNs, with limited progress in this area. The first internationalized email was sent in June 2012, but the situation with internationalized email is even more complex than with the web. Not only does the domain name need to accept internationalized characters, but so do the username portion of the address, the email content and headers. This extended requirement for internationalization requires upgrades of both user software and the infrastructure that electronic mail uses for delivery. Progress on this is extremely slow.

While email remains a challenge, the deployment and use of IDNs in browsers are making steady,

albeit slow progress. While major browsers all support the use of IDNs in URLs, the problem is more difficult in browser-based applications. Many key content providers (such as Facebook, LinkedIn, Twitter, and Evernote) use email addresses as identifiers and support URLs as external references. Support for internationalized identifiers in applications lags behind support in browsers. The popularity of these applications, and their failure to support IDNs, impede successful uptake in many countries.

While applications evolve to support IDNs, there needs to be broader deployment of IDNs outside the existing ccTLD environment. ICANN's new gTLD programme has welcomed applications for new IDN gTLDs, but only 100 applications (5% of total) were IDNs, so for the foreseeable future, ASCII strings in the top-level domain space will continue to swamp IDNs.

Uptake of IDNs in some regions is happening more quickly than in others. Two factors influence the speed of IDN uptake. First, country-specific issues such as localized content, linguistic and cultural homogeneity, and access to broadband influence availability and user acceptance of IDNs. Second, ccTLD issues including the number of local registrars, registration policies, prices and the market acceptance of the ccTLD, influence the availability of IDNs. Vietnam provides one example of the successful execution of an IDN strategy. IDNs under .vn were launched in March 2007, with limited uptake. A change in policy took place in April 2011, when IDNs were offered free of charge. The result is that, from a base of 98,000 IDNs in May 2011, by May 2012, there were 762,000 IDNs.

The lack of availability of applications, services and user software that support IDNs is emerging as a global problem. While Internet infrastructure may provide a foundation for IDN deployment, IDN usage remains a problem, inhibiting wider use of IDNs, particularly in regions where non-Latin scripts are in use. There have been successes in the deployment of Internet infrastructure that supports IDNs, but user experience of IDNs lags significantly behind. While feedback from registrars indicates regional or sectoral differences in user awareness of IDNs, user awareness remains generally low.

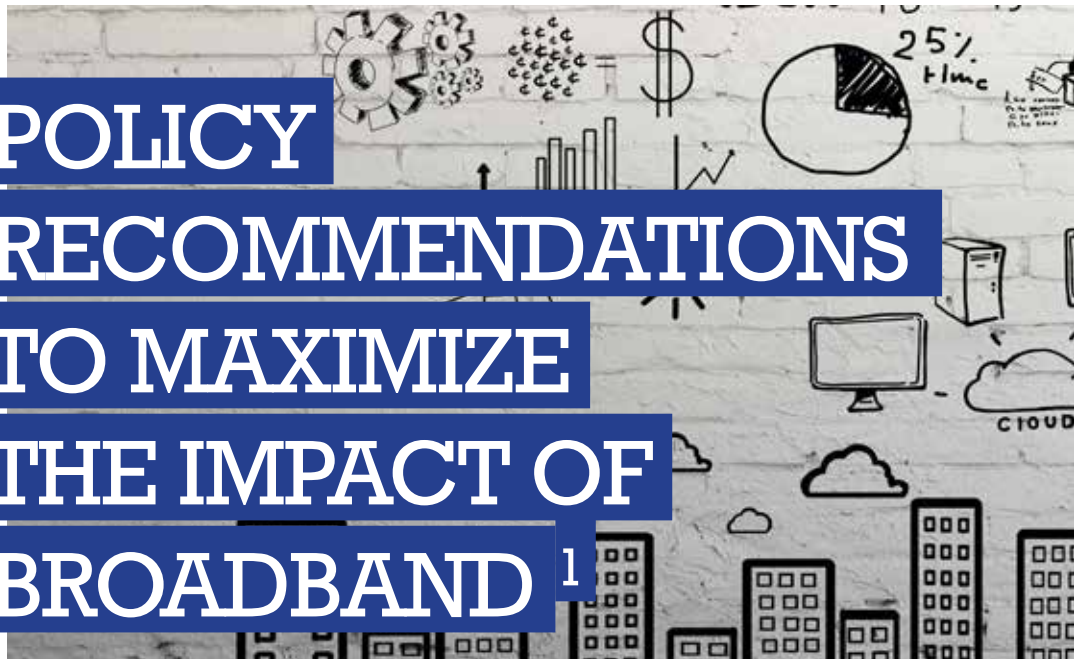
Local language content online has exploded over the past five years. The use of local scripts in domain names has progressed, as has work to enable the use of local scripts in email addresses. However, much remains to be done in terms of increasing end-user familiarity with this opportunity and guaranteeing adequate education and business channels for IDNs. Unless significant progress is made, the result could be an uptake of alternatives to IDNs to stimulate local content on the Internet. Strong cooperation and dialogue among all stakeholders (governments, registry operators, businesses and application providers) are crucial to ensure that communities can express themselves online in their own language.

ENDNOTES

1. UNESCO report, “Freedom of connection. Freedom of Expression. The Changing Legal and Regulatory Ecology Shaping the Internet”: http://www.unesco.org/new/en/communication-and-information/resources/publications-and-communication-materials/publications/full-list/freedom-of-connection-freedom-of-expression-the-changing-legal-and-regulatory-ecology-shaping-the-internet/
2. See: http://www.euroispa.org/files/091016_euroispa_telecom_review_am_138.pdf.
3. Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, Frank La Rue, Human Rights Council, Seventeenth session Agenda item 3, United Nations General Assembly, 16 May 2011
4. http://www.ericsson.com/res/thecompany/docs/corporate-responsibility/2012/human_rights0521_final_web.pdf
5. Report on Protecting and Empowering Consumers in the Purchase of Digital Content Products, OECD Publishing, Paris, doi: 10.1787/5k49czlc7wd3-en.
6. “An Internationalized Domain Name (IDN) is a domain name written in non-Latin scripts such as Chinese, Arabic, Hangul or Cyrillic”, page 12, EURid/UNESCO World Report on IDN Deployment 2012.
7. EURid/UNESCO World Report on IDN Deployment 2012.

7

POLICY RECOMMENDATIONS TO MAXIMIZE THE IMPACT OF BROADBAND [1]



This chapter has been authored by Antonio García Zaballos and Felix Gonzalez Herranz of the Inter-American Development Bank (IDB), as the main authors.

The full set of benefits conferred by broadband connectivity from an economic and social perspective should be recognized by public authorities, as well as by the private sector, in order to promote and boost broadband deployments. A thorough approach to broadband policy can include the timely adoption of national strategies encouraging national backbone roll-out, spectrum policies and practices, subsidies, taxes, user skills and trust, applications and content, competition policy, and other aspects of infrastructure, including backhaul and access.

Effective policy and regulatory frameworks can act as vital levers to facilitate the development of broadband connectivity. To achieve this goal, all stakeholders need to be involved (including Ministries, regulators, agencies, industry associations, policy-makers, operators, users and academia). To enhance broadband connectivity and penetration, the following recommendations present possible effective actions in the policy and regulatory domains.

7.1 Promote Market Liberalization

Governments need to ensure that liberalization of the market encompasses all key elements of the broadband service delivery: international gateway, national and regional backbone, and Internet access. As mentioned in Chapter 4, recent ITU/Cisco/ Broadband Commission research suggests that there is a strong role for competition in boosting broadband penetration. Based on panel regressions of broadband penetration for 165 countries for ten years between 2001-2011, competitive markets are associated with broadband penetration levels some 1.4% higher on average for fixed broadband and up to 26.5% higher for mobile broadband[1]. Competition has been a key driver of higher levels of uptake and investment in communication networks and services in many countries. Countries should implement pro-competitive regulation – e.g., by lowering termination rates that may effectively prevent price reductions in mobile voice markets.

7.2 Review and update regulatory service obligations

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 or regulatory service obligations, as sudden changes in regulation can affect the future evolution of the sector. Updates and revisions to regulatory frameworks are best done on the basis of a cost-benefit analysis of each market sector. As explored in Chapter 5, appropriate regulations and service obligations are the foundations of an enabling environment for both innovation and return on investments, while meeting national goals of broadband connectivity. A balanced approach between these elements enables the private sector to provide universal connectivity and extend connectivity to less populated or less developed regions, while ensuring transparency and fairness.

7.3 Consider Open Access Approaches to Infrastructure

Open access and infrastructure-sharing can impact future network growth. There are different strategies for open access[2], with varied definitions, terms and conditions. Open access has been interpreted to mean that all suppliers, whether in horizontal or vertical markets, are able to obtain access to the new network facilities on fair, reasonable and equivalent terms. This can include price terms (such as the price that the wholesaler is allowed to charge for access) and non-price issues (such as delivery times, service level agreements, clear product specifications, etc.).

Depending on the model adopted, the terms and conditions of access can vary. Regulators need to balance incentives for investment in ultra-fast networks, while

supporting competition. Open access becomes progressively less important moving up the infrastructure layers, provided that a framework exists for equitable, non-discriminatory, and competitive access to telecom facilities, and there is sufficient incentive in the regulation of open access to encourage investment in infrastructure[3]. Examples of open access to bottlenecks in infrastructure include local loop unbundling (LLU), wholesale broadband access, ducts, in-building wiring or submarine cables. Roll-out and innovation in the lower layer services can be ensured by a balanced approach to open access.

7.4 Introduce and Develop a National Broadband Plan

As explained in Chapter 4, countries with NBPs have higher fixed and mobile broadband penetration than countries without plans. The Broadband Commission for Digital Development has made a strong call for countries to develop a joint vision for leadership, through consultation and the involvement of all stakeholders. National Broadband Plans need to promote measures to foster both the demand side, as well as supply, if they are to prove successful. Even once introduced, Plans should be reviewed regularly to take into account changing market conditions.

7.5 Update and Utilize Universal Service Funds (USFs)

As discussed in Chapter 5, depending on geography, population coverage and other potential challenges, several countries have used public funds and/or USFs to develop broadband in areas where the commercial provision of broadband is not readily viable. In those areas where private firms may be less willing to invest, USFs may make targeted interventions. USFs can be expanded to include programmes for broadband adoption, containing all the elements needed to get unserved or underserved people online, including content, subscriptions, devices, and digital training, as well as infrastructure. This will also assist in the optimum and timely deployment of funds, which should be committed in a technology-neutral way, and by competitive means, such as reverse auctions.

7.6 Review Licensing Schemes

More modern approaches to regulation may be needed – such converged regulation, simplified licensing or unified licensing involving one unified license for the provision of any telecommunication service. Policy-makers can ensure that licensing schemes are technology-neutral, and consider unified licensing, so all operators are on a level playing-field with regard to UAS programme implementation, new innovators are encouraged to enter the market, and neither incumbent fixed nor mobile operators are disadvantaged. Changes to licensing schemes should be made based on careful consideration and thorough cost-benefit analysis.

7.7 Review & Reduce Taxation

Depending on the structure of services in each country, the revenues raised through taxation of ICT services and devices are generally likely to be less than the broader economic returns from greater use of telecommunication services benefiting the population and economy as a whole[4].

The roll-out and use of broadband infrastructure should be promoted via suitable tools, such as: creating tax incentives for investments in infrastructure, tax reductions on devices, and using government funds as direct investment through PPPs.

7.8 Review Policy Frameworks for Spectrum

Countries can ensure that spectrum policies and practices are in line with UAS goals, and assigned in a technology- and service-neutral manner, while striving to realize economies of scale and benefit consumers with their spectrum arrangements. Spectrum resources for broadband networks need to be harmonized on the global and regional levels. Policy-makers should carefully evaluate the needs and conditions in their country and enact policy frameworks that both encourage innovation and investment and enable efficient spectrum usage through a range of different mechanisms. Spectrum bands between 40–1000 MHz can be “beach-front” spectrum for mobile broadband in remote areas and for deep indoor coverage in urban areas. Advanced mobile broadband connectivity with very high peak data rates could use spectrum bands up to 6.5 GHz.

Optimizing approaches to spectrum policy, allocation and management have become an important part of governments’ overall broadband policy portfolio.

When exploring up-to-date or fresh approaches to spectrum management, it is vital to take into account the expected spectrum needs of different services (e.g., mobile and satellite services, among others).

Spectrum for multi-gigabit backhaul systems also needs to be secured to avoid future bottle-necks.

Some radiofrequencies allocated to cellular mobile networks are potentially underused in rural areas (due to lower population density and reduced mobile traffic) and could be made available on a co-allocated basis to mobile broadband services, subject to national and market circumstances. Operators should be encouraged to migrate 2G systems to new technologies (e.g., 3G/4G) for mobile broadband. Spectrum licensing fees could be reduced, or even eliminated, in under-served areas to lower cost-barriers to UAS providers. Another option is to allocate this spectrum under UAS obligations. Featured Insight 27 explores the implications of the digital dividend for expanding broadband coverage.

FEATURED INSIGHT 27: HARNESSING THE DIGITAL DIVIDEND FOR BROADBAND COVERAGE

Today, the explosion in mobile applications and services and mobile devices (including smartphones and tablets) are driving huge increases in demand for rich content, producing incredible volumes of data traffic across mobile networks. Global mobile traffic is expected to grow at a compound annual growth rate of 42% through 2015 (Analysys Mason). This steep trajectory of mobile data demand, combined with the continued expansion of mobile broadband networks, underlies the mobile industry's call for additional spectrum allocations. Spectrum must be internationally harmonized to ensure consumers reap the benefits of scale economies in device manufacturing, and spectrum must be licensed with the exclusivity and certainty needed to ensure continued network investment and a high quality of service.

Spectrum in the sub-1GHz frequency range is ideal for rolling out broadband service affordably across wide rural areas, as well as offering dependable service indoors, making its release a priority. The 'Digital Dividend' – spectrum that becomes available as countries make the essential, yet challenging, transition from analogue to more efficient digital television broadcasting – sits in this range. In 2007, ITU identified the upper portion of the television band (the 700MHz or 800MHz bands, depending on the region) for mobile broadband services. Countries are in various stages of clearing and releasing this spectrum, so it can be licensed for mobile. A handful of countries, including the U.S. and a number of European markets, have completed this. Release of the Digital Dividend is a golden opportunity for advancing national broadband objectives.

The mobile industry is uniquely positioned to provide widespread broadband service to those who do not yet have it. Citizens around the world are just beginning to reap the true rewards of mobile. Proposals for experimental technologies and attempts to develop new business models risk obscuring the fact that licensed mobile services are the most viable, scalable and best-established model for extending broadband to citizens. Exclusively licensed spectrum for mobile is delivering on the goal of access for everyone, where other technologies fall short, and is providing direct employment and increasing productivity across many sectors. By following best practices in spectrum management, based on proven outcomes, Governments around the world will secure a bright future for their citizens through mobile broadband.

Dr. Anne Bouverot, Director General, GSMA.

7.9 Spur Demand and Introduce Measures to Stimulate the Creation of Local Content

Increased public awareness and the ability to use broadband services are driving demand for broadband services and applications – for instance, through dedicated training, the development of e-learning or e-government services, the development of local content, or subsidies on broadband-related equipment in schools, universities, or telecentres. To increase demand, policy-makers should consider measures to stimulate the creation of local content. Governments can provide incentives for apps developer communities for example, to encourage the development of apps, particularly in the high social impact areas of health and education.

As explained in Chapter 6, the Internet is a communications medium which individuals can use to exercise their right to seek, receive and impart information and ideas of all kinds, regardless of frontiers, as guaranteed under Article 19 of both the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights. Therefore, the right of freedom of expression online should be preserved and ensured. Online privacy is important, but should not be used as a pretext for introducing limitations on freedom of expression.

Media and information literacy are essential for literate use of the Internet, as well as observing the rights and respect for others, including linguistic minorities. Multilingualism is one aspect of cultural diversity in cyberspace; promoting the use of different languages online is the responsibility of all stakeholders. in some countries, liberal registration policies of IDNs have proven to be an effective policy measure to enhance multilingualism. The development of Internet-related language policies should also be encouraged at the national level, especially in countries with multiple languages. Capacity-building and training are required on Internet-related language policies among national and regional institutions to explore and adapt technological solutions, while partnerships between local Internet technical and content generating communities can also facilitate the spread of local multilingual content.

7.10 Support Accurate and Timely Statistical Monitoring

Policy choices must be informed by reliable data and indicators on ICT developments. 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[5]. Data should be collected on a timely basis 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 Consider Undertaking Public Consultations on Policy

Governments may wish to conduct a public consultation on broadband policy, including UAS. Consultations are a critical part of all policy development, and this is true for UAS as well. The full benefits of broadband for enhancing national competitiveness and empowering citizens are most likely to be realized where there is strong partnership between Government, industry and other stakeholders and where Governments engage in a consultative, participatory approach to policy in conjunction with key stakeholders. National Broadband Plans are one key means of dialogue, which should seek the views and engagement of all key stakeholders. Such Plans should be viewed more as part of a process towards building consensus around a vision for the development of broadband within a society, rather than the final outcome itself.

Ultimately, there is no single way to improve broadband; there are many different ways, with different success factors, depending on existing country circumstances.

It is the Commission's belief that reviewing and implementing some of these policy recommendations (but not all, depending on country circumstances and national priorities) may help accelerate the deployment of universal broadband, to the benefit of all.

ENDNOTES

1. “Planning for Progress: Why National Broadband Plans Matter”, ITU/Broadband Commission for Digital Development/Cisco, 1 July 2013 – available from www.broadbandcommission.org
2. ITU GSR11 Discussion Paper on Open Access Regulation in the Digital Economy, www.itu.int/gsr11.
3. D. Rogerson, quote from GSR 2011.
4. ITU Study on Taxing telecommunications/ICT services: an overview and workshop on the taxation of telecommunication services, led by Professor Martin Cave of the London School of Economics (LSE) and Dr. Windfred Mfuh of the University of Warwick, on 1-2 September 2011.
5. http://www.itu.int/en/ITU-D/Statistics/Pages/intlcoop/partnership/default.aspx

Annex 1: Target 1 – List of National Broadband Plans

ECONOMY	POLICY AVAILABLE?	YEAR POLICY WAS ADOPTED	TITLE/DETAILS
Afghanistan	Yes	2008	Afghanistan National Development Strategy: 1387 – 1391 (2008 – 2013)
Albania	Yes	2008	E-Albania
Algeria	Yes	2008	E-Algérie 2013
Andorra	Yes	2009	Universal Access Service
Angola	Yes	2010	White Book of Information and Communication Technologies, Livro branco das Tecnologias da Informação e Comunicação – LBTIC
Antigua & Barbuda	Yes	2012	GATE 2012
Argentina	Yes	2010	Plan Nacional de Telecomunicaciones - Argentina Conectada
Armenia	Yes	2008	GOVERNMENT OF REPUBLIC OF ARMENIA DECREE No35 ON APPROVING THE INFORMATION TECHNOLOGY SECTOR DEVELOPMENT CONCEPT PAPER
Australia	Yes	2010	National Broadband Network
Austria	Yes	2010	Broadband Austria - Breitband strategie 2020
Azerbaijan	Planning		
Bahamas	Yes	2003	Policy Statement on Electronic Commerce and the Bahamian Digital Agenda
Bahrain	Yes	2010	National Broadband Network for the Kingdom of Bahrain
Bangladesh	Yes	2009	Broadband National Policy Act 2009
Barbados	Yes	2010	National Information and Communication Technologies Strategic Plan of Barbados 2010-2015
Belarus	Yes	2011	National programme on accelerated development of services in the field of information and communication technologies for 2011–2015
Belgium	Yes	2009	België : digitaal hart van Europa
Belize	Yes	2011	ICT National Strategy
Benin	Planning		
Bhutan	Yes	2008	National Broadband Master Plan Implementation Project (NBMIP)
Bolivia	No		
Bosnia and Herzegovina	No		
Botswana	Yes	2004	Botswana's National ICT Policy
Brazil	Yes	2010	National Broadband Plan (Plano Nacional de Banda Larga - PNBL)
Brunei Darussalam	Yes	2008	National Broadband Blueprint
Bulgaria	Yes	2009	National strategy of broadband development in Republic of Bulgaria
Burkina Faso	Yes	2006	Lettre de politique sectorielle 2006-2010
Burundi	Yes	2011	Burundi/ ICT : National Projects for Broadband Connectivity Burundi Community Telecentre Network (BCTN)
Cambodia	Yes	2011	2015 ASEAN ICT Master PLAN / Cambodia ICT development Strategy 2011-2015
Cameroon	No		
Canada	Yes	2010	Broadband Canada: Connecting Rural Canadians
Cape Verde	Planning		
Central African Rep.	Yes	2006	Politique, Stratégies et plan d'actions de l'édification de la Société de l'Information en République Centrafricaine
Chad	Yes	2007	Plan de développement des technologies de l'Information et de la Communication au Tchad or PLAN NICI

Annex 1: Target 1 – List of National Broadband Plans

ECONOMY	POLICY AVAILABLE?	YEAR POLICY WAS ADOPTED	TITLE/DETAILS
Chile	Yes	2010	Strategy for Digital Development La Agenda Digital del Gobierno de Chile para el período 2010-2014 / ICT as a part of Chile's Strategy for Development: Present Issues and Challenges
China	Yes	2010	Three Network Convergence -National Government Investment
Colombia	Yes	2011	Live Digital - Vive Digital
Comoros	Planning		
Congo (Dem. Rep.)	Yes	2009	Document de la Politique sectorielle des télécommunications et des technologies de l'information et de la communication (TIC) West Africa Cable System (WACS)
Costa Rica	Yes	2012	Estrategia Nacional de Banda Acha
Côte d'Ivoire	Yes	2010	Objectifs Strategiques du Government de Côte dÍvore en Matiere de Telecommunications et de TIC
Croatia	Yes	2011	National broadband development strategy in the Republic of Croatia, Strategy for Broadband Development in the Republic of Croatia for 2012–2015
Cuba	Planning		
Cyprus	Yes	2012	Digital Strategy for Cyprus
Czech Republic	Yes	2011	Digital Czech Republic - State policy in electronic communications
D.P.R. Korea	No		
Denmark	Yes	2010	Digital work programme by the Minister of Science, Technology and Innovation.
Djibouti	Yes	2004	Plan d'action national pour l'exploitation des TIC en République de Djibouti pour le développement national, EASSy
Dominica	No		
Dominican Rep.	Yes	2007	Conectividad Rural de Banda Ancha E-Dominicana (includes rural broadband connectivity program)
Ecuador	Yes	2011	Estrategia Ecuador Digital 2.0 and Broadband Plan
Egypt	Yes	2011	National Broadband Plan - A Framework for Broadband Development
El Salvador	No		
Equatorial Guinea	Yes	2010	GITGE (Gestor de Infraestructura de Telecomunicaciones de G.E.)
Eritrea	No		
Estonia	Yes	2006	Information Society Development Plan 2013
Ethiopia	Yes	2005	ICT Policy
Fiji	Yes	2011	National Broadband Policy
Finland	Yes	2005	Broadband 2015 Project, Kainuu Information Society Strategy 2007-2015
France	Yes	2010	Plan national très haut débit
Gabon	Yes	2011	Digital Gabon: vaste Programme de réformes multi sectorielles dont la finalité est de faire du Gabon un Pays Emergent, à travers les pilliers suivants : Gabon Industriel, Gabon vert et Gabon des Services.
Gambia	Yes	2008	The Gambian ICT4D-2012 Plan
Georgia	No		
Germany	Yes	2009	Breitbandstrategie der Bundesregierung
Ghana	Yes	2010	Broadband Wireless Access
Greece	Yes	2006	Digital Strategy 2006-2013

Annex 1: Target 1 – List of National Broadband Plans

ECONOMY	POLICY AVAILABLE?	YEAR POLICY WAS ADOPTED	TITLE/DETAILS
Grenada	**Yes**	**2006**	Information and Communication Technology (ICT) 2006-2010 /A Strategy And Action Plan for Grenada
Guatemala	**No**		
Guinea	**Yes**	**2009**	Plan National de frequences/ Plan de développement de l'infrastructure nationale d'information et de communication de la République de Guinée 2001 – 2004
Guinea-Bissau	**No**		
Guyana	**Yes**	**2011**	E-Guyana
Haiti	**No**		
Honduras	**Yes**	**2010**	Resolución NR 005/10- Normativa que regulará la prestación de servicios de telecomunicaciones con conectividad de banda ancha
Hungary	**Yes**	**2010**	Digital Renewal Action Plan
Iceland	**Yes**	**2005**	Telecom Policy Statement 2005-2010
India	**Yes**	**2011**	National Optical Fibre Network
Indonesia	**Yes**	**2010**	Priorities Of The Ministry Of Communication And Information Technology Year 2010-2014
Iran	**Yes**	**2002**	TAKFA Plan
Iraq	**Planning**		
Ireland	**Yes**	**2008**	Ireland's Broadband Strategy
Israel	**Yes**	**2012**	The Communication Initiative: fiber-based national broadband network
Italy	**Yes**	**2010**	"Italia Digitale" Digital Italy Plan
Jamaica	**Yes**	**2007**	National ICT Strategy
Japan	**Yes**	**2010**	New Broadband Super Highway (Haraguchi vision II)
Jordan	**Yes**	**2007**	National ICT Strategy of Jordan
Kazakhstan	**Yes**	**2010**	Program of ICT Development
Kenya	**Yes**	**2006**	ICT Masterplan 2012-2017
Kiribati	**No**		
Korea (Rep.)	**Yes**	**2009**	Ultra Broadband Convergence Network
Kuwait	**No**		
Kyrgyzstan	**No**		
Lao P.D.R.	**No**		
Latvia	**Yes**	**2005**	Broadband development strategy for year 2006-2012
Lebanon	**Yes**	**2008**	Lebanese Broadband Stakeholders Group (LBSG)
Lesotho	**Yes**	**2005**	ICT Policy for Lesotho
Liberia	**Yes**	**2010 - 2015**	Government of Liberia's Policy for the Telecommunications and Information Communications Technology (ICT)
Libya	**No**		
Liechtenstein	**Yes**	**2006**	Communications Act - Law on Electronic Communication
Lithuania	**Yes**	**2005**	Strategy of Broadband Infrastructure Development in Lithuania in 2005-2010
Luxembourg	**Yes**	**2010**	Stratégie nationale pour les réseaux à « ultra-haut » débit - L'« ultra-haut » débit pour tous
Macao, China	**No**		
Madagascar	**No**		
Malawi	**Yes**	**2003**	An Integrated ICT-led Socio-Economic Development Policy for Malawi

Annex 1: Target 1 – List of National Broadband Plans

ECONOMY	POLICY AVAILABLE?	YEAR POLICY WAS ADOPTED	TITLE/DETAILS
Malaysia	**Yes**	**2010**	National BB Implementation NBI
Maldives	**No**		
Mali	**No**		
Malta	**Yes**	**2012**	Provision of access at a fixed location
Marshall Islands	**Planning**		
Mauritania	**No**		
Mauritius	**Yes**	**2012**	National Broadband Policy 2012 - 2020 (NBP2012)
Mexico	**Yes**	**2011**	Digital Agenda
Micronesia	**Planning**		
Moldova	**Yes**	**2010**	Hotărâre cu privire la aprobarea Programului de dezvoltare a accesului la Internet în bandă largă pe anii 2010-2013
Monaco	**No**		
Mongolia	**Yes**	**2011**	National program on Broadband Network up to 2015 year
Montenegro	**Yes**	**2012**	Strategy of electronic communication sector in Montenegro, Strategy for the Development of Information Society 2012-2016 - Montenegro - Digital Society
Morocco	**Yes**	**2012**	Plan national pour le développement du haut et très haut débit au Maroc
Mozambique	**Yes**	**2006**	National ICT Policy Implementation Strategy 2002 and 2006 - Digital Inclusion in Mozambique
Myanmar	**No**		
Namibia	**Yes**	**2009**	Telecommunications Policy for the Republic of Namibia
Nauru	**No**		
Nepal	**No**		
Netherlands	**Yes**	**2010**	Digital Agenda
New Zealand	**Yes**	**2010**	Ultra-fast broadband initiative, Five Point Government Action Plan for faster broadband
Nicaragua	**No**		
Niger	**Yes**	**2005**	Plan de développement des Technologies de l'Information et de la Communication au Niger / Plan NICI du Niger
Nigeria	**Yes**	**2013**	National ICT Policy 2013 - 2018
Norway	**Yes**	**2001**	Action plan on Broadband communication
Oman	**Yes**	**2012**	National Broadband Strategy
Pakistan	**Yes**	**2007**	National Broadband policy 2004, National Broadband Programme 2007
Panama	**Yes**	**2008**	National ICT Strategy 2008-2018
Papua New Guinea	**Yes**	**2011**	National ICT Policy and PNG LNG Fibre cable project
Paraguay	**Yes**	**2011**	Paraguay 2013 Conectado y Plan Nacional de Telecomunicaciones - PNT
Peru	**Yes**	**2010**	Plan Nacional para el Desarrollo de la Banda Ancha en el Péru
Philippines	**Yes**	**2011**	The Philippine Digital Strategy, Transformation 2.0: Digitally Empowered Nation
Poland	**Yes**	**2010**	Mega–Bill: The act on supporting the development of telecommunications services and networks
Portugal	**Yes**	**2010**	Digital Agenda 2015 (2010-2015)
Qatar	**Yes**	**2011**	Qatar's National ICT Plan 2015: Advancing the Digital Agenda Qatar National Broadband Network (Q.NBN)

Annex 1: Target 1 – List of National Broadband Plans

ECONOMY	POLICY AVAILABLE?	YEAR POLICY WAS ADOPTED	TITLE/DETAILS
Romania	**Yes**	**2007**	The Regulatory Strategy for the Romanian Electronic Communications Sector for 2007-2010
Russian Federation	**Yes**	**2010**	Information Society Strategy / Information Society Programme
Rwanda	**Yes**	**2006**	Regional Connectivity Infrastructure Program (RCIP)
S. Tomé & Principe	**No**		
Samoa	**Yes**	**2010**	Broadband Spectrum Plan
San Marino	**No**		
Saudi Arabia	**Yes**	**2010**	USF strategic Plan, Kingdom's strategy for the deployment of broadband services
Senegal	**Planning**		
Serbia	**Yes**	**2010**	Стратегију развоја широкопојасног приступа у Републици Србији до 2012. Године - Strategy for the development of broadband in the Republic of Serbia until 2012
Seychelles	**No**		
Sierra Leone	**No**		
Singapore	**Yes**	**2005**	Intelligent Nation 2015 (or iN2015)
Slovak Republic	**Yes**	**2006**	Operačný Program Informatizácia Spoločnosti (Operational program- Information society)
Slovenia	**Yes**	**2008**	Broadband Network Development Strategy (Strategija razvoja širokopasovnih omrežij v Republiki Sloveniji)
Solomon Islands	**Planning**		
Somalia	**No**		
South Africa	**Yes**	**2010**	Broadband Policy for SA
Spain	**Yes**	**2010**	Plan Avanza: Plan Avanza: 2005, Plan Avanza 2 aprobado el 16/07/2010
Sri Lanka	**Yes**	**2012**	e- Sri Lanka, 2012 - HSBB NBP
St. Kitts and Nevis	**Yes**	**2006**	National Information and Communications Technology (ICT) Strategic Plan
St. Lucia	**No**		
St. Vincent and the Grenadines	**No**		
Sudan	**No**		
Suriname	**No**		
Swaziland	**No**		
Sweden	**Yes**	**2011**	Broadband Strategy for Sweden
Switzerland	**Yes**	**2007**	The universal service with regard to telecommunications
Syria	**No**		
Tajikistan	**No**		
Tanzania	**Yes**	**2004**	National Information Communication and Technology Broadband Backbone (NICTBB)
TFYR Macedonia	**Yes**	**2005**	National Strategy for the development of Electronic Communications with Information Technologies
Thailand	**Yes**	**2010**	The National Broadband Policy
Timor-Leste	**No**		
Togo	**Planning**		
Tonga	**Yes**	**2011**	Tonga-Fiji Connectivity Project : Pacific Regional Connectivity Program (PRCP)
Trinidad & Tobago	**Yes**	**2008**	Trinidad & Tobago's National Information & Communication Technology Strategy-Fastforward- Accelerating into the Digital Future

Annex 1: Target 1 – List of National Broadband Plans

ECONOMY	POLICY AVAILABLE?	YEAR POLICY WAS ADOPTED	TITLE/DETAILS
Tunisia	**Yes**	**2012**	La Stratégie Tunisienne pour le Haut-Débit (Tunisia Broadband Strategy, TBS)
Turkey	**Yes**	**2006**	Information Society Strategy 2006 -2010, Ninth Development Plan 2007 - 2013
Turkmenistan	**No**		
Tuvalu	**No**		
Uganda	**Yes**	**2009**	Uganda Broadband Infrastructure Strategy National Position Paper
Ukraine	**No**		
United Arab Emirates	**No**		
United Kingdom	**Yes**	**2010**	Britain's Superfast Broadband Future, Broadband Delivery UK
United States	**Yes**	**2010**	Connecting America: The National Broadband Plan
Uruguay	**Yes**	**2007**	Ceibal Plan
Uzbekistan	**No**		
Vanuatu	**Planning**		
Vatican	**No**		
Venezuela	**No**		
Viet Nam	**Yes**	**2010**	Master Plan of Viet Nam, from 2010 to 2015 and Prime Minister's Decree 1755/QD-TTg on the approval of a National Strategy on Transforming Viet Nam into an advanced ICT country
Yemen	**No**		
Zambia	**Yes**	**2006**	National Information and Communication Technology Policy
Zimbabwe	**Yes**	**2005**	National Information and Communication Technology Policy Framework Connection to the undersea cable initiatives promotes broadband usage

ECONOMIES			
Hong Kong, China	**Yes**	**2008**	2008 Digital 21 Strategy - Moving Ahead
Chinese Taipei	**Yes**	**2011**	Broadband for Villages and Broadband for Tribes
Cook Islands	**Yes**	**2003**	National ICT Policy

Source: ITU World Telecommunication/ICT Regulatory database, Broadband Commission for Digital Development.

Annex 2: Fixed Broadband Penetration, Worldwide, per 100 inhabitants, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
1	Switzerland	**41.9**	50	Russia	**14.5**
2	Netherlands	**39.4**	51	St. Lucia	**13.8**
3	Denmark	**38.2**	52	Azerbaijan	**13.8**
4	France	**37.8**	53	Grenada	**13.7** e
5	Korea (Rep.)	**37.6**	54	Trinidad & Tobago	**13.6**
6	Norway	**36.9** e	55	China	**13.0** e
7	Iceland	**34.5** e	56	Bahrain	**12.7**
8	Belgium	**34.1**	57	Dominica	**12.6**
9	Germany	**34.0**	58	St. Vincent and the Grenadines	**12.4**
10	United Kingdom	**34.0**	59	Chile	**12.4**
11	Liechtenstein	**33.0**	60	Moldova	**11.9**
12	Canada	**32.9** e	61	United Arab Emirates	**11.7**
13	Luxembourg	**32.6**	62	Seychelles	**11.7**
14	Sweden	**32.2**	63	Lebanon	**11.7**
15	Malta	**31.7**	64	Mexico	**10.9**
16	Hong Kong, China	**31.6**	65	Argentina	**10.9**
17	San Marino	**31.0**	66	Bosnia and Herzegovina	**10.8**
18	Andorra	**31.0** e	67	Mauritius	**10.6**
19	Finland	**30.4**	68	Turkey	**10.5**
20	United States	**28.0**	69	Serbia	**10.2**
21	Japan	**27.9**	70	Costa Rica	**10.0**
22	New Zealand	**27.8**	71	Kazakhstan	**9.7**
23	St. Kitts and Nevis	**27.2** e	72	Brazil	**9.2**
24	Belarus	**26.6**	73	Georgia	**9.1**
25	Singapore	**26.1**	74	Malaysia	**8.4**
26	Estonia	**25.7**	75	Colombia	**8.4**
27	Macao, China	**25.5**	76	Montenegro	**8.3** e
28	Austria	**25.2**	77	Panama	**8.2**
29	Australia	**25.1**	78	Qatar	**8.2**
30	Slovenia	**24.6**	79	Ukraine	**8.1**
31	Spain	**24.3**	80	Saudi Arabia	**6.8**
32	Barbados	**23.8** e	81	Venezuela	**6.7**
33	Greece	**23.5**	82	Armenia	**6.6**
34	Hungary	**22.9**	83	Thailand	**6.2**
35	Ireland	**22.7**	84	Suriname	**5.7** e
36	Portugal	**22.3**	85	Antigua & Barbuda	**5.6** e
37	Israel	**22.2** e	86	Tuvalu	**5.6** e
38	Italy	**22.1**	87	Maldives	**5.5**
39	Latvia	**21.5** e	88	Ecuador	**5.4**
40	Croatia	**20.3**	89	Albania	**5.0**
41	Lithuania	**19.5**	90	Viet Nam	**5.0** e
42	Cyprus	**19.2**	91	Brunei Darussalam	**4.8**
43	Bulgaria	**17.6**	92	Tunisia	**4.8**
44	Poland	**16.6** e	93	Peru	**4.8**
45	Uruguay	**16.6**	94	Dominican Rep.	**4.4** e
46	Czech Republic	**16.6**	95	Jamaica	**4.3**
47	Romania	**15.9**	96	Iran (I.R.)	**4.1**
48	TFYR Macedonia	**14.6**	97	El Salvador	**3.9** e
49	Slovak Republic	**14.6**	98	Guyana	**3.9**

Annex 2: Fixed Broadband Penetration, Worldwide, per 100 inhabitants, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
99	Cape Verde	**3.8**	147	Angola	**0.2** e
100	Mongolia	**3.6**	148	Lesotho	**0.1** e
101	Belize	**3.1**	149	Papua New Guinea	**0.1** e
102	Algeria	**3.0** e	150	Uganda	**0.1**
103	Jordan	**3.0**	151	Zambia	**0.1**
104	Namibia	**2.8**	152	Kenya	**0.1**
105	Bahamas	**2.8** e	153	Mozambique	**0.1**
106	Egypt	**2.7**	154	Burkina Faso	**0.1**
107	Kyrgyzstan	**2.6**	155	Togo	**0.1** e
108	Oman	**2.5**	156	Tajikistan	**0.1** e
109	Bhutan	**2.2**	157	Sudan	**0.1**
110	Philippines	**2.2** e	158	Benin	**0.1**
111	South Africa	**2.2** e	159	Timor-Leste	**0.1** e
112	Morocco	**2.1**	160	Cuba	**0.0**
113	Sri Lanka	**2.0**	161	Ethiopia	**0.0**
114	Syria	**1.8**	162	Madagascar	**0.0**
115	Djibouti	**1.7** e	163	Gambia	**0.0**
116	Nicaragua	**1.7** e	164	Turkmenistan	**0.0** e
117	Kuwait	**1.6** e	165	Comoros	**0.0** e
118	Fiji	**1.5**	166	Rwanda	**0.0**
119	Lao P.D.R.	**1.5** e	167	Niger	**0.0**
120	Tonga	**1.4** e	168	Mali	**0.0**
121	Indonesia	**1.2** e	169	Myanmar	**0.0** e
122	India	**1.1**	170	Nigeria	**0.0**
123	Paraguay	**1.1** e	171	Congo	**0.0**
124	Bolivia	**1.1**	172	Tanzania	**0.0** e
125	Libya	**1.0** e	173	Malawi	**0.0**
126	Vanuatu	**1.0**	174	Guinea	**0.0** e
127	Kiribati	**1.0** e	175	Cameroon	**0.0**
128	Botswana	**0.8**	176	Burundi	**0.0** e
129	Honduras	**0.8**	177	Liberia	**0.0** e
130	Senegal	**0.7**	178	Eritrea	**0.0**
131	Uzbekistan	**0.7**	179	South Sudan	**0.0**
132	Yemen	**0.7**	180	Central African Rep.	**0.0**
133	Zimbabwe	**0.5**	181	Congo (Dem. Rep.)	**0.0**
134	S. Tomé & Principe	**0.5** e	182	Guinea-Bissau	**0.0** e
135	Pakistan	**0.5**	183	Nauru	**0.0**
136	Nepal	**0.4** e		Afghanistan	**n/a**
137	Solomon Islands	**0.4**		D.P.R. Korea	**n/a**
138	Bangladesh	**0.3**		Guatemala	**n/a**
139	Gabon	**0.3** e		Haiti	**n/a**
140	Swaziland	**0.3**		Iraq	**n/a**
141	Ghana	**0.3**		Marshall Islands	**n/a**
142	Côte d'Ivoire	**0.2** e		Micronesia	**n/a**
143	Cambodia	**0.2**		Samoa	**n/a**
144	Equatorial Guinea	**0.2**		Sierra Leone	**n/a**
145	Mauritania	**0.2**		Somalia	**n/a**
146	Chad	**0.2**		Vatican	**n/a**
				World average	**9.1**

Notes: The table includes ITU Members.
n/a - not available.
e - ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 3: Mobile Broadband Penetration, Worldwide, per 100 inhabitants, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
1	Singapore	**123.3**	50	Azerbaijan	**33.3**
2	Japan	**113.1**	51	Belarus	**32.8**
3	Finland	**106.5**	52	Portugal	**32.5**
4	Korea (Rep.)	**106.0**	53	Uruguay	**32.0**
5	Sweden	**101.3**	54	Indonesia	**31.9** e
6	Australia	**96.2**	55	Zimbabwe	**29.7**
7	Denmark	**87.5**	56	Namibia	**28.8**
8	Norway	**84.6**	57	Chile	**28.0**
9	United States	**74.7**	58	Armenia	**27.6**
10	Hong Kong, China	**73.5**	59	Montenegro	**27.0** e
11	Luxembourg	**72.6** e	60	Egypt	**26.9**
12	Estonia	**72.5** e	61	Mongolia	**26.7**
13	Qatar	**72.1**	62	South Africa	**26.0** e
14	United Kingdom	**72.0**	63	Romania	**23.7**
15	Iceland	**71.7** e	64	Hungary	**23.1**
16	Bahrain	**67.1**	65	Cape Verde	**22.5**
17	Israel	**65.5** e	66	Georgia	**22.4**
18	New Zealand	**65.2**	67	Ecuador	**22.2**
19	Ireland	**64.2**	68	TFYR Macedonia	**21.6**
20	Netherlands	**61.0**	69	Mauritius	**21.5**
21	Malta	**57.6**	70	Maldives	**21.5**
22	Oman	**56.7**	71	Uzbekistan	**20.7**
23	Austria	**55.5**	72	Antigua & Barbuda	**19.9** e
24	Spain	**53.2**	73	Viet Nam	**19.0** e
25	Russia	**52.9**	74	Albania	**18.4**
26	Croatia	**52.3**	75	China	**17.2** e
27	France	**52.2**	76	Botswana	**16.6**
28	Italy	**51.8**	77	Sudan	**16.4**
29	Latvia	**51.2** e	78	Turkey	**16.3**
30	United Arab Emirates	**50.9**	79	Dominican Rep.	**15.4** e
31	Monaco	**50.8**	80	Panama	**15.0**
32	Canada	**50.0** e	81	Costa Rica	**14.5**
33	Poland	**49.3** e	82	Libya	**13.8** e
34	Liechtenstein	**48.5**	83	Malaysia	**13.5**
35	Greece	**44.5**	84	Argentina	**12.4** e
36	Czech Republic	**44.0**	85	Swaziland	**12.0** e
37	Saudi Arabia	**42.8**	86	San Marino	**11.0**
38	Kazakhstan	**42.0**	87	Bosnia and Herzegovina	**10.9**
39	Switzerland	**41.4**	88	Fiji	**10.8**
40	Germany	**41.0**	89	Jordan	**10.7**
41	Bulgaria	**40.3**	90	Nigeria	**10.2**
42	Serbia	**40.2**	91	Morocco	**10.0**
43	Slovenia	**37.1**	92	Mexico	**9.7**
44	Brazil	**36.6**	93	Nauru	**9.6**
45	Barbados	**36.4** e	94	Seychelles	**8.7**
46	Slovak Republic	**34.9**	95	Lithuania	**8.6**
47	Cyprus	**33.8**	96	Brunei Darussalam	**7.6**
48	Belgium	**33.7**	97	Uganda	**7.6**
49	Ghana	**33.3**	98	Bolivia	**6.7**

Annex 3: Mobile Broadband Penetration, Worldwide, per 100 inhabitants, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
99	Solomon Islands	**6.3**	147	Gabon	**0.0** e
100	El Salvador	**5.5** e	148	Guinea	**0.0** e
101	Ukraine	**5.5** e	149	Guinea-Bissau	**0.0** e
102	Paraguay	**5.5** e	150	South Sudan	**0.0** e
103	Tunisia	**5.2**	151	Comoros	**0.0** e
104	Moldova	**5.1**	152	Djibouti	**0.0** e
105	Colombia	**4.9**	153	Somalia	**0.0** e
106	India	**4.9** e	154	Iran (I.R.)	**0.0** e
107	Venezuela	**4.7**	155	Kiribati	**0.0** e
108	Guatemala	**4.5** e	156	Micronesia	**0.0** e
109	Sri Lanka	**4.4**	157	Tuvalu	**0.0** e
110	Honduras	**4.2**	158	Vanuatu	**0.0** e
111	Philippines	**3.8** e	159	Turkmenistan	**0.0** e
112	Senegal	**3.8**	160	Cuba	**0.0** e
113	Malawi	**3.5**	161	Dominica	**0.0** e
114	Rwanda	**3.2**	162	Grenada	**0.0** e
115	Mauritania	**3.2**	163	St. Kitts and Nevis	**0.0** e
116	Bahamas	**2.8** e	164	St. Lucia	**0.0** e
117	Peru	**2.8**	165	Burkina Faso	**0.0** e
118	Bhutan	**2.5**	166	Burundi	**0.0** e
119	Kenya	**2.2**	167	Algeria	**0.0** e
120	Congo	**2.1**	168	Equatorial Guinea	**0.0**
121	Syria	**1.8** e	169	Guyana	**0.0**
122	Mozambique	**1.8** e	170	St. Vincent and the Grenadines	**0.0**
123	Jamaica	**1.6** e		Afghanistan	**n/a**
124	Angola	**1.5** e		Andorra	**n/a**
125	Tanzania	**1.5** e		Cameroon	**n/a**
126	Trinidad & Tobago	**1.5**		Congo (Dem. Rep.)	**n/a**
127	Gambia	**1.2**		Côte d'Ivoire	**n/a**
128	Nicaragua	**1.0** e		D.P.R. Korea	**n/a**
129	Lao P.D.R.	**0.8** e		Iraq	**n/a**
130	Togo	**0.7** e		Kuwait	**n/a**
131	Mali	**0.7**		Kyrgyzstan	**n/a**
132	Zambia	**0.7**		Lesotho	**n/a**
133	Ethiopia	**0.4**		Liberia	**n/a**
134	Benin	**0.3**		Macao, China	**n/a**
135	Pakistan	**0.3**		Madagascar	**n/a**
136	Lebanon	**0.3** e		Marshall Islands	**n/a**
137	Bangladesh	**0.2**		Nepal	**n/a**
138	Yemen	**0.2**		Niger	**n/a**
139	Haiti	**0.2**		Papua New Guinea	**n/a**
140	Thailand	**0.1** e		S. Tomé & Principe	**n/a**
141	Belize	**0.1**		Samoa	**n/a**
142	Myanmar	**0.0** e		Sierra Leone	**n/a**
143	Eritrea	**0.0**		Tajikistan	**n/a**
144	Suriname	**0.0** e		Timor-Leste	**n/a**
145	Central African Rep.	**0.0** e		Tonga	**n/a**
146	Chad	**0.0** e		Vatican	**n/a**
				World average	**22.1**

Notes: The table includes ITU Members.
n/a - not available.
e - ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 4: Percentage of Households with Internet, Developing Countries, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
1	Korea (Rep.)	97.4	50	Tunisia	20.6 e
2	Qatar	88.1	51	Suriname	20.2 e
3	Singapore	87.7 e	52	Peru	20.2
4	Macao, China	81.0 e	53	Venezuela	20.2 e
5	Bahrain	79.0	54	Tuvalu	19.7 e
6	Hong Kong, China	78.6	55	Algeria	19.4 e
7	Israel	73.4 e	56	Philippines	18.9 e
8	Brunei Darussalam	72.4 e	57	Thailand	18.4
9	United Arab Emirates	72.0	58	Viet Nam	15.6 e
10	Saudi Arabia	66.6 e	59	Iraq	15.6 e
11	Kuwait	65.2 e	60	El Salvador	15.0 e
12	Malaysia	64.7	61	Mongolia	14.0
13	Lebanon	64.0 e	62	Cape Verde	13.7 e
14	Cyprus	62.0	63	Libya	13.7 e
15	Barbados	57.9 e	64	Dominican Rep.	13.7 e
16	Kazakhstan	52.6 e	65	Honduras	13.2 e
17	St. Vincent and the Grenadines	49.7 e	66	Namibia	13.0 e
18	Uruguay	48.4	67	Tonga	12.0 e
19	Belarus	48.3	68	Bhutan	11.6
20	Antigua & Barbuda	48.2 e	69	Kenya	11.5 e
21	Argentina	47.5 e	70	Swaziland	11.4 e
22	Costa Rica	47.3	71	Ghana	11.0 e
23	Turkey	47.2	72	Sri Lanka	10.3 e
24	Azerbaijan	46.8 e	73	Bolivia	10.0 e
25	Brazil	45.4 e	74	Uzbekistan	9.6 e
26	Chile	45.3 e	75	India	9.5 e
27	Jordan	43.6 e	76	Guatemala	9.3 e
28	Mauritius	42.0 e	77	Botswana	9.1 e
29	Seychelles	41.9 e	78	Nigeria	9.1 e
30	Oman	41.9 e	79	Guyana	8.9 e
31	Trinidad & Tobago	40.0 e	80	Pakistan	8.3 e
32	Morocco	38.9	81	Gabon	7.9 e
33	Syria	38.0 e	82	Nicaragua	7.4 e
34	China	37.4 e	83	Angola	7.2 e
35	Maldives	34.3 e	84	Turkmenistan	6.7 e
36	Egypt	32.3	85	Gambia	6.7 e
37	St. Lucia	32.2 e	86	Indonesia	6.5
38	Colombia	32.1	87	Kyrgyzstan	6.3 e
39	Georgia	32.0	88	Senegal	5.8 e
40	Panama	31.6	89	Malawi	5.6
41	Sudan	29.3	90	Djibouti	5.1 e
42	Iran (I.R.)	26.5 e	91	Tanzania	5.1 e
43	Mexico	26.0	92	Lao P.D.R.	5.1 e
44	South Africa	25.5 e	93	Zimbabwe	4.9 e
45	Armenia	25.4 e	94	Burundi	4.7 e
46	Fiji	24.4 e	95	Yemen	4.7 e
47	Jamaica	23.0 e	96	Mozambique	4.7 e
48	Paraguay	22.8 e	97	Solomon Islands	4.2 e
49	Ecuador	22.5	98	Uganda	4.2 e

Annex 4: Percentage of Households with Internet, Developing Countries, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
99	Nepal	**4.1** e	123	Niger	**1.4** e
100	Cambodia	**3.9** e	124	Côte d'Ivoire	**1.4** e
101	Cuba	**3.8** e	125	Congo (Dem. Rep.)	**1.3** e
102	Lesotho	**3.7** e	126	Congo	**1.3** e
103	Tajikistan	**3.6** e	127	Guinea	**1.3** e
104	Cameroon	**3.5** e	128	Eritrea	**1.1** e
105	Mauritania	**3.4** e		Bahamas	**n/a**
106	Comoros	**3.4** e		Belize	**n/a**
107	Haiti	**3.4** e		D.P.R. Korea	**n/a**
108	Burkina Faso	**2.8** e		Dominica	**n/a**
109	Zambia	**2.8** e		Equatorial Guinea	**n/a**
110	Papua New Guinea	**2.7** e		Grenada	**n/a**
111	Madagascar	**2.7** e		Kiribati	**n/a**
112	Mali	**2.5** e		Marshall Islands	**n/a**
113	Rwanda	**2.4** e		Micronesia	**n/a**
114	Benin	**2.4** e		Nauru	**n/a**
115	Central African Rep.	**2.4** e		S. Tomé& Principe	**n/a**
116	Chad	**2.3** e		Samoa	**n/a**
117	Bangladesh	**2.1** e		Sierra Leone	**n/a**
118	Ethiopia	**1.9** e		Somalia	**n/a**
119	Afghanistan	**1.9** e		St. Kitts and Nevis	**n/a**
120	Myanmar	**1.8** e		Timor-Leste	**n/a**
121	Guinea-Bissau	**1.6** e		Togo	**n/a**
122	Liberia	**1.6** e		Vanuatu	**n/a**
				Average all developing countries	**24.0**

Notes: The table includes ITU Members.
n/a - not available.
e - ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 5: Percentage of Individuals using the Internet, Worldwide, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
1	Iceland	**96.0**	50	Croatia	**63.0**
2	Norway	**95.0**	51	Chile	**61.4** e
3	Sweden	**94.0**	52	Lebanon	**61.2** e
4	Denmark	**93.0**	53	Cyprus	**61.0**
5	Netherlands	**93.0**	54	Brunei Darussalam	**60.3** e
6	Luxembourg	**92.0**	55	Oman	**60.0** e
7	Finland	**91.0**	56	Trinidad & Tobago	**59.5** e
8	New Zealand	**89.5** e	57	Italy	**58.0**
9	Liechtenstein	**89.4** e	58	Montenegro	**56.8**
10	Qatar	**88.1**	59	Greece	**56.0**
11	Bahrain	**88.0**	60	Argentina	**55.8** e
12	United Kingdom	**87.0** e	61	Dominica	**55.2** e
13	Monaco	**87.0** e	62	Bulgaria	**55.1**
14	Canada	**86.8** e	63	Uruguay	**55.1** e
15	Andorra	**86.4** e	64	Morocco	**55.0**
16	Switzerland	**85.2**	65	Albania	**54.7** e
17	United Arab Emirates	**85.0**	66	Azerbaijan	**54.2** e
18	Korea (Rep.)	**84.1**	67	Saudi Arabia	**54.0** e
19	Germany	**84.0**	68	Kazakhstan	**53.3** e
20	Antigua & Barbuda	**83.8**	69	Russia	**53.3** e
21	France	**83.0**	70	San Marino	**50.9** e
22	Australia	**82.3** e	71	Romania	**50.0**
23	Belgium	**82.0**	72	Brazil	**49.8** e
24	United States	**81.0** e	73	Colombia	**49.0**
25	Austria	**81.0**	74	St. Lucia	**48.6** e
26	Slovak Republic	**80.0**	75	Serbia	**48.1** e
27	St. Kitts and Nevis	**79.3** e	76	St. Vincent and the Grenadines	**47.5** e
28	Kuwait	**79.2** e	77	Costa Rica	**47.5**
29	Japan	**79.1**	78	Seychelles	**47.1** e
30	Estonia	**79.0**	79	Belarus	**46.9**
31	Ireland	**79.0**	80	Jamaica	**46.5** e
32	Czech Republic	**75.0**	81	Georgia	**45.5** e
33	Singapore	**74.2** e	82	Panama	**45.2** e
34	Latvia	**74.0**	83	Turkey	**45.1**
35	Israel	**73.4** e	84	Dominican Rep.	**45.0** e
36	Barbados	**73.3** e	85	Egypt	**44.1**
37	Hong Kong, China	**72.8**	86	Venezuela	**44.0** e
38	Hungary	**72.0**	87	Moldova	**43.4** e
39	Spain	**72.0**	88	China	**42.3** e
40	Bahamas	**71.7** e	89	Grenada	**42.1** e
41	Malta	**70.0**	90	Tunisia	**41.4** e
42	Slovenia	**70.0**	91	Mauritius	**41.4** e
43	Lithuania	**68.0**	92	South Africa	**41.0** e
44	Malaysia	**65.8**	93	Jordan	**41.0** e
45	Bosnia and Herzegovina	**65.4** e	94	Viet Nam	**39.5** e
46	Poland	**65.0**	95	Armenia	**39.2** e
47	Macao, China	**64.3** e	96	Maldives	**38.9** e
48	Portugal	**64.0**	97	Mexico	**38.4**
49	TFYR Macedonia	**63.1** e	98	Peru	**38.2**

Annex 5: Percentage of Individuals using the Internet, Worldwide, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
99	Uzbekistan	36.5 e	147	Botswana	11.5 e
100	Philippines	36.2 e	148	Nepal	11.1 e
101	Ecuador	35.1	149	Lao P.D.R.	10.7 e
102	Tuvalu	35.0 e	150	Kiribati	10.7 e
103	Tonga	34.9 e	151	Vanuatu	10.6 e
104	Cape Verde	34.7 e	152	Marshall Islands	10.0 e
105	Suriname	34.7 e	153	Pakistan	10.0 e
106	Bolivia	34.2 e	154	Haiti	9.8 e
107	Guyana	34.3 e	155	Gabon	8.6 e
108	Fiji	33.7 e	156	Djibouti	8.3 e
109	Ukraine	33.7 e	157	Rwanda	8.0 e
110	Nigeria	32.9 e	158	Turkmenistan	7.2 e
111	Kenya	32.1 e	159	Iraq	7.1 e
112	Paraguay	27.1 e	160	Solomon Islands	7.0 e
113	Thailand	26.5	161	Bangladesh	6.3 e
114	Iran (I.R.)	26.0 e	162	Congo	6.1 e
115	Micronesia	26.0 e	163	Comoros	6.0 e
116	Cuba	25.6 e	164	Cameroon	5.7 e
117	El Salvador	25.5 e	165	Afghanistan	5.5 e
118	Bhutan	25.4 e	166	Mauritania	5.4 e
119	Belize	25.0 e	167	Cambodia	4.9 e
120	Syria	24.3 e	168	Mozambique	4.8 e
121	Kyrgyzstan	21.7 e	169	Lesotho	4.6 e
122	S. Tomé & Principe	21.6 e	170	Malawi	4.4 e
123	Sudan	21.0	171	Togo	4.0 e
124	Swaziland	20.8 e	172	Benin	3.8 e
125	Libya	19.9 e	173	Liberia	3.8 e
126	Senegal	19.2 e	174	Burkina Faso	3.7 e
127	Sri Lanka	18.3 e	175	Central African Rep.	3.0 e
128	Honduras	18.1 e	176	Guinea-Bissau	2.9 e
129	Yemen	17.4 e	177	Côte d'Ivoire	2.4 e
130	Ghana	17.1 e	178	Papua New Guinea	2.3 e
131	Zimbabwe	17.1 e	179	Mali	2.2 e
132	Angola	16.9 e	180	Chad	2.1 e
133	Mongolia	16.4	181	Madagascar	2.1 e
134	Guatemala	16.0 e	182	Congo (Dem. Rep.)	1.7 e
135	Indonesia	15.4	183	Guinea	1.5 e
136	Algeria	15.2 e	184	Ethiopia	1.5 e
137	Uganda	14.7 e	185	Niger	1.4 e
138	Tajikistan	14.5 e	186	Somalia	1.4 e
139	Equatorial Guinea	13.9 e	187	Sierra Leone	1.3 e
140	Nicaragua	13.5 e	188	Burundi	1.2 e
141	Zambia	13.5 e	189	Myanmar	1.1 e
142	Tanzania	13.1 e	190	Timor-Leste	0.9 e
143	Namibia	12.9 e	191	Eritrea	0.8 e
144	Samoa	12.9 e	192	D.P.R. Korea	0.0 e
145	India	12.6 e		Nauru	n/a
146	Gambia	12.4 e		South Sudan	n/a
				World average	**35.7**

Notes: The table includes ITU Members.
n/a - not available.
e - ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Annex 6: Percentage of Individuals using the Internet, Developing Countries, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
1	Qatar	**88.1**	50	Maldives	**38.9** e
2	Bahrain	**88.0**	51	Mexico	**38.4**
3	United Arab Emirates	**85.0**	52	Peru	**38.2**
4	Korea (Rep.)	**84.1**	53	Uzbekistan	**36.5** e
5	Antigua & Barbuda	**83.8** e	54	Philippines	**36.2** e
6	St. Kitts and Nevis	**79.4** e	55	Ecuador	**35.1**
7	Kuwait	**79.2** e	56	Tuvalu	**35.0** e
8	Singapore	**74.2** e	57	Tonga	**34.9** e
9	Israel	**73.4** e	58	Cape Verde	**34.7** e
10	Barbados	**73.3** e	59	Suriname	**34.7** e
11	Hong Kong, China	**72.8**	60	Guyana	**34.3** e
12	Bahamas	**71.8** e	61	Bolivia	**34.2** e
13	Malaysia	**65.8**	62	Fiji	**33.7** e
14	Macao, China	**64.3** e	63	Nigeria	**32.9** e
15	Chile	**61.4** e	64	Kenya	**32.1** e
16	Lebanon	**61.3** e	65	Paraguay	**27.1** e
17	Cyprus	**61.0**	66	Thailand	**26.5**
18	Brunei Darussalam	**60.3** e	67	Iran (I.R.)	**26.0** e
19	Oman	**60.0** e	68	Micronesia	**26.0** e
20	Trinidad & Tobago	**59.5** e	69	Cuba	**25.6** e
21	Argentina	**55.8** e	70	El Salvador	**25.5** e
22	Dominica	**55.2** e	71	Bhutan	**25.4** e
23	Uruguay	**55.1** e	72	Belize	**25.0** e
24	Morocco	**55.0**	73	Syria	**24.3** e
25	Azerbaijan	**54.2** e	74	Kyrgyzstan	**21.7** e
26	Saudi Arabia	**54.0** e	75	S. Tomé & Principe	**21.6** e
27	Kazakhstan	**53.3** e	76	Sudan	**21.0**
28	Brazil	**49.9** e	77	Swaziland	**20.8** e
29	Colombia	**49.0**	78	Libya	**19.9** e
30	St. Lucia	**48.6** e	79	Senegal	**19.2** e
31	St. Vincent and the Grenadines	**47.5** e	80	Sri Lanka	**18.3** e
32	Costa Rica	**47.5**	81	Honduras	**18.1** e
33	Seychelles	**47.1** e	82	Yemen	**17.5** e
34	Belarus	**46.9**	83	Ghana	**17.1** e
35	Jamaica	**46.5** e	84	Zimbabwe	**17.1** e
36	Georgia	**45.5** e	85	Angola	**16.9** e
37	Panama	**45.2** e	86	Mongolia	**16.4**
38	Turkey	**45.1**	87	Guatemala	**16.0** e
39	Dominican Rep.	**45.0** e	88	Indonesia	**15.4**
40	Egypt	**44.1**	89	Algeria	**15.2** e
41	Venezuela	**44.1** e	90	Uganda	**14.7** e
42	China	**42.3** e	91	Tajikistan	**14.5** e
43	Grenada	**42.1** e	92	Equatorial Guinea	**13.9** e
44	Tunisia	**41.4** e	93	Nicaragua	**13.5** e
45	Mauritius	**41.4** e	94	Zambia	**13.5** e
46	Jordan	**41.0** e	95	Tanzania	**13.1** e
47	South Africa	**41.0** e	96	Namibia	**12.9** e
48	Viet Nam	**39.5** e	97	Samoa	**12.9** e
49	Armenia	**39.2** e	98	India	**12.6** e

Annex 6: Percentage of Individuals using the Internet, Developing Countries, 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
99	Gambia	**12.5** e	123	Malawi	**4.4** e
100	Botswana	**11.5** e	124	Togo	**4.0** e
101	Nepal	**11.2** e	125	Benin	**3.8** e
102	Haiti	**10.9** e	126	Liberia	**3.8** e
103	Lao P.D.R.	**10.8** e	127	Burkina Faso	**3.7** e
104	Kiribati	**10.8** e	128	Central African Rep.	**3.0** e
105	Vanuatu	**10.6** e	129	Guinea-Bissau	**2.9** e
106	Marshall Islands	**10.0** e	130	Côte d'Ivoire	**2.4** e
107	Pakistan	**10.0** e	131	Papua New Guinea	**2.3** e
108	Gabon	**8.6** e	132	Mali	**2.2** e
109	Djibouti	**8.3** e	133	Chad	**2.1** e
110	Rwanda	**8.0** e	134	Madagascar	**2.1** e
111	Turkmenistan	**7.2** e	135	Congo (Dem. Rep.)	**1.7** e
112	Iraq	**7.1** e	136	Guinea	**1.5** e
113	Solomon Islands	**7.0** e	137	Ethiopia	**1.5** e
114	Bangladesh	**6.3** e	138	Niger	**1.4** e
115	Congo	**6.1** e	139	Somalia	**1.4** e
116	Comoros	**6.0** e	140	Sierra Leone	**1.3** e
117	Cameroon	**5.7** e	141	Burundi	**1.2** e
118	Afghanistan	**5.5** e	142	Myanmar	**1.1** e
119	Mauritania	**5.4** e	143	Timor-Leste	**0.9** e
120	Cambodia	**4.9** e	144	Eritrea	**0.8** e
121	Mozambique	**4.9** e		D.P.R. Korea	**n/a**
122	Lesotho	**4.6** e		Nauru	**n/a**
				Average all developing countries	**27.5**

Notes: The table includes ITU Members.
n/a - not available.
e - ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

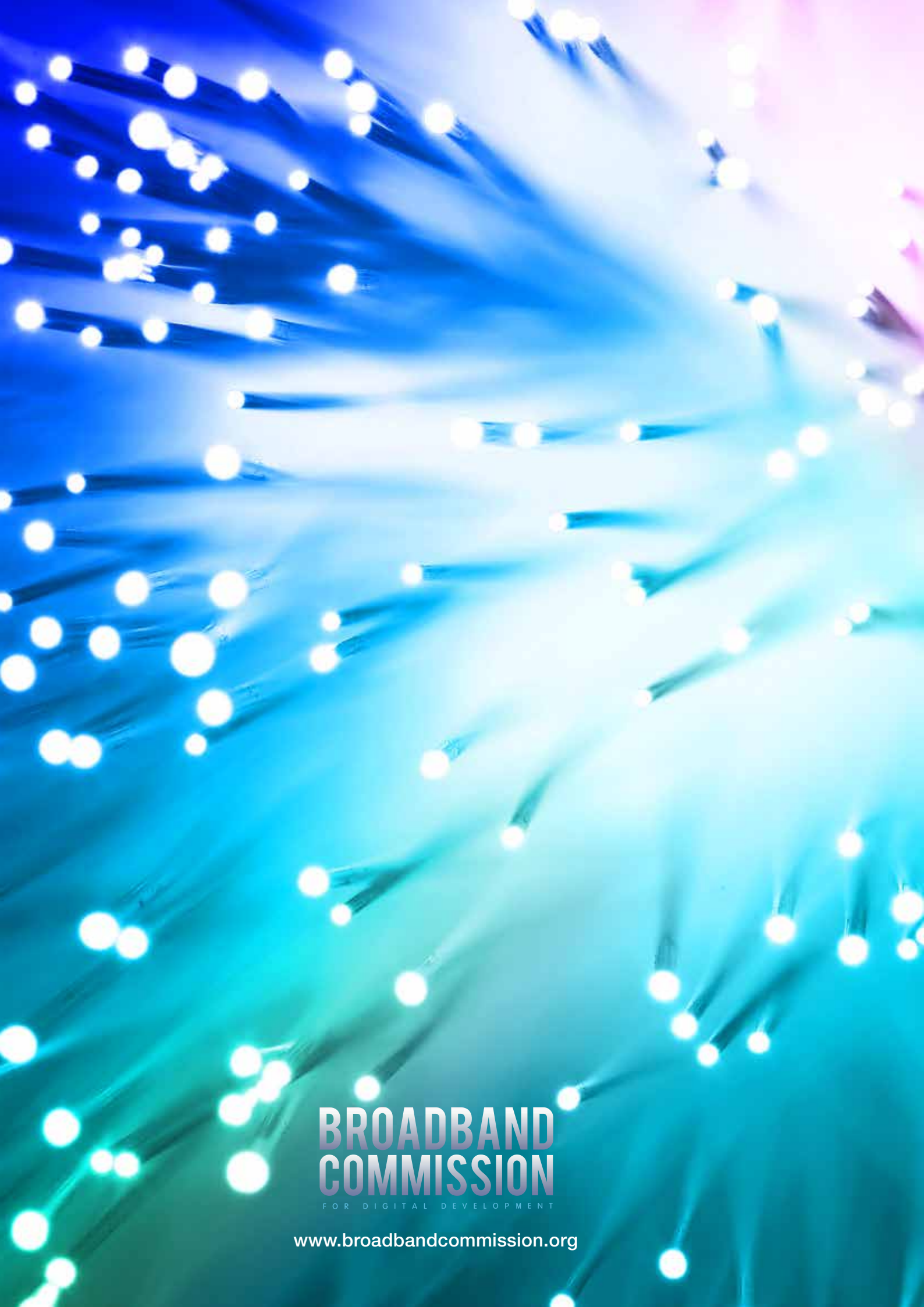
Annex 7: Percentage of Individuals using the Internet, Least Developed Countries (LDCs), 2012

RANK	ECONOMY	2012	RANK	ECONOMY	2012
1	Tuvalu	**35.00** e	25	Mauritania	**5.37** e
2	Bhutan	**25.43** e	26	Cambodia	**4.94** e
3	S. Tomé & Principe	**21.57** e	27	Mozambique	**4.85** e
4	Sudan	**21.00**	28	Lesotho	**4.59** e
5	Senegal	**19.20** e	29	Malawi	**4.35** e
6	Yemen	**17.45** e	30	Togo	**4.00** e
7	Angola	**16.94** e	31	Benin	**3.80** e
8	Uganda	**14.69** e	32	Liberia	**3.79** e
9	Equatorial Guinea	**13.94** e	33	Burkina Faso	**3.73** e
10	Zambia	**13.47** e	34	Central African Rep.	**3.00** e
11	Tanzania	**13.08** e	35	Guinea-Bissau	**2.89** e
12	Samoa	**12.92** e	36	Mali	**2.17** e
13	Gambia	**12.45** e	37	Chad	**2.10** e
14	Nepal	**11.15** e	38	Madagascar	**2.05** e
15	Haiti	**10.87** e	39	Congo (Dem. Rep.)	**1.68** e
16	Lao P.D.R.	**10.75** e	40	Guinea	**1.49** e
17	Kiribati	**10.75** e	41	Ethiopia	**1.48** e
18	Vanuatu	**10.60** e	42	Niger	**1.41** e
19	Djibouti	**8.27** e	43	Somalia	**1.38** e
20	Rwanda	**8.02** e	44	Sierra Leone	**1.30** e
21	Solomon Islands	**7.00** e	45	Burundi	**1.22** e
22	Bangladesh	**6.30** e	46	Myanmar	**1.07** e
23	Comoros	**5.98** e	47	Timor-Leste	**0.91** e
24	Afghanistan	**5.45** e	48	Eritrea	**0.80** e
				Average all LDCs	**7.1**

Notes: The table includes ITU Members.
e - ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

LIST OF ACRONYMS AND ABBREVIATIONS

ADSL	Asymmetric Digital Subscriber Line
ATM	Asynchronous Transport Mode
CAGR	Compound Annual Growth Rate
ccTLD	country code Top-Level Domain
CO2	Carbon Dioxide
COPIF	Singapore's Code of Practice for Info-comm Facilities in Buildings
CSR	Corporate Social Responsibility
CTL	Connect To Learn
DSA	Dynamic Spectrum Access
DSL	Digital Subscriber Line
EuroISPA	European Internet Service Providers Association
FCC	Federal Communications Commission (US regulator)
FTTC	fibre-to-the-Cabinet (FTTC)
FTTH	Fibre-To-The-Home
Gbps	Gigabits per Second
GHG	Greenhouse Gas(es)
GSI	Global Standards Initiative
GSM	Global System for Mobile Communications
GSMA	GSM Association
GSR	Global Symposium for Regulators
gTLD	generic Top-Level Domain
HSBB	High-Speed Broadband project (in Malaysia)
HSDPA	High-Speed Downlink Packet Access
HSPA	High-Speed Packet Access
HTS	High Throughput Satellite
ICT	Information and Communication Technology
IDA	Info-comm Development Authority (of Singapore)
IDNs	Internationalized Domain Names
IP	Internet Protocol
IRR	Internal Rate of Return
ITU	International Telecommunication Union
LDCs	Least Developed Countries
LLU	Local Loop Unbundling
LTE	Long-Term Evolution
MDGs	Millennium Development Goals
NBN	Next-generation Broadband Network
NBP	National Broadband Plan
NGN	Next-generation Network
NGOs	Non-Governmental Organizations
NIA	National Information Society Agency (Rep. of Korea)
NPV	Net Present Value
OECD	Organisation for Economic Cooperation and Development
OER	Open Educational Resources
PPP	Public-Private Partnership
Qnbn	Qatar's National Broadband Network
R3B	Reaching the Third Billion (Intel Corporation)
SIM	Subscriber Identification Module
SMS	Short Message Service
TDM	Time Division Multiplex
UNESCO	United Nations Scientific and Cultural Organization
UAS	Universal Access and Service
UASF	Universal Service and Access Fund
UIS	UNESCO Institute for Statistics
USAID	United States Agency for International Development
USF	Universal Service Fund
USO	Universal Service Obligation
WIPO	World Intellectual Property Organization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