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on the Information Society
Turning targets into action

**Progress in the Implementation of the WSIS Action Line:
C2. Information and communication infrastructure: an essential foundation for the
Information Society**

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1. Introduction

This document presents a brief summary of the progress made in the implementation of Action Line C2 since the first World Summit on the Information Society (WSIS) in 2003.

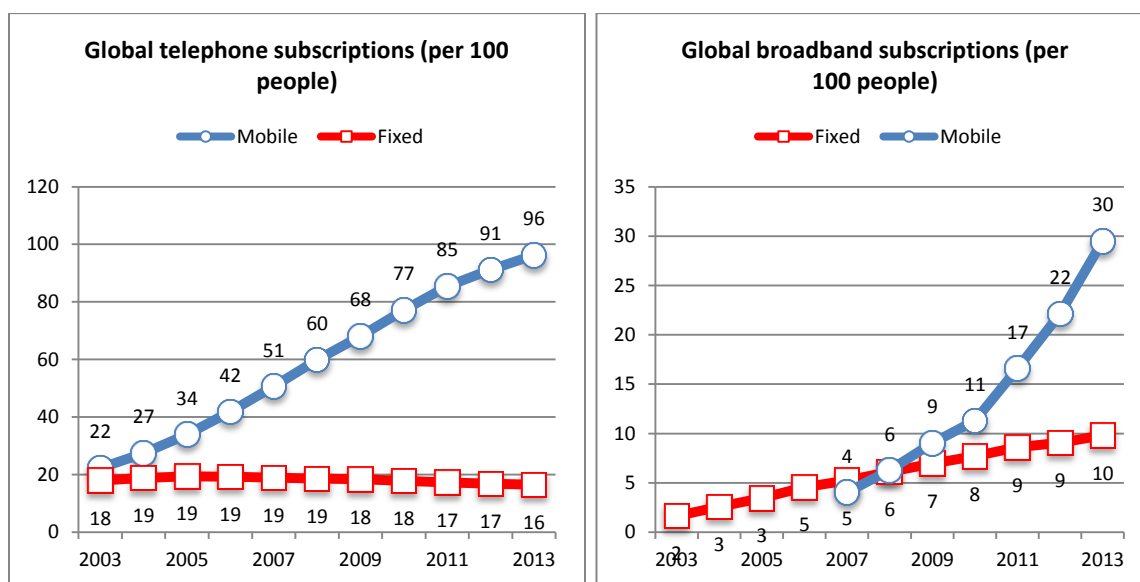
2. Review

Access to ICTs has improved dramatically over the last ten years primarily due to the deployment of wireless technology. Nevertheless there remain coverage gaps in many developing nations, primarily in rural areas. A rising number of countries have adopted universal service programs to extend coverage to commercially unattractive areas and reduce the digital divide. Convergence has grown with voice, data and video services increasingly shifting to next generation Internet Protocol (IP) networks. This has been accompanied by the introduction of new access devices such as smartphones, tablets and "phablets", increasingly providing consumers the ability to access information anyplace, anytime and anywhere. This trend is placing increasing strains on ICT networks. Broadband has emerged as a critical general purpose technology with powerful social and economic impacts. International efforts are seeking ways to enhance broadband connectivity in developing countries in order for them to meet development goals.

Access to ICT

Access to ICT has changed significantly in the decade since WSIS in 2003, largely driven by wireless technology. Global mobile penetration has skyrocketed from just over a quarter in 2003 to almost 100 in 2013 far surpassing fixed telephone penetration which has been stagnant (Figure 1, left). The situation is similar for broadband where subscriptions to high-speed mobile networks far surpass those for wired networks (Figure 1, right).

Figure 1: Global telephone and broadband subscriptions (per 100 people)



Source: ITU.

International standards act as defining elements in the global infrastructure of ICTs. Conforming to international standards avoids costly market battles over different technologies. For companies from emerging markets, international standards create a level playing field which provides access to new markets. They are an essential aid to developing countries in building their infrastructure and encouraging economic development, and through economies of scale, they can reduce costs for all: manufacturers, operators and consumers.

The first global mobile standard *IMT-2000* was developed by the ITU in 1999.¹ The ITU also developed standards for fourth generation of wireless systems and in October 2010 it designated two technologies as fulfilling the high-speed requirements (peak data rates of 100 Mbit/s for high mobility and 1 Gbit/s for low mobility) of *IMT-Advanced*.² Similarly, the ITU has been active in developing fixed broadband specifications including those for ADSL technology (G series of ITU-T Recommendations)³ and Passive Optical Networks (PON) (ITU-T G.983 and ITU-T G.984 standards).

Similarly, global backbone infrastructure has grown rapidly over the last decade. International Internet bandwidth delivered over undersea fiber optic cables increased 53% a year between 2007 and 2012.⁴ Some 54 Tbps of capacity was added between 2007 and 2012 (Figure 2) with demand in developing countries rising the fastest. Africa in particular has benefited from this growth with seven regional undersea cables alone deployed since 2009 adding 22 Tb/s of capacity compared to just one cable in 2001.

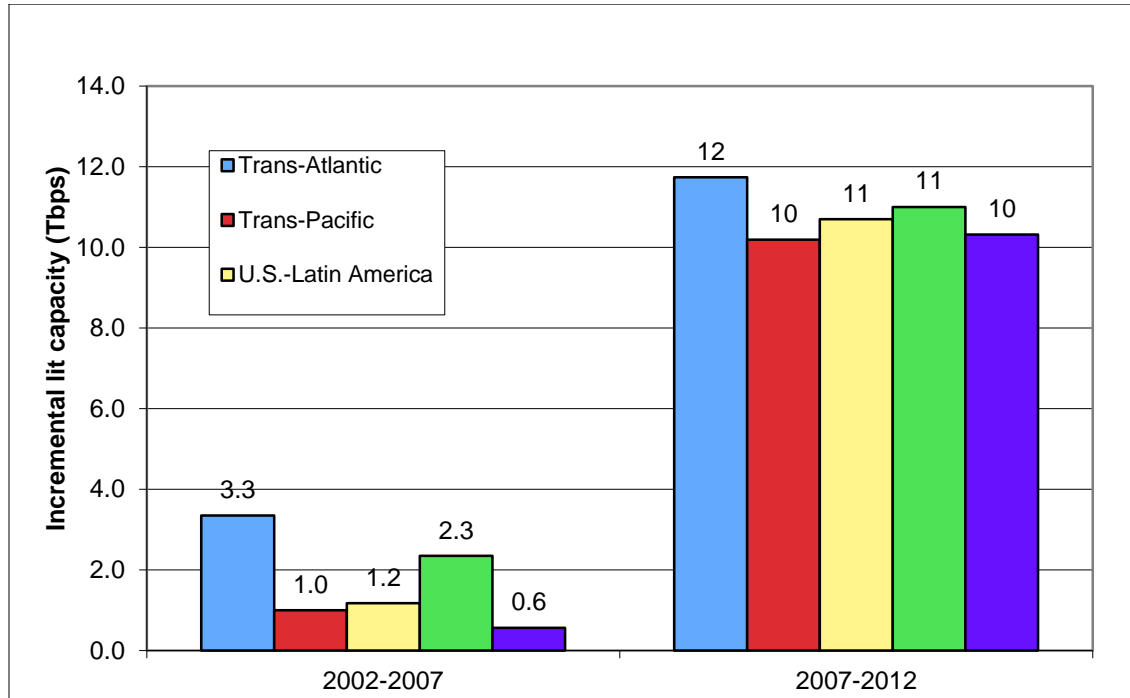
¹ There have been twelve revisions of Recommendation ITU-R M.1457. The latest is M.1457-11 of February 2013. See: ITU. February 2013. *Recommendation ITU-R M.1457-11: Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)*. <http://www.itu.int/rec/R-REC-M.1457/e>.

² "ITU paves way for next-generation 4G mobile technologies." *Press Release*, October 21, 2010. http://www.itu.int/net/pressoffice/press_releases/2010/40.aspx

³ See "Study Group 15 at a Glance" at: <http://www.itu.int/net/ITU-T/info/sg15.aspx>

⁴ Telegeography. 2013. "International bandwidth demand is decentralising." [http://www.telegeography.com/products/commsupdate/articles/2013/04/17/international-bandwidth-demand-is-decentralising/..](http://www.telegeography.com/products/commsupdate/articles/2013/04/17/international-bandwidth-demand-is-decentralising/)

Figure 2: Incremental in use submarine cable capacity on major routes



Source: TeleGeography/www.telegeography.com.

Existing bottlenecks to backbone infrastructure include the lack of open access to international connectivity in some countries. Landlocked countries also face a challenge in ensuring terrestrial transit arrangements to undersea cables. The high cost of national backbone deployment is also a hindrance to the spread of broadband outside urban areas. This can be ameliorated through infrastructure sharing, an area where the ITU has advocated a number of principles in order to lower rollout costs.⁵

Broadband

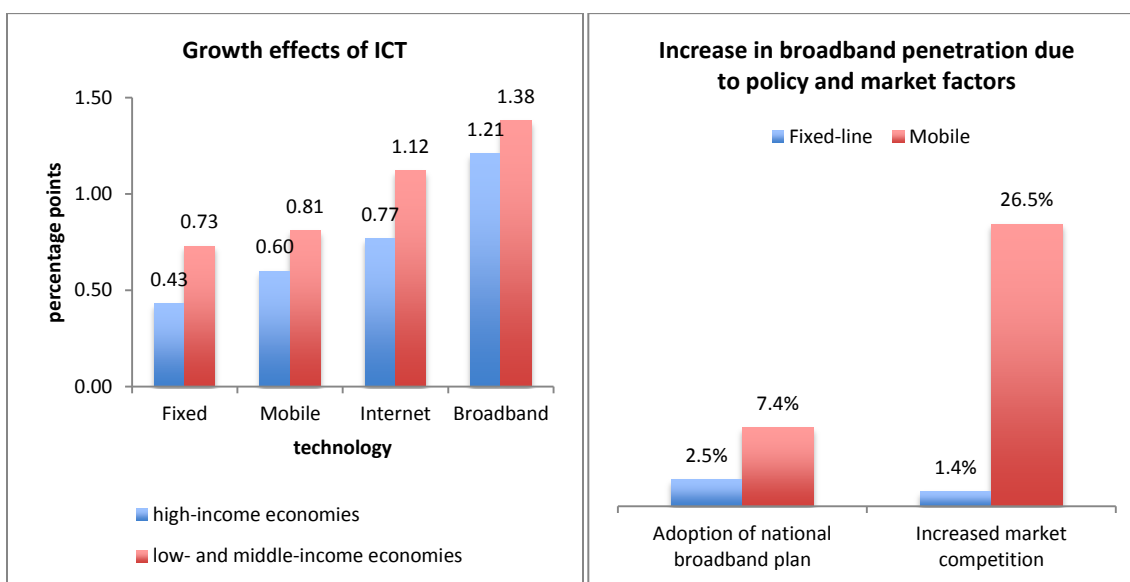
The economic impact of broadband is significant. According to a World Bank study, each 10 percentage point increase in broadband penetration triggers a 1.21 percentage point increase in economic growth in developed economies and 1.38 in developing ones (Figure 3, left).⁶ Also, the importance of prioritizing broadband and adopting a strategy is emphasized by ITU research showing that the existence of a broadband plan boosts penetration (Figure 3, right).⁷

⁵ "ITU advocates infrastructure sharing to counter investment drought." 2008. *Press Release*, November 27. http://www.itu.int/newsroom/press_releases/2008/35.html.

⁶ Qiang, Christine Zhen-Wei, Carlo Rossotto, and Kaoru Kimura. 2009. "Economic Impacts of Broadband." In *Information and Communications for Development*. Washington D.C.: World Bank. http://siteresources.worldbank.org/EXTIC4D/Resources/IC4D_Broadband_35_50.pdf.

⁷ "National broadband plans: Significant influence." 2013. *EIU Views*, July 10. <http://eiuviews.com/index.php/telecoms/2013/07/10/national-broadband-plans-significant-influence/>

Figure 3: Economic growth impact of broadband and broadband growth due to national plan



Note: In the left chart, the y axis represents the percentage-point increase in economic growth per 10-percentage-point increase in telecommunications penetration.

Source: World Bank and ITU.

Convergence

The digitization of text, data, audio and video and subsequent transmission over packet-switched Internet Protocol (IP) network infrastructure has continued unabated over the last decade. This convergence of media has been accompanied by the introduction of new access devices such as smartphones and tablet computers which did not exist at the time of the first WSIS. As a result, users have unprecedented options for how, when and where they want to access digitized information and entertainment.

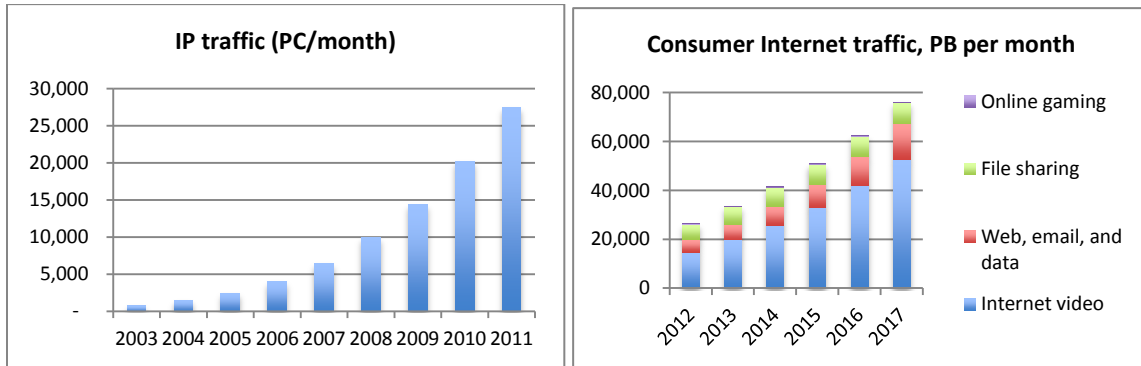
This migration to IP infrastructure platforms and growth of "smart" devices is generating a massive amount of traffic. It is estimated that IP traffic will grow by 21% a year over fixed networks and 68% over mobile networks between 2012-2017 with video accounting for the lion's share, growing from 57% of all traffic in 2012 to 69% by 2017. This rapid increase in IP network traffic presents legal and technical challenges to ensuring that there is sufficient infrastructure capacity.

To accommodate the growth of converged data traffic over IP infrastructure, ITU has developed standards for Next Generation Networks (NGNs) including two fundamental recommendations: Y.2001, General overview of NGN and Y.2011, General principles and general reference model for next generation networks.⁸ It also plays a leading role in identifying policy and regulatory issues related to NGNs.⁹

⁸ http://www.itu.int/dms_pub/itu-t/oth/1D/0B/T1D0B0000010003PDFE.pdf

⁹ <http://www.itu.int/osg/spu/ngn/index.phtml>

Figure 4: Global consumer Internet Traffic



Note: PB=Petabyte. Internet video: Includes short-form Internet video (for example, YouTube), long-form Internet video (for example, Hulu), live Internet video, Internet-video-to-TV (for example, Netflix through Roku), online video purchases and rentals, webcam viewing, and web-based video monitoring (excludes P2P video file downloads).

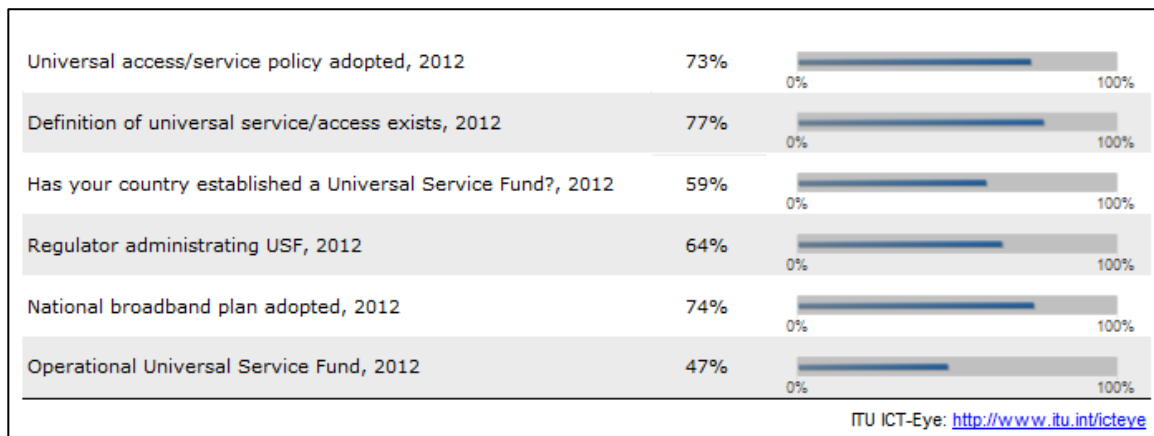
Source: ITU adapted from

http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360_ns827_Networking_Solutions_White_Paper.html

Universal service

Competitive mobile markets have significantly boosted access to telecommunications services. However there continue to be pockets of un-served, mainly in areas that are deemed to be commercially unattractive. A number of countries have adopted universal service policies to extend access and reduce the digital divide. In 2012 almost three quarters of nations had adopted a universal access/service policy and almost half had an operational universal service fund (Table 1).

Table 1: Countries with universal service/access policies



There are also special groups that face challenges in using ICTs such as the elderly, the disabled and indigenous communities. Those with a disability form a significant group numbering around one billion people. A recent report found that ICTs accelerate the social and economic inclusion of persons with disabilities.¹⁰ The United Nations Convention on the Rights of Persons with

¹⁰ "The ICT Opportunity for a Disability-inclusive Development Framework." 2013. Geneva, Switzerland: ITU. <http://www.itu.int/en/action/accessibility/Pages/hlmd2013.aspx>.

Disabilities (CRPD) adopted in December 2006,¹¹ features several dispositions related to ICT accessibility and 52 countries have ratified it.

The *digital dividend* refers to the benefits of transitioning terrestrial broadcasting services from analog to digital.¹² This liberates radio spectrum for new services such as mobile broadband, of particular relevance for rural areas because analog broadcasting uses lower frequencies which have a wider transmission range resulting in lower costs for deploy new services. The 2007 ITU World Radiocommunication Conference identified candidate UHF bands for IMT-2000 services.

The growing availability of WLAN-enabled devices has led to the provision of free Wi-Fi access. Some telecommunication operators offer free Wi-Fi to existing subscribers of their other broadband services. Some governments have promoted Wi-Fi as a universalization strategy, encouraging operators to provide free access is to users, usually limited to a certain amount of time or volume of data used.

3. Actions taken

High-speed networks have assumed strategic importance for economic and social development. In response, also as an enabler for achieving the UN's Millennium Development Goals (MDG), the ITU and UNESCO established the Broadband Commission for Digital Development at the opening press conference of the WSIS Forum 2010¹³. The multi-stakeholder Commission -- consisting of private sector leaders, government policy-makers, international agencies, academia and others - - works towards making broadband a development priority and identifies practical ways of achieving broadband growth. The Commission has adopted four broadband targets to be achieved by 2015 (Table 2), and recommended actions are taken to achieve these targets.

Table 2: Broadband Commission targets to achieved by 2015

	Goal	Target	Status 2013
1	Making broadband policy universal	All countries should have a national broadband plan or strategy or include broadband in their Universal Access / Service Definitions	134 or 69% of all countries had a national plan, strategy, or policy
2	Making broadband affordable	Entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces (for example, amount to less than 5% of average monthly income).	Developing countries where broadband cost less than 5% of average income: 48
3	Connecting homes to broadband	40% of households in developing countries should have Internet access	In the developing world, 28% of households have Internet access
4	Getting people online	Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in Least Developed Countries (LDCs).	Worldwide penetration: 39% Developing country penetration: 31% LDC penetration: 10%

Source: Adapted from Broadband Commission. 2013. *The State of Broadband 2013: Universalizing Broadband*. Geneva, Switzerland: ITU and UNESCO.

¹¹ <http://www.un.org/disabilities/default.asp?id=269>

¹² ITU. 2012a "Digital Dividend: Insights for spectrum Decisions." http://www.itu.int/ITU-D/tech/digital_broadcasting/Reports/DigitalDividend.pdf

¹³ "ITU and UNESCO announce top-level global Broadband Commission." 2010. Press Release, May 10. http://www.itu.int/net/pressoffice/press_releases/2010/18.aspx#UkamChYR924.

A number of global standards have been developed to promote infrastructure development. These include IMT-2000 and IMT-Advanced for mobile broadband networks as well as relevant recommendations for broadband telephone (ADSL), fiber optic networks and next generation networks.

The Action Line C2 facilitator has supported eight WSIS Action Line C2 Facilitation Meetings in the framework of WSIS Forums. The meetings have had Ministers, CEOs and other high-level representatives as speakers and panelists, exchanging ideas on best practices, emerging trends and recommendations.

ITU has organized several "Connect Summits" aimed at mobilizing additional funds and new partnerships to attain the WSIS goals, including the development of infrastructure and has also supported countries to develop national wireless broadband plans. Also, within the framework of the Connect the World initiative, ITU is implementing broadband wireless networks and developing ICT applications to provide free or low cost digital access for schools and hospitals, and for underserved populations in rural and remote areas. Within the context of the UN Convention on the Rights of Persons with Disabilities, the ITU has developed guidelines and toolkits to mainstream access and use of ICTs for the disabled.¹⁴

4. Conclusions and challenges

The ICT world is a much changed place since the first WSIS in 2003. Basic access to telecommunications has increased dramatically thanks to the rapid take-up of wireless technology. Competitive markets, lower cost of deployment compared to wireline networks, falling device prices and no contract subscription has driven mobile penetration to almost 100 at the end of 2013, up dramatically from 22 in 2003. Nevertheless there remain a significant number of unconnected people with over four billion persons around the world still not using the Internet at the end of 2013.¹⁵ In order to extend access, a number of countries have adopted universal access strategies such as extending telecommunications coverage to rural areas. Greater sharing of such strategies is needed to identify best practices in order to accelerate digital inclusion.

Convergence of telecommunications, broadcasting and the Internet has continued unabated over the last decade. Telephone and cable television networks are used to access the Internet while the Internet is delivering audio and video information and entertainment. New devices to access the Internet such as smartphones and tablets which did not exist at the time of the first WSIS allow users to access the Internet anytime and anyplace. However growing IP traffic is straining infrastructure networks, confronting policy makers, regulators, operators and consumers with technical, legal and commercial challenges.

Broadband has emerged as a critical general purpose technology with beneficial social and economic impacts. The Broadband Commission has been established to increase the visibility of broadband in policy making and propose practical strategies for increasing access. It has proposed four key targets for monitoring the take-up of broadband worldwide. Effective regulatory frameworks, enhanced market liberalization, public private partnerships and expanded human capacity development will be needed for many developing countries to achieve the high-speed network targets.

¹⁴ <http://www.itu.int/ITU-D/sis/PwDs/>

¹⁵ <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

Going forward, the world faces three key infrastructure challenges: connecting the unconnected, dealing effectively with ever growing IP traffic and promoting the widespread adoption of ever speedier broadband networks.