BRIEFING PAPER:

Indicators for measuring ICT access

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November 2012

EVIDENCE ON DEMAND

CLIMATE & ENVIRONMENT
INFRASTRUCTURE | LIVELIHOODS

This report has been produced by Evidence on Demand with the assistance of the UK Department for International Development (DFID) contracted through the Climate, Environment, Infrastructure and Livelihoods Professional Evidence and Applied Knowledge Services (CEIL PEAKS) programme, jointly managed by HTSPE Limited and IMC Worldwide Limited.

DOI: http://dx.doi.org/10.12774/eod_hd018.nov2012.minges

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Objective of work

DFID are doing some work on what the post MDG framework might look like. On infrastructure our proposed target is: Everybody has access to telecoms and electricity and the number of people without ready access to transport services is halved.

The indicators below this will be:

- Number of people with household electricity connections (both on- and off-grid)
- Number of rural people living more than 30 minutes' walk from affordable, reliable transport services
- Number of urban people for whom reliable transport services are affordable, requiring less than 20% of monthly household expenditure
- Number of people able to access the internet and mobile communications technologies

DFID already have data on electricity/energy but for transport and ICT we need to address the questions:

1. What is the availability and quality of data to support these indicators and how can this be improved?
2. How measurable are the indicators and what will be the approach?
3. What will be the cost of achieving the target?

Indicators for measuring ICT access within the Global Development Framework

The international community considers ICT to be an important enabler of socio-economic development. A key concern is the disparity in ICT access within and between nations, what is often referred to as the "digital divide." The first effort to measure this was the report of Independent Commission for World Wide Telecommunications Development called *The Missing Link*.[1] Published almost three decades ago, before the emergence of the Internet and mobile telephony, the focus was on the great disparity in wireline telephones around the world. Since then, there have been numerous studies examining disparities in telecommunications and later ICT access. One of the challenges remains how to track a continually evolving sector.

MDGs

Integrating ICT access into global development objectives had its genesis with the Millennium Development Goals (MDGs), an outcome of the United Nations Millennium Declaration in 2000.[2] The International Telecommunication Union (ITU), the UN agency charged with identifying the appropriate ICT indicators noted the difficulty of the task:

"… of all the different targets, number 18 is the most vague (raising the questions of which ICTs should be made available, to whom and by when). A trade-off between the ideal indicator and widespread availability had to be considered. In addition, the number of indicators for the MDG targets had to be kept to a manageable amount."[3]

Three indicators relating to ICTs were identified and placed under Goal 8: "Develop A Global Partnership for Development" within the MDG classification (Table 1).

Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications
8.14 Telephone lines per 100 population 8.15 Cellular subscribers per 100 population 8.16 Internet users per 100 population[4]

Table 1 ICT indicators for tracking MDGs

One idiosyncrasy of the Goal 8 MDG indicators is that unlike the other seven MDG goals, there are no explicit targets. Nevertheless there are fairly complete data sets of annual time series available for all three ICT indicators compiled by the ITU.

[1] The report found two-thirds of the world population had no access to telephone services and originated the oft-cited phrase "Tokyo has more telephones than the whole of the African continent…" See: Independent Commission for World Wide Telecommunications Development. 1984. *The Missing Link.* http://www.itu.int/osg/spu/sfo/missinglink/index.html

[2] See the Millennium Development Goals webpage at: http://www.un.org/millenniumgoals

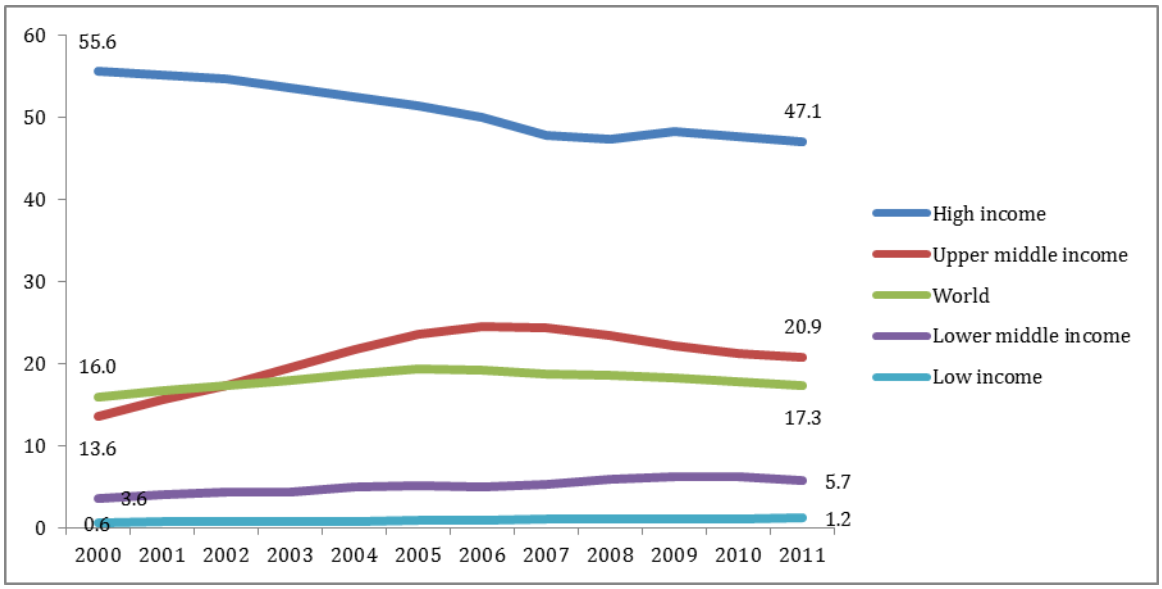
[3] ITU. 2003. *World Telecommunication Development Report 2003: Access Indicators for the Information Society*. Geneva: ITU. http://www.itu.int/ITU-D/ict/publications/wtdr_03/index.html

[4] The number of personal computers per 100 population had originally been selected as one of the three indicators. However due to a lack of data, the MDG Expert Group replaced this indicator with Internet users per 100 population in 2007. See: http://unstats.un.org/unsd/mdg/Metadata.aspx?IndicatorId=0&SeriesId=607

1. What is the availability and quality of data to support these indicators and how can this be improved?

In regards to telephone lines per 100 population, there has not been much growth over the last decade. The world average rose slightly from 16.0 in 2000 to 17.3 in 2011 (Figure 1). It declined in high-income economies; in low-income economies the figure stood at just over one telephone line per 100 population in 2011.[5]

Figure 1 Telephone lines per 100 population

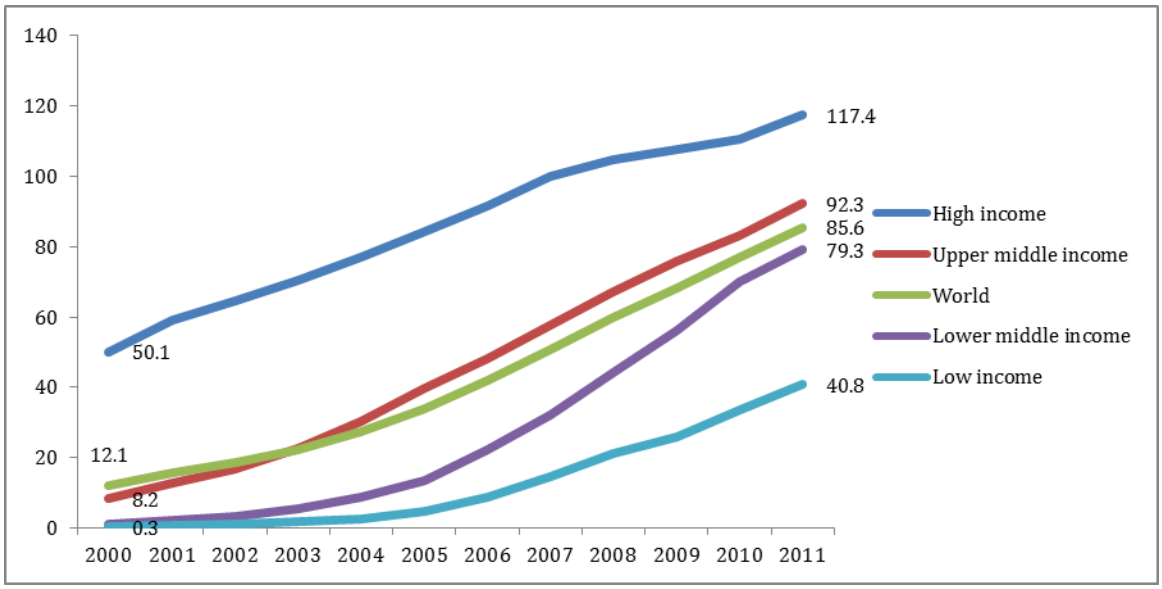


Source: http://data.worldbank.org/indicator/IT.MLT.MAIN.P2

The growth in cellular subscribers per 100 people has been phenomenal. Global penetration increased by over 600% between 2000 and 2011, from 12 per 100 people to 86. In high-income economies there are more subscriptions than people. In low-income economies, there was less than one mobile subscription per 100 inhabitants in 2000; by 2011 this had risen to 41, an annual average growth rate of over fifty percent a year.

[5] World Bank economic classifications are used based on 2011 Gross National Income (GNI) per capita. The groups are: low income, $1,025 or less; lower middle income, $1,026 - $4,035; upper middle income, $4,036 - $12,475; and high income, $12,476 or more. See "How we Classify Economies" at: http://data.worldbank.org/about/country-classifications.

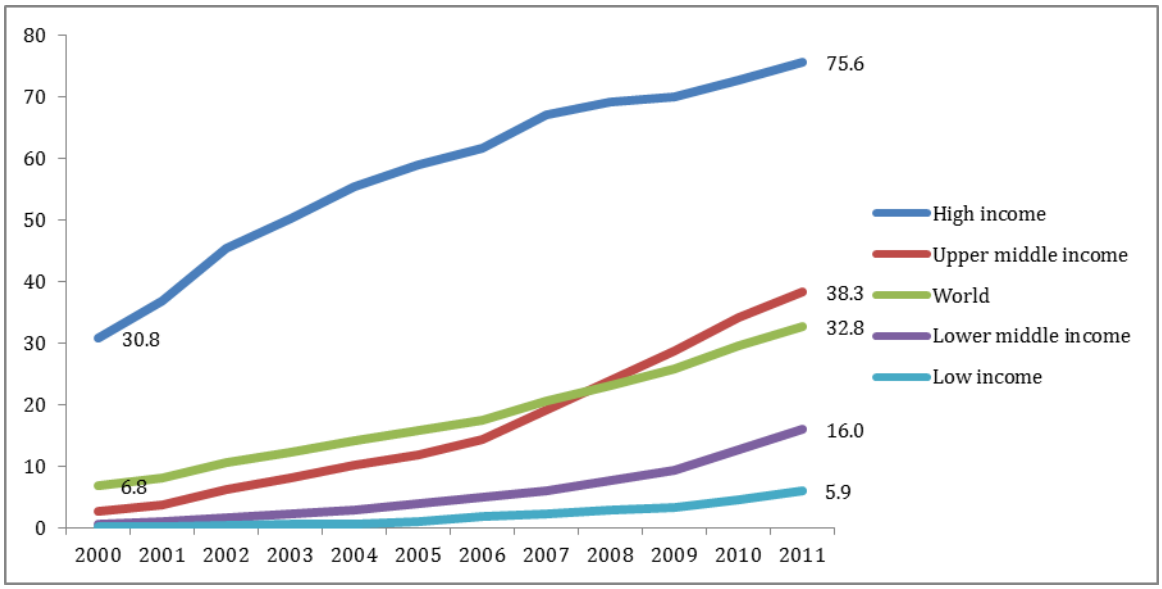
Figure 2 Cellular subscribers per 100 population



Source: http://data.worldbank.org/indicator/IT.CEL.SETS.P2

Growth in Internet use has been higher than telephone lines but less than mobile. A third of the world used the Internet in 2011 up from less than seven percent in 2000 (Figure 3). However the absolute digital divide is widening between wealthier and low-income economies. While low-income countries have managed to raise Internet penetration from virtually zero in 2000 (0.1) to almost six percent of the population by 2011, the percentage point gap between them and high-income countries rose from 31 to 70.

Figure 3 Internet users per 100 population



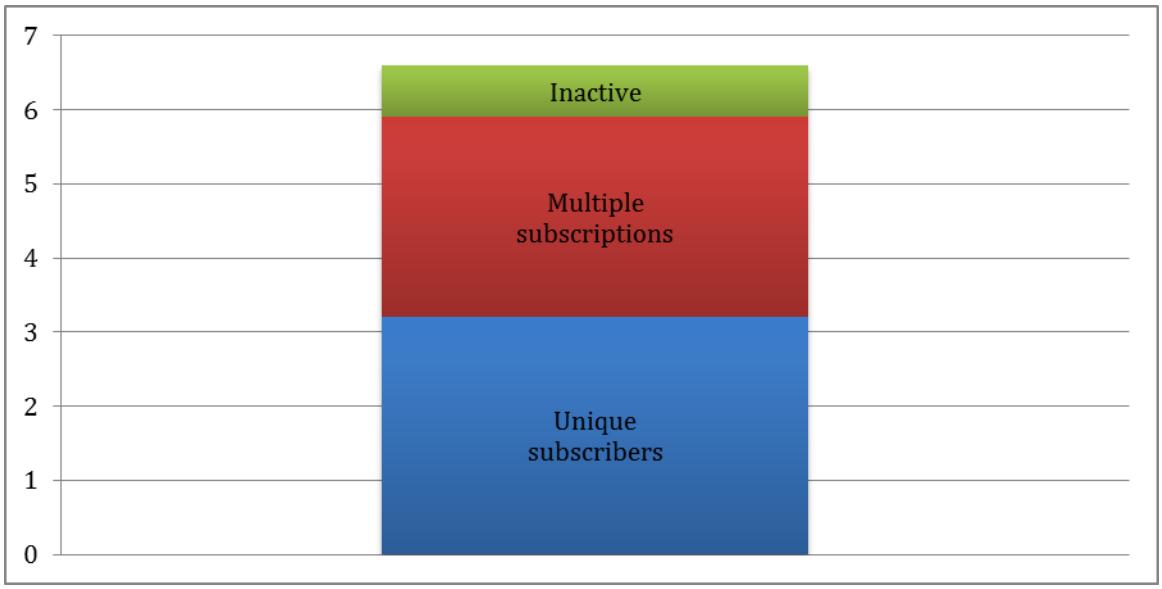
Source: http://data.worldbank.org/indicator/IT.NET.USER.P2

2. How measurable are the indicators and what will be the approach?

The original MDGs were adopted in 2000. At that time, there were only 12.1 mobile subscriptions per 100 people compared to 16.0 per 100 population for telephone lines. Since then, mobile subscriptions have increased dramatically and fixed line subscriptions have remained stagnant. As a result, fixed telephone lines are less relevant as a measure of ICT access. While wired telephone networks do serve important functions particularly for delivering broadband Internet (i.e., ADSL), their role in having a significant impact on access is low. The main reason is that fixed telephone line networks cost much more to deploy compared to wireless technology and mobile networks are capable of delivering broadband speeds. There are also some limitations with the data. First some countries include fixed wireless telephone as fixed lines even though this is due to regulatory rather than technological reasons. More importantly, the emergence of alternative wireline technologies such as cable television and fiber optic means that a traditional copper wire telephone line is no longer the only way to have fixed voice and broadband access (in addition to preference for mobile, this is another contributor of the decline in fixed line telephones).

Mobile subscription data is widely available with one main reason being that it is a key metric among mobile operators and therefore easy to provide. However the use of subscription data is misleading since users can have multiple subscriptions or the prepaid period can lapse but continue to remain counted by operators. Therefore subscription data exaggerates the number of people that actually have access to a mobile phone. Wireless Intelligence, a consultancy that publishes mobile subscription data, has made assumptions regarding the extent of global inactive and duplicate subscriptions.[6] According to their estimate the number of total reported mobile connections around the world stood at 6.6 billion in 2012, while the number of unique subscriptions was less than half that at 3.2 billion (Figure 4). This reduces global penetration from over 100% to 45%.

Figure 4 Wireless Intelligence estimates of active global mobile subscriptions (billions)



Note: Primary research on inactive and multiple subscription ratios conducted in 2009, 2011 and 2012 across 39 countries, representing about 75% of global connections.
Source: Wireless Intelligence estimate.

[6] Wireless Intelligence. 2012. "Global Mobile Penetration — Subscribers Versus Connections", October. https://wirelessintelligence.com/analysis/2012/10/global-mobile-penetration-subscribers-versus-connections/354/

There are other indicators that would give a more precise picture of access to mobile phones. However subscription data continue to be used because they are available for practically every country in the world. A better measure would be the number of persons who use a mobile phone. However obtaining that data requires the use of a demand-side household survey. These surveys tend to be carried out infrequently or, in many developing countries, not at all.

Another measure is the proportion of households that have a mobile phone. This measure is precise: it cannot exceed 100. If a mobile phone exists in a household, then all members can theoretically use it, thereby extending access. Household availability has been the traditional indicator for measuring universal service. This indicator is collected by a growing number of countries through ongoing household surveys, as well as special health surveys.[7] The United Nations recommended in 2008 that the question "Household having mobile cellular telephone(s)" be included in the questionnaires used for the 2010 round of censuses.[8] The World Bank has estimated that almost three of four households around the world had mobile phone service in 2010.[9] Another attraction of the household measure is that it can be broken down by urban and rural locations (Table 2).

Table II.2. Households with mobile phones, selected LDCs, 2007–2008 (%)

Country	Year	Share of households with mobile phones (%)		
		Total	Urban	Rural
Bangladesh	2007	31.7	54.7	25.3
Burkina Faso	2007	21.6	63.6	10.2
Cambodia	2008	37.4	76.2	28.8
Democratic Rep. of Congo	2007	20.8	46.9	3.5
Liberia	2007	43.2	69.0	20.7
Rwanda	2008	13.1	42.4	7.7
Sierra Leone	2008	28.1	63.5	9.9
United Republic of Tanzania	2008	28.1	61.4	17.1

Source: ITU and national sources.

Table 2 Households with mobile phones, selected LDCs, 2007-2008 (%)

[7] For example see the Demographic and Health Surveys of Measure DHS at: http://www.measuredhs.com/

[8] United Nations. 2008. *Principles and Recommendations for Population and Housing Censuses, Revision 2*. http://unstats.un.org/unsd/demographic/sources/census/docs/P&R_Rev2.pdf

[9] World Bank. 2012. *Information and Communications for Development: Maximizing Mobile*. http://go.worldbank.org/0J2CTQTYP0

While the proportion of people that use the Internet is a key indicator, there are limitations with the data. The figure should be obtained through a survey to be reliable. A number of countries carry these surveys out sporadically or not at all. In cases where data is lacking, estimates are based on factors such as subscriptions, bandwidth or the number of Internet hosts but this is not entirely dependable. Furthermore, the estimated data is rarely clearly flagged in international data sets. Mobile Internet access is also significant although definitions are not always precise. Also, in cases where survey data is available, official international data is harmonized based on the proportion of individuals surveyed using the Internet rather than the total number of users, distorting group averages. Finally, understanding how the Internet is used is almost as important as knowing how many users there are.

Indicators for measuring access within the international ICT community

This section identifies emerging indicators that have been identified by the international community since the MDGs were established.

Core indicators

The Partnership on Measuring ICT for Development is a group of international organisations that identify and define ICT indicators.[10] They have developed a set of core indicators for (i) measuring ICT infrastructure and access and (ii) access to, and use of, ICT by households and individuals (Table 3).[11] While the former are administrative data typically collected by government agencies responsible for ICT the latter need to be collected through surveys.

ICT infrastructure and access	Access to, and use of, ICT by households and individuals
A1 Fixed telephone lines per 100 inhabitants A2 Mobile cellular telephone subscriptions per 100 inhabitants A3 Fixed Internet subscribers per 100 inhabitants A4 Fixed broadband Internet subscribers per 100 inhabitants A5 Mobile broadband subscriptions per 100 inhabitants A6 International Internet bandwidth per inhabitant (bits/second/inhabitant A7 Percentage of the population covered by a mobile cellular telephone network A8 Fixed broadband Internet access tariffs per month in US$, and as a percentage of monthly per capita income A9 Mobile cellular telephone prepaid tariffs per month in US$, and as a percentage of monthly per capita income A10 Percentage of localities with public Internet access centres (PIACs)	HH1 Proportion of households with a radio HH2 Proportion of households with a TV HH3 Proportion of households with telephone HH4 Proportion of households with a computer HH5 Proportion of individuals who used a computer in the last 12 months HH6 Proportion of households with Internet access HH7 Proportion of individuals who used the Internet in the last 12 months HH8 Location of individual use of the Internet in the last 12 months HH9 Internet activities undertaken by individuals in the last 12 months HH10 Proportion of individuals who used a mobile cellular telephone in the last 12 months HH11 Proportion of households with access to the Internet by type of access HH12 Frequency of individual use of the Internet in the last 12 months HHR1 Proportion of households with electricity

Source: Partnership for Measuring ICT for Development.

Table 3 Partnership for Measuring ICT for Development: Core indicators

[10] http://www.itu.int/ITU-D/ict/partnership/index.html#core
[11] Partnership for Measuring ICT for Development

WSIS

The UN World Summit on the Information Society (WSIS) took place in two phases Geneva (2003) and Tunis (2005). One of the outcomes was the Geneva Plan of Action identifying ten targets to achieve by 2015. They are the first globally agreed targets for measuring ICT development. They cover connectivity across several domains such as education, health, government and cultural institutions in addition to access for communities and individuals:

1. To connect villages with ICTs and establish community access points
2. To connect universities, colleges, secondary schools and primary schools with ICTs
3. To connect scientific and research centres with ICTs
4. To connect public libraries, cultural centres, museums, post offices and archives with ICTs
5. To connect health centres and hospitals with ICTs
6. To connect all local and central government departments and establish websites and e-mail addresses
7. To adapt all primary and secondary school curricula to meet the challenges of the information society, taking into account national circumstances
8. To ensure that all of the world's population have access to television and radio services
9. To encourage the development of content and put in place technical conditions in order to facilitate the presence and use of all world languages on the Internet
10. To ensure that more than half the world's inhabitants have access to ICTs within their reach

Source: http://www.itu.int/wsis/docs/geneva/official/poa.html

Table 4 WSIS targets

The WSIS targets provide an interesting contrast to the MDGs. While the MDG ICT indicators are precise, unlike the other MDGs, there are no specific goals associated with them. On the other hand, the WSIS targets establish goals but no specific indicators for measuring them. Several studies have proposed indicators for measuring the WSIS targets.[12] In a 2010 report, the ITU recommended indicators for tracking Targets 1 and 10, the two most relevant in terms of measuring individual and household ICT access (Table 5).[13] All the proposed indicators are also core indicators of the Partnership on Measuring ICT for Development. Target 1 is focused on village connectivity and therefore proposes indicators that are broken down by rural penetration. It also proposes a community indicator in the form of the proportion of localities with a public Internet access centre.

Target	Proposed Indicator
1. To connect villages with ICTs and establish community access points	1. Percentage of rural population covered by a mobile cellular telephone net-work, broken down by technology (2G, 3G)
	2. Proportion of rural households with a telephone, broken down by type of network (fixed and/or mobile, mobile only, fixed only)
	3. Proportion of rural households with Internet access, broken down by type of access (narrowband, broadband)
	4. Percentage of localities with public Internet access centres (PIACs), broken down by size of locality, or by urban/rural
	5. Location of individual use of the Internet in the last 12 months
10. To ensure that more than half the world's inhabitants have access to ICTs within their reach	1. Mobile cellular telephone subscriptions per 100 inhabitants
	2. Proportion of individuals who used a mobile cellular telephone in the last 12 months
	3. Proportion of individuals who used the Internet (from any location) in the last 12 months

[12] World Bank. 2006. "Tracking ICTs: World Summit on the Information Society Targets." In *Information and Communications for Development*. http://go.worldbank.org/PB9HXQQUR0

[13] ITU. 2010. *World Telecommunication/ICT Report: Monitoring the WSIS Targets*. http://www.itu.int/ITU-D/ict/publications/wtdr_10/index.html

Target	Proposed Indicator
	4. Proportion of households with access to the Internet by type of access (narrowband, broadband)

Source: ITU. 2010. World Telecommunication/ICT Report: Monitoring the WSIS Targets.

Table 5 Indicators proposed for monitoring WSIS targets 1 and 10

Broadband

High speed Internet access has become a top-level policy concern in many countries due to its potential for boosting economic growth.[14] The Broadband Commission for Digital Development was established to address the importance of broadband and its relevance for achieving the MDGs.[15] The Commission adopted several indicators to track broadband development with targets to be achieved by 2015.[16]

Target	Status
Target 1: Making broadband policy universal. By 2015, all countries should have a national broadband plan or strategy or include broadband in their Universal Access / Service Definitions.	In 2010, out of 144 developing countries, 99 had a UAS definition. Of those, 49 had included Internet dial-up and 36 had included broadband.
Target 2: Making broadband affordable. By 2015, entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces (amounting to less than 5% of average monthly income).	In 49 economies in the world – mostly rich-world economies – broadband access in 2010 cost less that 2% of average income. □ This compares to 32 economies in the world in 2010 where broadband access cost more than half of average national income. □ In 2010, there were 35 developing economies (out of 118) where broadband access cost less than 5% of average monthly income, up from 21 two years earlier.
Target 3: Connecting homes to broadband. By 2015, 40% of households in developing countries should have Internet access.	In developed countries, more than two thirds of households already had Internet access at the end of 2010, compared to around 16% of households in the developing world.
Target 4: Getting people online. By 2015, Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in LDCs.	At the end of 2010, just over two billion people were using the Internet – or 30% of the global population. □ Internet penetration in 2010 stood at 21% in the developing world and at just under 5% in the world's least developed countries (LDCs).

Source: Broadband Commission for Digital Development. "Broadband Targets for 2015."

Table 6 Broadband Commission targets

[14] According to World Bank analysis low- and middle-income countries experienced a 1.4 percentage point increase in GDP for each 10 percent increase in broadband penetration between 2000 and 2006. The World Bank also found that the development impact of broadband is greater in developing countries than in high-income countries and that broadband may have a larger growth effect than wireline telephony, mobile and plain Internet access. See: Qiang, Christine Zhen-Wei, and Carlo M. Rossotto. 2009. "Economic Impacts of Broadband." In *Information and Communications for Development: Extending Reach and Increasing Impact*. Washington, DC: World Bank.

[15] http://www.broadbandcommission.org/about/overview.aspx

[16] Broadband Commission for Digital Development. "Broadband Targets for 2015." http://www.broadbandcommission.org/Documents/Broadband_Targets.pdf

Key indicators for tracking access

As noted, the MDG indicators for tracking ICT access have either outgrown their usefulness (i.e., fixed telephone line penetration) or have methodological issues (i.e., mobile subscriptions). At the same time the international community has identified new indicators to measure current key ICT policy concerns. Given the need to balance relevant indicators for measuring ICT access against a manageable number, the following emerge as key ones to focus on:

- Percentage of the population covered by a wireless *broadband* network
- Proportion of individuals who used a mobile cellular telephone in the last 12 months
- Proportion of individuals that used the Internet in the last 12 months

The first indicator is collectible from either operator or regulator measurements. In many countries, reaching certain levels of population coverage is a requirement for obtaining a license and thus monitored. Note that this indicator expands on the similar core indicator identified earlier by emphasizing the coverage should be a *broadband* signal (e.g., 3G/4G mobile or WiMAX). This indicator measures the availability of a broadband network regardless of whether one is actually subscribing to it. Thus it reflects infrastructural availability, the fundamental precursor to access. Of course, other factors such as affordability of devices and services and desire will impact whether people can then actually use the network.

The second indicator overcomes the limitation of mobile subscription statistics by counting the people that have actually used a cellphone. It can be captured through surveys. The Pew Research Center, a public opinion polling company, carried out a survey across 21 countries in 2011 inquiring about ownership of mobile phones including usage of text and access to the Internet (Table 7).[17] It is worth contrasting the Pew results with a median value of 85% with the much lower estimate of Wireless Intelligence discussed earlier. This indicator is both a core indicator and is also recommended for monitoring the WSIS targets.

The third indicator is part of the MDGs, is recommended for monitoring the WSIS targets and is also a core indicator. To improve its effectiveness, surveys should be carried out in all countries to measure Internet usage. Where this is not possible estimates should be clearly identified. Further it would be very useful to include sub-indicators about the type of applications being used (e.g., proportion of individuals using e-government, education, e-commerce, etc. over the Internet).

Ideally, these indicators would also be available on a disaggregated urban/rural basis.

[17] Pew Research Center. 2011. *Global Digital Communication: Texting, Social Networking Popular Worldwide*. http://www.pewglobal.org/2011/12/20/global-digital-communication-texting-social-networking-popular-worldwide/

Cell Phone Usage

		*On your cell phone, do you regularly…**			
	% Saying they own a cell phone	**Make phone calls**	**Send text messages**	**Take pictures or video**	**Use the internet**
	%	%	%	%	%
U.S.	85	96	67	57	43
Spain	96	98	70	59	21
Britain	89	87	79	54	38
Germany	88	82	56	27	18
France	85	95	77	51	28
Lithuania	91	99	79	47	24
Russia	86	99	75	50	27
Ukraine	84	100	72	48	19
Poland	78	99	85	56	30
Turkey	84	97	64	44	22
Jordan	95	94	63	43	23
Israel	95	99	73	57	47
Lebanon	79	100	87	33	19
Egypt	71	98	72	58	15
China	93	99	80	54	37
Japan	86	98	81	72	47
Indonesia	55	96	96	38	22
India	53	98	49	26	10
Pakistan	48	97	44	9	6
Mexico	57	89	82	61	18
Kenya	74	100	89	31	29
MEDIAN	**85**	**98**	**75**	**50**	**23**

* Asked only of those who say they own a cell phone.

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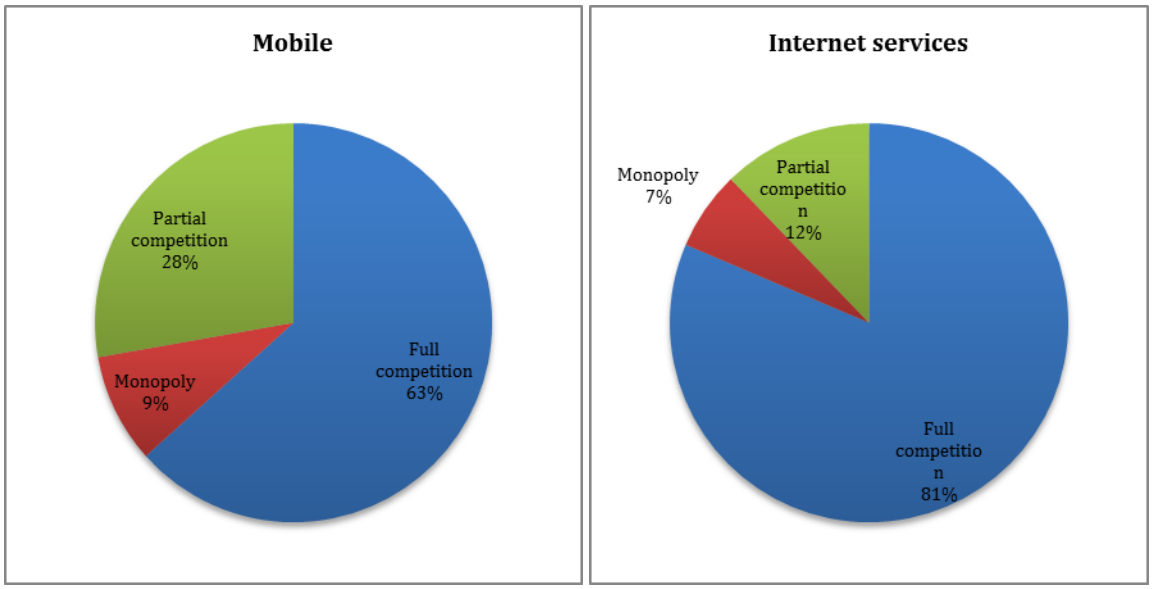
Table 7 Cell Phone Usage

Costs of achieving full ICT access

One of the salient features of global ICT markets is the high level of competition and private sector involvement. A majority of countries have opened their markets to competition and less than 10% of countries are judged by the ITU to have monopoly mobile or Internet services markets (Figure 5).[18]

Figure 5 Level of competition



Source: ITU ICT Eye, Level of competition, 2012, http://www.itu.int/ITU-D/ICTEYE/Regulators/Regulators.aspx#

The World Bank has published figures regarding private investment in mobile networks around the world (Table 8). It calculates that during the period 1990-2010, the private sector committed to invest US$440 billion in mobile networks.

Region	Number of projects	Investment commitments in physical assets (millions of current US$)
East Asia and Pacific	45	54,194
Europe and Central Asia	75	87,445
Latin America and the Caribbean	52	153,944
Middle East and North Africa	21	23,538
South Asia	31	69,286
Sub-Saharan Africa	105	52,305
TOTAL	**329**	**440,7132**

Sources: World Bank and PPIAF, PPI Project Database. (http://ppi.worldbank.org).

Table 8 Private participation in mobile networks, 1990-2010

The emergence of competition and the private sector in ICT markets shape the way access is analyzed:

1) **Existing access**: refers to those that already have access to ICT services

[18] International Telecommunication Union. 2012. "Regulatory Knowledge Center-Level of Competition." ITU ICT EYE. http://www.itu.int/ITU-D/ICTEYE/Regulators/Regulators.aspx#.

2) **Efficient market gap**: refers to those who would have access if there were a perfectly competitive market
3) **Universal coverage gap**: refers to those who live in areas where it is not profitable to install networks

A World Bank study on Africa used these concepts to estimate the cost of extending mobile population coverage to those falling in the efficient market and universal coverage gaps.[19] The investment model was based on an estimated cost of mobile towers and base stations and the terrain and population density in each country. The study determined that it would cost US$18.6 billion to extend mobile networks to the 38% of the population on the continent without a mobile signal (Table 9).

A	Percent of population in efficient market gap group	30.5%
B	Population of efficient market gap group (million)	273.7
C	Percent of population in universal coverage gap group	7%
D	Population of universal coverage gap group (million)	62.8
E	Percent of population without mobile coverage (A+C)	37.5%
F	Population without mobile coverage (million) (B+D)	336.5
G	Investment cost of extending mobile coverage to efficient market gap group	US$7.8 billion
H	Investment cost of extending mobile coverage to universal market gap group	US$10.8 billion
I	Total investment cost	US$18.6 billion
J	Investment cost per person (I/F)	US$55
K	Investment cost per 1% increase in mobile coverage (I/E)	US$496 million

Source: Adapted from World Bank. 2009. Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa.

Table 9 Investment requirements for completing mobile population coverage in Africa

Some countries have recognised that universal coverage gaps in mobile networks are likely to persist unless there is regulatory intervention. In Chile, the Telecommunications Development Fund (to which all operators contribute a certain proportion of revenues) is being used to finance mobile broadband deployment in remote and rural areas without coverage. One of the country's mobile operators, ENTEL, was awarded the contract to provide coverage based on making the lowest cost offer. The total cost of the project is US$110 million of which US$45 million is financed by the development fund and the remainder by ENTEL.[20] The project will cover some three million people living in 1,465 rural localities.

[19] World Bank. 2009. *Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa*. http://www.infrastructureafrica.org/library/doc/937/costing-needs-investment-ict-infrastructure-africa

[20] SUBTEL. 2011. "Gobierno Inaugura Segunda Etapa Del Proyecto De Conectividad 'Todo Chile Comunicado'." *Noticias*, August 12. http://agenda.subtel.cl/prontus_subtel/site/artic/20110803/pags/20110803100606.html.

Amount of investment	US$110 million	**Cost per locality/person:**
Localities	1,465	US$75,085
Population	3 million	US$37

Source: Adapted from SUBTEL. 2011. "Gobierno Inaugura Segunda Etapa Del Proyecto De Conectividad 'Todo Chile Comunicado'".

Table 10 Investment costs for extending mobile broadband coverage to 1,465 rural localities in Chile

According to a United Nations Conference for Trade and Development (UNCTAD) report, 14% of the world's inhabitants were not covered by a mobile signal in 2008.[21] The preceding ratios calculated from the World Bank study and Chilean experience can be used to obtain a rough estimate of the investment required to achieve complete terrestrial mobile population signal coverage around the world (Table 11). The results are highly variable depending on the assumption used. Applying the per person cost calculated for Africa results in a significantly higher figure (US$ 54 billion) than the figure for Chile (US$ 36 billion). This suggests that investment costs in Africa are higher than in Chile; it is not clear whether the uncovered parts of the world would be closer to the African or Chilean situation. In any case, these are very rough estimates and more detailed study would be necessary to obtain a more rigorous benchmark.

Percent of population not covered by a mobile signal	14%
Population not covered by a mobile signal	976 million
Investment needed (based on Chile)	US$36 billion
Investment needed (based on Africa)	US$54 billion

Source: Author's calculation.

Table 11 Estimates of investment to obtain complete worldwide mobile signal coverage based on assumptions from Africa and Chile

[21] UNCTAD. 2010. *Information Economy Report 2010: ICTs, Enterprises and Poverty Alleviation*. http://unctad.org/en/Pages/Publications/InformationEconomyReportSeries.aspx

Conclusions

ICT has become a significant part of the international development agenda. While a vital industry in its own right, ICT is also seen as a critical enabler of socio-economic development. Therefore monitoring ICT access is important to ensure that countries can participate in its benefits. The United Nations adopted three indicators for measuring ICT as part of the MDGs:

- 8.14 Telephone lines per 100 population
- 8.15 Cellular subscribers per 100 population
- 8.16 Internet users per 100 population

While these indicators have initially proven valuable for measuring ICT developments, technological change and a shift towards demand-side statistics now limits their usefulness. The following revised indicators are proposed for tracking global ICT access:

- Percentage of the population covered by a wireless broadband network
- Proportion of individuals that use a mobile cellular telephone
- Proportion of individuals that use the Internet

It is recommended that these indicators also be made available on a disaggregated urban/rural basis and that in the case of Internet users, additional information be collected about the type of use.

Over the last three decades there has been continual restructuring of the ICT sector in most countries of the world. As a result, there is a high level of competition and private sector investment in ICT markets. This has been one of the key factors behind the rapid growth of mobile networks. Nonetheless there remain areas that are deemed unprofitable, mainly in rural locations. Some countries are funding the deployment of mobile networks in these un-served areas.

Infrastructure is becoming less of a barrier to access and in the future the price of services and user devices and digital literacy are likely to be the main barriers to expanded ICT access.