Support for the Harmonisation of ICT Policies in Sub-Saharan Africa (HIPSSA)

Methodological criteria for the selection of ICT indicators for country and regional factsheets

HIPSSA

Harmonization of ICT Policies in Sub-Sahara Africa

Establishment of Harmonized Policies for the ICT Market in the ACP Countries

Methodological criteria for the selection of ICT indicators for country and regional factsheets

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Harmonization of ICT Policies in Sub-Sahara Africa

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Acknowledgements

This report presents an achievement of the regional activities carried out under the HIPSSA project "Support for Harmonisation of the ICT Policies in Sub-Saharan Africa", officially launched in Addis Ababa in December 2008.

In response to both the challenges and the opportunities of information and communication technologies' (ICTs) contribution to political, social, economic and environmental development, the International Telecommunication Union (ITU) and the European Commission (EC) joined forces and signed an agreement aimed at providing "Support for the Establishment of Harmonized Policies for the ICT market in the ACP", as a component of the Programme "ACP-Information and Communication Technologies (@CP-ICT)" within the framework of the 9th European Development Fund (EDF). i.e., ITU-EC-ACP Project.

This global ITU-EC-ACP project is being implemented through three separate sub-projects customised to the specific needs of each region: sub-Saharan Africa (HIPSSA), the Caribbean (HIPCAR), and the Pacific Island Countries (ICB4PAC).

The ITU, under the direction of the HIPSSA Project Coordinator and in close collaboration with the ITU-D ICT Data and Statistics Division (IDS), the ICT Eye system analyst and the ITU Regional Office for Africa, provided guidance and support to the consultant Mr. José Cervera Ferri, Director at DevStat, who prepared the methodological criteria for the selection of ICT indicators for country and regional factsheets.

The activities have been implemented by Mr Jean-François Le Bihan, responsible for the coordination of the activities in Sub-Saharan Africa (HIPSSA Senior Project Coordinator), and Mr Sandro Bazzanella, responsible for the management of the whole project covering Sub-Saharan Africa, Caribbean and the Pacific (ITU-EC-ACP Project Manager) with the overall support of Ms Hiwot Mulugeta, HIPSSA Project Assistant, and of Ms Silvia Villar, ITU-EC-ACP Project Assistant. The work was carried out under the overall direction of Mr Cosmas Zavazava, Chief, Project Support and Knowledge Management (PKM) Department. Support was provided by Ms. Doris Olaya and Ms. Esperanza Magpantay, Statisticians from the IDS. The report has further benefited from comments of the ITU Telecommunication Development Bureau's (BDT) Regulatory and Market Environment (RME) and Special Initiatives and Strategies (SIS) Divisions. The team at ITU's Publication Composition Service was responsible for its publication.

Summary

This report proposes a selection of ICT indicators from the ITU World Telecommunications/ICT indicators database that may be used for the preparation of brief country and regional statistical reports for African countries. The methodology for the selection is based on the analysis of data availability and policy relevance. Approximately 40 out of 161 indicators included in the ITU database's release of December 2010 were selected.

Data on ICT is scarce in the African region. National statistical offices and other government agencies do produce some ICT statistics from censuses, surveys and administrative registers. However, a large amount of data has to be estimated by international agencies in agreement with individual countries. This highlights the need for an additional effort to increase the availability of ICT data on the continent.

At a regional level, producing statistical aggregates is even more difficult. Firstly, it is hardly probable that data for all the countries in a region are available for a given year and, therefore, estimates for missing values have to be produced using econometric methods of time-series analysis integrated with expert knowledge. Secondly, the aggregation of country values may require, for some indicators such as the price of telephone calls, further methodological research.

The concrete outcome of this study is a set of country statistical factsheets on ICT that can be helpful to illustrate policy-relevant issues. Users can review these to improve their selection of relevant indicators and their dissemination. A secondary product is a set of regional tables and graphs that can be used to illustrate analytical reports. Some of the factsheets and tables lack statistical data and this indicates where individual governments would benefit from continued support in producing high-quality statistical ICT information.

Finally, these outcomes will be used to develop an online application where regional economic organizations (RECs) and the African Union will be able to access updated information on the selected indicators, provided a legal agreement between these organizations and the ITU concerning the use of the data is signed.

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Introduction

This report provides the basis for producing statistical reports (factsheets) on ICT indicators at a country and regional level.

Part 1 describes the criteria and procedures for defining the selection of ICT indicators to be included in a series of country and regional factsheets.

There are four types of selection criteria:

- Selection based on interest domains covered by the indicators (section 1)
- Selection based on coherence with aggregate (synthetic) ICT indices (section 2)
- Selection based on the statistical analysis of available data (sections 3 and 4)
- Selection based on relevance for policy issues (section 5).

Section 6 in Part 1 has a proposal for selecting the indicators to be included (without taking into consideration the complexity of imputing or estimating the missing values). An alternative grouping by domains is proposed for showing the data in summary country and regional factsheets.

Part 2 describes a proposal for country factsheets based on the selection of indicators. They have been produced as Excel files (attached to this report).

Part 3 presents a proposal for model graphs and tables to be used in regional factsheets. They illustrate aggregated indicators at a regional level. Part 3 also discusses methodological options that should be further investigated. They are attached as Excel files and can be used to illustrate analytical reports at a regional level.

Part 1

INDICATORS AND METHODOLOGY FOR THEIR SELECTION

Part 1

1 Interest domains: groups of variables in the ITU World Telecommunications/ICT indicators database

ICT indicators included in the ITU database cover a wide range of issues. The coverage has evolved as policy-relevant issues have evolved. For example, the access to and use of mobile phones has the increased attention of policy-makers and economic agents, especially in developing countries. At the same time, it is expected that the relevance of access to fixed telephone lines in developing countries will decrease over time, as has happened in highly industrialised countries. The domains covered by the database are regularly reviewed and completed as information becomes available and their relevance evolves.

This report is elaborated based on the ITU database release of December 2010, which included 161 indicators. They are grouped by topics according to 11 thematic domains as well as demography and (macro) economy, which illustrate a general context and size of countries (see Table 1). It should be noted that the grouping does overlap to some extent: some indicators could be included in different domains (for example, indicators for the use of the Internet could be listed under 'ICT access and use' or 'Internet').

Table 1: Topics in the ITU database

Domain	Number of indicators	Domain	Number of indicators
Demography, economy[1]	11	Quality of service	2
Fixed telephone network	15	Revenue	6
ICT access and use	19	Staff	3
Internet	16	Tariffs	52
Investment	7	Telephone traffic	22
Mobile cellular network	8	**Total**	**161**

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

The selection of indicators should, therefore, cover as many domains as possible to achieve the highest relevance and completeness of the data. Relevance and completeness are quality dimensions of statistics related to the use and scope of indicators. See, for instance, the International Monetary Fund's Data Quality Assessment Framework.[2]

The selection could evolve by adding new indicators or discarding others. As stated by the ITU (2009) 'in the information society model, what is important is that the indicators characterizing (and used to measure) each stage are likely to change over time'.

Accordingly, indicators that show little availability in the 2000-2009 range but an increased availability in later years, should be taken into consideration. They show governments' interest in producing statistical information on the corresponding topic.

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1 Indicators in this domain are not directly collected by ITU from countries, but obtained from other International sources, such as UN, World Bank and IMF.

2 This can be downloaded from: http://dsbb.imf.org/images/pdfs/dqrs_factsheet.pdf [accessed 12 August 2011].

Core ICT indicators should always be taken into account. These are defined by the ITU as:[3]

- ICT infrastructure and access
- Access to and use of ICT by households and individuals
- Use of ICT by businesses
- The ICT sector
- International trade in ICT goods
- ICT in education.

An alternative grouping by domains and sub-domains for presentation purposes is proposed (see section 6).

2 Variables and indicators used in the calculation of aggregate ICT indices

With the increased attention being given to the development of ICT policies, there have been various attempts to produce policy-relevant aggregate indices that are simple to understand, provide country rankings and attract media attention to the results. The Digital Access Index (DAI), the ICT Opportunity Index (ICT-OI), the Digital Opportunity Index (DOI) and the ICT Development Index (IDI) are examples of these indicators. A review of these aggregate (or synthetic) indices can be found in *Measuring the Information Society: the ICT Development Index* (ITU, 2009). This section reviews the IDI calculation, which is the index currently calculated by the ITU.

The selection of indicators or variables to build an aggregate index takes into account different factors, such as the domain to which it refers and some statistical properties based on the information conveyed by the set of variables (determined by using multivariate statistical techniques). It also considers the availability of data for a large selection of countries. Therefore, variables that have been selected as candidates for aggregate indices have general advantages over those that have been discarded.

Furthermore, since aggregate indices generally attract media interest (given their simplicity and the possibility of ranking countries), users may be more familiar with the indicators and variables that the index includes.

2.1 Indicators used in the ICT Development Index (IDI)

The IDI is based on a conceptual framework that describes the processes countries are going through as they evolve towards becoming information societies. It intends to measure:

- ICT readiness (level of networked infrastructure and access of ICT)
- ICT intensity (level of use of ICT in the society)
- The impact of ICT (result of efficient and effective ICT use).

The first two topics are measured through the availability of ICT infrastructure and access, and the level of ICT usage.The impact of ICT is not straightforward to measure. However, since ICT's impact is dependent on the skills to use information technology, proxies related to education indicators have been used.

[3] The list of core indicators has been endorsed by the UN Statistical Commission in 2007 and reviewed further since then. See ITU (2010a).

A final selection of 11 indicators is made for the IDI, based on the availability of data, the results of a multivariate analysis carried out to understand the relationships between the different variables, the relevance of indicators and the recommendations made by experts.

The indicators[4] used to calculate the IDI are:

ICT access

- Fixed telephone lines per 100 inhabitants (i91)
- Mobile cellular telephone subscriptions per 100 inhabitants (i911)
- International Internet bandwith (bit/s) per Internet user (i994U)
- Proportion of households with a computer (xHH4)
- Proportion of households with Internet access at home (xHH6)

ICT use and intensity of use

- Internet users per 100 inhabitants (i99H)
- Fixed broadband subscriptions per 100 inhabitants (i992)
- Mobile broadband subscriptions per 100 inhabitants (also expressed as Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants) (i911_MB)

ICT skills and the capacity to use ICTs effectively

- Adult literacy rate
- Secondary gross enrolment ratio
- Tertiary gross enrolment ratio

The IDI is calculated after a normalisation process, which is described in the ITU (2009) report, *Measuring the Information Society: the ICT Development Index.*

3 Availability of data in the ITU World Telecommunications/ICT indicators database: general remarks

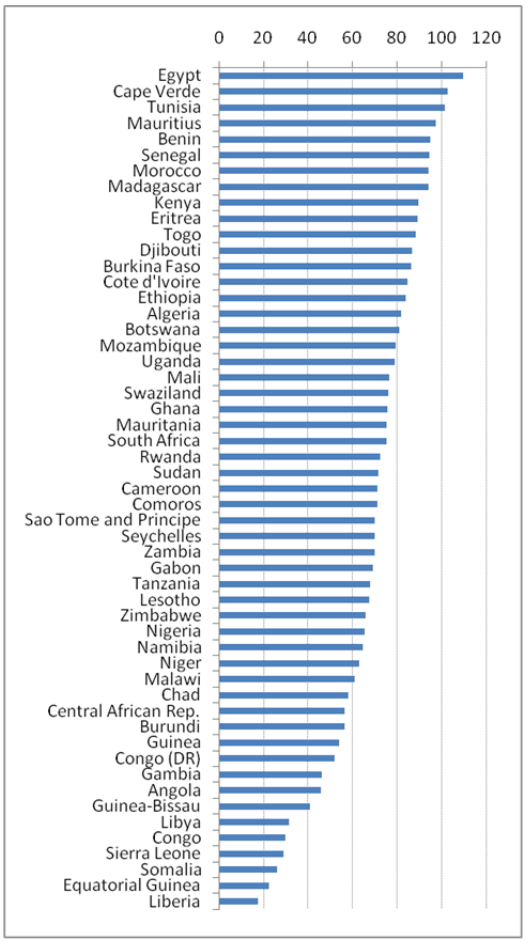
There is a large number of missing values in the database, due to the generalised weaknesses of statistical systems in most African countries. Statistical operations to collect the indicators are not regularly carried out on the continent. Some indicators are produced by administrative registers (from the telecommunications companies, the line ministries or the regulatory agencies), while others result from household surveys and censuses.[5]

However, in a large part due to the launching of the World Summit on the Information Society (WSIS) and the Partnership on Measuring ICT for Development, the availability of some indicators has increased in recent years. This suggests that the availability of indicators should be analysed separately, for the whole range and also for the period 2007-2009.

[4] Throughout the report, indicators in the ITU database are referred to by the full descriptive name as well as by their symbolic name. The list of indicators is given as Annex 1.

[5] See Partnership for Measuring ICT for Development (2005, 18-20 for a review of the sources from which ICT indicators are produced.

Figure 1. Average number of data per year (out of 161 series)[6]



For each indicator in the ITU database,[7] several measures of availability have, therefore, been calculated:

- Average number of data per year (out of 161 series) (see Figure 1)
- Percentage of missing values for the whole range 2000-2009 and all the 47 sub-Saharan Africa countries
- Percentage of missing values for the range 2007-2009 and all the 47 countries
- Reduction in percentage of missing values in 2007-2009 compared to percentage of missing values in 2003-2009.

Note: It should be taken into account that the ITU database includes estimates produced by ITU and other international agencies. If only the data transmitted by national organisations are included, the availability rates would drop greatly.

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

The average number of available series per year is a proxy of the statistical capacity of each country for measuring its information society. It is worth noting that, in the main, countries with the lowest availability of indicators are also those that are unstable or where conflicts have taken place.[8]

For any indicator's series, a country which is missing 10 data points out of the possible 470 (47x10) country-year combinations accounts for about two per cent of the total data of the indicator's series.

There is a large variation in the percentage of missing values across indicators. Some of them have up to 90 per cent and more of missing country-year combinations.

The percentage of missing values in 2007-2009 could also be due to an additional factor or quality dimension of statistics: timeliness. Thus, some indicators such as the number of personal computers or number of TV sets (and their per capita relatives) are relatively scarcer in 2007-2009. This could be due to the fact that they are generally estimated from imports and/or production registries, in the case of computers or produced from census estimates, in the case of TVs. Population and household censuses

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6 Data for the Arab Saharawi Republic are not included in the ITU database. Morocco is not a member of any African region considered for this study.

7 The calculations of availability are based on the data for 47 sub-Saharan African countries. North African countries have, in general, higher availability of statistical information.

8 Figure 1 provides a preliminary insight into the geographical scope for potential technical assistance in the production of ICT indicators. This assistance should, in any case, be considered within the wider frame of the support given to individual countries' statistical system and articulated in national development policies.

generally take place only every 10 years (most countries carry them out in the years ending with 00 or 01 according to UN recommendations).[9]

It is noteworthy that there is an impressive increase in the availability of the indicators relating to mobile cellular subscriptions (i911, i911_MB, i271MB_ACCESS and i271), a fact that shows the growing relevance of the use of mobiles in African countries.

For each domain, the list of indicators, with their availability measured by the prevalence of missing values, is presented in section 4. A measure of improved availability is given by dividing the percentage of missing values in 2007-2009 by the percentage of missing values in 2000-2009 (ratios smaller than 1 represent an improvement of availability).

Generally, the assessment of availability of an indicator in an international database implies that its other quality dimensions (such as international comparability or accuracy) have been checked as a previous step for inclusion.

4 Proposals for the selection of variables and indicators based on data availability in the ITU World Telecommunications/ICT database

From the prospective list of 161 indicators, it is possible to select a smaller number that fulfil the criteria outlined in section 1: completeness (in coverage of different policy-relevant domains) and availability. At the same time, there may be some indicators which are very relevant for policy purposes but for which little data exists. Others may be available for a large number of countries and years, but have lost their relevance over time since a technology may, for example, have been universally adopted.[10] These issues are dealt with in section 5.

4.1 Indicators on fixed-telephone networks

Two indicators present no significant percentage of missing values: *Fixed telephone lines* and fixed telephone lines per 100 inhabitants (i112 and i91 respectively). They should be considered for selection, as should most indicators used to calculate indexes (DAI, ICT-OI and IDI) because they have already undergone a selection process. Fixed telephone lines per 100 inhabitants is also one of the core ICT indicators.

A further suggestion for selection is indicators i1142 (*Percentage of fixed telephone lines connected to digital exchanges*)[11] and *Public payphones* (in total number, i1112 and per 1000 inhabitants, i98), whose availability has somewhat decreased in the last years (probably due to the infrequency of data collection regarding these indicators).

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[9] Given the challenges posed by the sources, and the difficulties for countries to collect them adequately,. ITU has stopped collecting these two indicators. Proposed replacements are *Proportion of households with TV* and *Proportion of households with computer*, which can be collected from household surveys and can better track the availability at user level.

[10] Some Organisation for Economic Co-operation and Development (OECD) countries no longer collect the proportion of households with access to a fixed telephone, as uptake is almost universal.

[11] This indicator was, however, dropped from the final list since it has reached 100 per cent for almost all countries in recent years, and is, therefore, of less relevance.

Table 2: Availability of indicators on fixed telephone networks[12]

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i281	Basic rate ISDN subscriptions	317	113	2	67.4%	80.1%	1.19
i112	Fixed telephone lines	4	0	0	0.9%	0.0%	0.00
i91	Fixed telephone lines per 100 inhabitants	4	0	0	0.9%	0.0%	0.00
i1191	International telephone circuits	335	118	15	71.3%	83.7%	1.17
i28	ISDN subscriptions	275	110	0	58.5%	78.0%	1.33
i28c	ISDN voice channel equivalents	302	124	0	64.3%	87.9%	1.37
i1142	Percentage of fixed telephone lines connected to digital exchanges	162	76	6	34.5%	53.9%	1.56
i1162	Percentage of fixed telephone lines in urban areas	321	103	17	68.3%	73.0%	1.07
i116	Percentage of fixed telephone lines which are residential	271	98	8	57.7%	69.5%	1.21
i1163%	Percentage of localities with telephone service	435	120	34	92.6%	85.1%	0.92
i282	Primary rate ISDN subscriptions	315	113	3	67.0%	80.1%	1.20
i1112	Public payphones	167	67	4	35.5%	47.5%	1.34
i98	Public payphones per 1000 inhabitants	167	67	4	35.5%	47.5%	1.34
i117	Total capacity of local public switching exchanges	262	113	9	55.7%	80.1%	1.44
i123	Waiting list for fixed telephone lines	288	117	14	61.3%	83.0%	1.35

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

[12] Cell colours are assigned according to cell values on a continuous three-colour scale from green (more available) to yellow (average availability) to red (less available).

4.2 Indicators on mobile-telephone networks

There are large differences in the availability of indicators on mobile-telephone networks. In general, indicators related to subscriptions are highly available (note that subscriptions do not measure the number of users of mobile cellular devices). The breakdown by prepaid/postpaid increases the number of missing data points. A significant effort has been made to measure *Mobile cellular subscriptions with access to data communications at broadband speeds* (in total number, *i271MB_ACCESS* and *per 100 inhabitants, i911_MB)*[13] in the last three years, notably decreasing the proportion of missing values (from 35.3% to 4.3%). This suggests the increasing policy relevance of this indicator.

Indicator *Total number of subscriptions to low and medium speed access to data communications* (i271L) is problematic because of its extremely low availability, and it has been discontinued from ITU's indicators collection questionnaire.

It is, therefore, recommended that indicators are selected on the number of subscriptions and those with access to data communications at broadband speed (*i911* and *i911_MB*).

Table 3: Availability of indicators on mobile telephone networks

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i2712	Digital mobile cellular subscriptions	130	60	5	27.7%	42.6%	1.54
i911	Mobile cellular subscriptions per 100 inhabitants	4	0	0	0.9%	0.0%	0.00
i911_MB	Mobile cellular subscriptions with access to data communications at broadband speed per 100 inhabitants	166	6	0	35.3%	4.3%	0.12
i271MB_ACCESS	Mobile cellular subscriptions with access to data communications at broadband speeds	166	6	0	35.3%	4.3%	0.12
i271P	Mobile cellular subscriptions: prepaid subscriptions	195	56	3	41.5%	39.7%	0.96
i271	Mobile cellular telephone subscriptions (postpaid + prepaid)	4	0	0	0.9%	0.0%	0.00

[13] This indicator measures the potential for access to internet at broadband speed, and not necessarily its actual use.

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i271POP	Per cent coverage of mobile cellular network (population)	224	76	2	47.7%	53.9%	1.13
i271L	Total number of subscriptions to low and medium speed access to data communications	441	138	36	93.8%	97.9%	1.04

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.3 Indicators on telephone traffic

Measures of telephone traffic differ in availability depending on destination (international versus domestic, and incoming versus outgoing) and device (fixed versus mobile). The most available measure is that of *International outgoing fixed telephone traffic (minutes)* (i132M), although data from 2006 to 2009 is less complete. However, efforts have been made to measure *International outgoing total telephone traffic* (i132T).

The indicator *International incoming fixed telephone traffic* (i132MI) is not as available, with about 55 per cent of missing data points in 2000-2009. It is, nevertheless, worth noting the increased availability during 2007-2009 of indicators related to *International incoming total telephone traffic* (i132TI) and to *International incoming and outgoing (fixed and mobile) total telephone traffic* (i132TB).

As i132TB comprises i132T and i132TI¸ the *International incoming and outgoing (fixed and mobile) total telephone traffic* (i132TB) indicator would be redundant if the other two indicators are selected.[14]

The remaining indicators show very little available data points. As mobile cellular devices become more widespread across the continent, the indicators relating to SMS and MMS sent are likely to show improved availability in the coming years.

Until then, data for mobile telephone traffic can be calculated as the difference between total and fixed telephone traffic, both incoming and outgoing.

In order to provide a more complete picture, it is recommended to select indicators related to both incoming and outgoing traffic, for fixed and mobile telephone and total. This also enables a calculation of the share of fixed and mobiletraffic within incoming and outgoing traffic.

[14] It is anticipated that the next ITU collection of ICT indicators will be limited to i132T and i132TI, not i132TB.

Table 4: Availability of indicators on telephone traffic

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i131M	Domestic fixed to fixed telephone traffic (minutes)	393	115	21	83.6%	81.6%	0.98
i133WM	Domestic mobile telephone traffic (minutes)	341	90	16	72.6%	63.8%	0.88
i1313WM	Fixed telephone lines to mobile networks traffic (minutes)	370	112	22	78.7%	79.4%	1.01
i1335WM	Incoming international minutes to mobile network	410	114	27	87.2%	80.9%	0.93
i132TB	International incoming and outgoing (fixed and mobile) total telephone traffic (minutes)	409	93	25	87.0%	66.0%	0.76
I132MB	International incoming and outgoing fixed telephone traffic (minutes)	258	99	7	54.9%	70.2%	1.28
i132MI	International incoming fixed telephone traffic (minutes)	254	96	7	54.0%	68.1%	1.26
i132TI	International incoming total telephone traffic (minutes)	394	91	24	83.8%	64.5%	0.77
I132M	International outgoing fixed telephone traffic (minutes)	152	98	1	32.3%	69.5%	2.15
i132T	International outgoing total telephone traffic (minutes)	400	86	22	85.1%	61.0%	0.72
i1311IM	Internet dial-up traffic (minutes)	392	135	31	83.4%	95.7%	1.15
i1311M	Local fixed telephone traffic (minutes)	350	118	18	74.5%	83.7%	1.12
i133MMS	MMS sent	442	123	34	94.0%	87.2%	0.93
i1312M	National fixed trunk telephone traffic (minutes)	381	127	24	81.1%	90.1%	1.11

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i133RM	Number of countries with which there is a roaming agreement	448	127	35	95.3%	90.1%	0.94
i1332WMF	Outgoing mobile minutes to fixed networks	388	107	23	82.6%	75.9%	0.92
i1333WM	Outgoing/originating mobile minutes to international	414	112	25	88.1%	79.4%	0.90
i1332WM	Outgoing/originating mobile minutes to other mobile networks	406	117	24	86.4%	83.0%	0.96
i1331WM	Outgoing/originating mobile minutes to same mobile network	420	127	28	89.4%	90.1%	1.01
i1334WM	Roaming minutes (outside home network)	462	141	44	98.3%	100.0%	1.02
i1336WM	Roaming minutes by foreign subscribers	462	141	44	98.3%	100.0%	1.02
i133SMS	SMS sent	379	97	22	80.6%	68.8%	0.85

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.4 Indicators on ICT access and use

With the approval of the list of core ICT indicators, the measuring of access to and use of ICT has gained impetus. This is particularly the case in relation to households and businesses, for which international manuals now exist (prepared by ITU and the United Nations Conference on Trade and Development (UNCTAD). It should be noted that the ITU database does not include indicators referring to ICT access and use by businesses, only by households and individuals. Indicators on the access and use of ICT by businesses are available in the UNCTAD database.

These indicators, like those relating to the ownership (or availability) of particular devices (radios, TV sets, personal computers, fixed and mobile telephones) are generally collected through household surveys, or, less frequently, population and housing censuses. Household surveys are not always produced periodically in some African countries, due to the weakness of the national statistical systems, and population censuses are only decennial, due to their high cost. It is therefore expected that timeliness is not high. However, after international initiatives such as the Marrakech Plan for Statistics[15] which recommends strengthening the international system of household surveys, such indicators should become available at least every two to three years.

[15] See http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/SCBEXTERNAL/0,,contentMDK:20730049~menuPK:2155158~pagePK:229544~piPK:229605~theSitePK:239427,00.html

After analysing Table 5, the recommended indicators for selection are:

- Availability of computers: *Number of personal computers* (i422) and *Personal computers per 100 inhabitants* (i981) have almost complete data until 2005.[16] *Proportion of households with a computer* (XHH4) has the advantage of being one of the core ICT indicators, and is also used to calculate the IDI aggregate index.
- Access to Internet: *Proportion of households with Internet access at home* (XHH6) is another core ICT indicator and used for the IDI.

The two indicators on access by household are estimated for a large number of countries by ITU, based on actual data from national sources and trends in related variables (such as Internet subscriptions and economic variables). The estimates are then checked with the country. Their dissemination in the factsheet has to take this into account (as a footnote to the data table).

With regard to the availability of TV: *Number of TV sets* (i965) is almost completely available until 2003, but much less after this date (the same goes for its equivalent *Televisions per 100 inhabitants* (i9651)). *Proportion of households with a TV* (XHH2) is one of the core ICT indicators but it is scarcely available. Technological trends also enable computers to be increasingly used as TV sets.

The remaining indicators for this domain are too scarce to be considered for country factsheets or regional aggregations.

Table 5: Availability of indicators on ICT access and use

Code	Indicator	No of missing values in series	No of missing values in 3 last years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i965S	Direct to home satellite antenna subscriptions	388	133	20	82.6%	94.3%	1.14
i4213L	Leased line subscriptions	391	113	20	83.2%	80.1%	0.96
i422	Number of personal computers	172	126	2	36.6%	89.4%	2.44
i955	Number of radio sets	318	135	1	67.7%	95.7%	1.42
i965C	Number of terrestrial multi-channel TV subscribers	407	134	24	86.6%	95.0%	1.10
i965	Number of TV sets	219	135	1	46.6%	95.7%	2.05
i981	Personal computers per 100 inhabitants	172	126	2	36.6%	89.4%	2.44
XHH4	Proportion of households with a computer	183	56	6	38.9%	39.7%	1.02
XHH3F	Proportion of households with a fixed line telephone	405	121	15	86.2%	85.8%	1.00

[16] The collection of these indicators has been discontinued due to difficulties in measuring them adequately.

Code	Indicator	No of missing values in series	No of missing values in 3 last years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
XHH3M	Proportion of households with a mobile cellular telephone	416	119	21	88.5%	84.4%	0.95
XHH1	Proportion of households with a radio	376	115	10	80.0%	81.6%	1.02
XHH2	Proportion of households with a TV	302	90	7	64.3%	63.8%	0.99
XHHR1	Proportion of households with electricity	401	117	17	85.3%	83.0%	0.97
XHH6	Proportion of households with Internet access at home	198	59	7	42.1%	41.8%	0.99
YHH5	Proportion of individuals who used a computer (from any location) in the last 12 months	465	138	44	98.9%	97.9%	0.99
YHH10	Proportion of individuals who used a mobile cellular telephone in the last 12 months	467	140	45	99.4%	99.3%	1.00
YHH7	Proportion of individuals who used the Internet (from any location) in the last 12 months	464	138	43	98.7%	97.9%	0.99
i9651	Televisions per 100 inhabitants	219	135	1	46.6%	95.7%	2.05
i965M	Total number of multi-channel TV subscribers	462	137	44	98.3%	97.2%	0.99

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.5 Indicators on Internet

Internet indicators in the ITU database relate to (1) the infrastructure for Internet connections, (2) the use of Internet and (3) Internet subscriptions. Thus, some could also be considered relevant for the domain 'ICT access and use' and, therefore, the selection should take this into account.

The indicators *Estimated Internet users* (i4212) and the relative measure *Internet users (%)* (i99H) are available for most countries (less than 3% of missing data points). For many countries, the statistics in the database are ITU estimates agreed with the countries.

The data for subscriptions to Internet services is also widely available. In particular, as advanced Internet uses and services require broadband connection, the indicators of *Total fixed broadband Internet*

subscriptions (i4213TFB) and *Fixed broadband subscriptions per 100 inhabitants* (i992) are missing for only 8.5% of the country-year combinations. In comparison, the more general indicator *Internet subscriptions per 100 inhabitants* (i993) is missing for one-third of data points, with problems in coverage for the last three years.

Other indicators with high availability but timeliness problems (measured by the relative increase of missing data in recent years) are *International Internet bandwith (Mbit/s)* (i4214) and the relative indicator *International Internet bandwith per Internet user* (i994U). These could alternatively be listed under a domain related to 'ICT infrastructure'.

The remaining indicators present availability problems.

Table 6: Availability of indicators on Internet

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i4213CAB	Cable modem Internet subscriptions	260	110	0	55.3%	78.0%	1.41
i4213D	Dial-up Internet subscriptions	303	106	14	64.5%	75.2%	1.17
i4213DSL	DSL Internet subscriptions	214	83	0	45.5%	58.9%	1.29
i4212	Estimated Internet users	7	4	0	1.5%	2.8%	1.90
i4212F%F	Female Internet users as percentage of female population	452	132	40	96.2%	93.6%	0.97
i4213FTTH/B	Fibre-to-the-home/building	464	136	44	98.7%	96.5%	0.98
i4213BS_S	Fixed broadband Internet speed (Mbit/s)	406	77	10	86.4%	54.6%	0.63
i992	Fixed broadband subscriptions per 100 inhabitants	66	12	0	14.0%	8.5%	0.61
i4214	International Internet bandwidth (Mbit/s)	72	48	0	15.3%	34.0%	2.22
i994U	International Internet bandwidth per Internet user	77	52	0	16.4%	36.9%	2.25
i993	Internet subscriptions per 100 inhabitants	158	62	0	33.6%	44.0%	1.31
i99H	Internet users (%)	7	4	0	1.5%	2.8%	1.90
i4213OB	Other fixed (wired) broadband Internet subscriptions	400	121	31	85.1%	85.8%	1.01

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i4212F	Percentage female Internet users	421	126	32	89.6%	89.4%	1.00
i4213	Total fixed Internet subscriptions	158	62	0	33.6%	44.0%	1.31
i4213TFB	Total fixed broadband Internet subscriptions	66	12	0	14.0%	8.5%	0.61

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.6 Indicators on investment

The availability of investment indicators is scarce, except for *Total annual investment in telecommunications* (in national currency, *i81* and USD, *i81$).* However there is a lack of timeliness which causes a loss of about 16%-20% of data points over the last three years. For 2008 and 2009, the coverage includes 15 and 16 countries respectively.

Indicator *i841f Foreign investment* has serious availability problems, being available for less than seven different countries across the 2000-2009 range.

It is recommended that indicator *i81$* is kept for the selection.. The addition of country values makes aggregation at the regional level straightforward. However, the series displays erratic behaviour in general, making it difficult to estimate trends.

Table 7: Availability of indicators on investment

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i83	Fixed telephone service investment	374	115	22	79.6%	81.6%	1.02
i83$	Fixed telephone service investment (USD)	379	116	23	80.6%	82.3%	1.02
i841F	Foreign investment	458	136	40	97.4%	96.5%	0.99
i841M	Mobile communication investment	365	106	19	77.7%	75.2%	0.97
i841M$	Mobile communication investment (USD)	370	107	20	78.7%	75.9%	0.96
i81	Total annual investment in telecommunication	242	97	10	51.5%	68.8%	1.34
i81$	Total annual investment in telecommunication (USD)	249	98	10	53.0%	69.5%	1.31

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.7 Indicators on quality of service

The indicators on the quality of telephone service are limited to fixed telephone lines. Given their decreasing popularity and the high percentage of missing values (about 70% in the last three years), the indicators in this domain are unsuitable for inclusion in a country fiche.

Table 8: Availability of indicators on quality of service

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i143	Faults per 100 fixed telephone lines per year	290	101	10	61.7%	71.6%	1.16
i141	Percentage of fixed telephone faults cleared by next working day	323	99	14	68.7%	70.2%	1.02

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

Most countries show a decreasing or at least stable trend for the quality indicators over recent years.

4.8 Indicators on revenues

The availability of revenues indicators is low, with less than half of all data points available and an additional loss for recent years of about 20%. No data are available for a number of fragile states: Chad, Congo, Equatorial Guinea, Guinea-Bissau, Liberia, Sierra Leone and Somalia. Other countries only have data for the earlier years. For recent years, these indicators are available for 17 to 22 countries, with *Total revenue from all telecommunication services (USD)* (i75$) more available than its components (fixed and mobile).

Table 9: Availability of indicators on revenues

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i71	Revenue from fixed telephone service	232	97	8	49.4%	68.8%	1.39
i71$	Revenue from fixed telephone service (USD)	237	98	8	50.4%	69.5%	1.38
i741	Revenue from mobile networks	209	88	6	44.5%	62.4%	1.40
i741$	Revenue from mobile networks (USD)	216	89	6	46.0%	63.1%	1.37
i75	Total revenue from all telecommunication services	182	83	4	38.7%	58.9%	1.52

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i75$	Total revenue from all telecommunication services (USD)	189	84	4	40.2%	59.6%	1.48

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.9 Indicators on staff

Only the indicator *Total full-time telecommunication staff* (*i51*) is a candidate for selection in this domain, although it presents 38.5% of missing values in the 2000-2009 range and shows some lack of timeliness. The countries for which it is totally missing are Congo, Liberia and Somalia. It is available for 21 and 18 countries in 2008 and 2009, respectively.

The aggregation of this indicator at the regional level is straightforward (sum).

Table 10

Code	Indicator	No of missing values in series	No of missing values in 3 last years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i51F	Female telecommunication staff	312	102	11	66.4%	72.3%	1.09
i51W	Mobile telecommunication staff	345	112	13	73.4%	79.4%	1.08
i51	Total full-time telecommunication staff	181	83	3	38.5%	58.9%	1.53

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.10 Indicators on tariffs

The indicators on tariffs account for about one-third of the database (52 indicators). Some of these are available for a very small number of country-year data points.

Indicators which show acceptable availability relate to:

- The price/cost of local fixed telephone calls:
  - Price of a local fixed telephone 3-minute call (off-peak rate) (in national currency – i153O, and in USD – i153O$)
  - Price of a local fixed telephone 3-minute call (peak rate) (in national currency – i153 and USD – i153$).
- The price of access to telephone services, including:

- Installation fee for residential telephone service (in national currency – i151 and in USD – i151$)
- Monthly subscription for residential telephone service (in national currency – i152 and in USD – i152$)
- Installation fee for business telephone (in national currency – i151B and in USD – i151B$) and Monthly subscription for business telephone service (in national currency – i152B and in USD – i152B$) show some timeliness issues and data on use are not included in the ITU database.

In relation to Internet fees, the only indicators that show an increase in availability, while still missing for about 46% and 60% of data points, respectively, are Fixed broadband Internet monthly subscription (i4213BS in national currency and i4213BS$ in USD) and Fixed broadband Internet connection charge in national currency (i4213BC) and in USD (i421BC$).

The availability of tariffs for mobile telephone calls is lower. Nevertheless, they may be considered for selection due to their relevance (see section 5.2).

It is proposed that the USD-based indicators are included for selection, to allow for international comparability.

Table 11: Availability of indicators on tariffs

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i153P	Cellular tariffs – Prepaid per min. local call (peak)	295	140	2	62.8%	99.3%	1.58
i153P$	Cellular tariffs – Prepaid per min. local call (peak) (USD)	299	140	3	63.6%	99.3%	1.56
i4213BC	Fixed broadband Internet connection charge	389	83	11	82.8%	58.9%	0.71
i4213BC$	Fixed broadband Internet connection charge (USD)	393	85	12	83.6%	60.3%	0.72
i4213BS_C	Fixed broadband Internet monthly cap	454	125	36	96.6%	88.7%	0.92
i4213BS	Fixed broadband Internet monthly subscription	369	65	6	78.5%	46.1%	0.59
i4213BS$	Fixed broadband Internet monthly subscription (USD)	374	68	7	79.6%	48.2%	0.61
i151B	Installation fee for business telephone service	122	60	3	26.0%	42.6%	1.64
i151B$	Installation fee for	130	62	3	27.7%	44.0%	1.59

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
	business telephone service (USD)						
i151	Installation fee for residential telephone service	97	36	4	20.6%	25.5%	1.24
i151$	Installation fee for residential telephone service (USD)	105	38	4	22.3%	27.0%	1.21
i153CO	Mobile cellular – price of 3 minute local call (off-peak)	149	70	3	31.7%	49.6%	1.57
i153CO$	Mobile cellular – price of 3 minute local call (off-peak) (USD)	156	72	3	33.2%	51.1%	1.54
i153C	Mobile cellular – price of 3 minute local call (peak)	143	64	3	30.4%	45.4%	1.49
i153C$	Mobile cellular – price of 3 minute local call (peak) (USD)	150	66	3	31.9%	46.8%	1.47
i152C	Mobile cellular monthly subscription charge	149	67	4	31.7%	47.5%	1.50
i152C$	Mobile cellular monthly subscription charge (USD)	157	70	4	33.4%	49.6%	1.49
i151C	Mobile cellular postpaid connection charge	173	78	2	36.8%	55.3%	1.50
i151C$	Mobile cellular postpaid connection charge (USD)	181	81	2	38.5%	57.4%	1.49
i153POO	Mobile cellular prepaid – price of local call per minute (off-peak off-net)	391	62	9	83.2%	44.0%	0.53
i153POO$	Mobile cellular prepaid – price of local call per minute (off-peak off-net) (USD)	394	65	10	83.8%	46.1%	0.55
i153PON	Mobile cellular prepaid – price of local call per minute (off-peak on-net)	391	62	8	83.2%	44.0%	0.53

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i153PON$	Mobile cellular prepaid – price of local call per minute (off-peak on-net) (USD)	394	65	9	83.8%	46.1%	0.55
i153POF	Mobile cellular prepaid – price of local call per minute (off-peak to fixed)	391	62	9	83.2%	44.0%	0.53
i153POF$	Mobile cellular prepaid – price of local call per minute (off-peak to fixed) (USD)	394	65	10	83.8%	46.1%	0.55
i153PO	Mobile cellular prepaid – price of local call per minute (peak off-net)	217	61	1	46.2%	43.3%	0.94
i153PO$	Mobile cellular prepaid – price of local call per minute (peak off-net) (USD)	224	64	2	47.7%	45.4%	0.95
i153PN	Mobile cellular prepaid – price of local call per minute (peak on-net)	390	61	8	83.0%	43.3%	0.52
i153PN$	Mobile cellular prepaid – price of local call per minute (peak on-net) (USD)	393	64	9	83.6%	45.4%	0.54
i153PF	Mobile cellular prepaid – price of local call per minute (peak to fixed)	391	62	9	83.2%	44.0%	0.53
i153PF$	Mobile cellular prepaid – price of local call per minute (peak to fixed) (USD)	394	65	10	83.8%	46.1%	0.55
i153PWO	Mobile cellular prepaid – price of local call per minute (weekend/evening, off-net)	391	62	9	83.2%	44.0%	0.53
i153PWO$	Mobile cellular prepaid – price of local call per minute (weekend/evening, off-net) (USD)	394	65	10	83.8%	46.1%	0.55

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i153PWN	Mobile cellular prepaid – price of local call per minute (weekend/evening, on-net)	391	62	8	83.2%	44.0%	0.53
i153PWN$	Mobile cellular prepaid – price of local call per minute (weekend/evening, on-net) (USD)	394	65	9	83.8%	46.1%	0.55
i153PWF	Mobile cellular prepaid – price of local call per minute (weekend/evening, to fixed)	391	62	9	83.2%	44.0%	0.53
i153PWF$	Mobile cellular prepaid – price of local call per minute (weekend/evening, to fixed) (USD)	394	65	10	83.8%	46.1%	0.55
i153SMS_PO	Mobile cellular prepaid – price of SMS (off-net)	422	93	11	89.8%	66.0%	0.73
i153SMS_PO$	Mobile cellular prepaid – price of SMS (off-net) (USD)	425	96	14	90.4%	68.1%	0.75
i153PSMS	Mobile cellular prepaid – price of SMS (on-net)	236	63	1	50.2%	44.7%	0.89
i153PSMS$	Mobile cellular prepaid – price of SMS (on-net) (USD)	243	66	2	51.7%	46.8%	0.91
i151P	Mobile cellular prepaid connection charge	295	123	5	62.8%	87.2%	1.39
i151P$	Mobile cellular prepaid connection charge (USD)	300	124	6	63.8%	87.9%	1.38
i152B	Monthly subscription for business telephone service	114	59	3	24.3%	41.8%	1.73
i152B$	Monthly subscription for business telephone service (USD)	123	61	3	26.2%	43.3%	1.65
i152	Monthly subscription for residential telephone service	86	34	4	18.3%	24.1%	1.32

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i152$	Monthly subscription for residential telephone service (USD)	95	36	4	20.2%	25.5%	1.26
i153O	Price of a 3-minute fixed telephone local call (off-peak rate)	119	32	4	25.3%	22.7%	0.90
i153O$	Price of a 3-minute fixed telephone local call (off-peak rate) (USD)	129	36	4	27.4%	25.5%	0.93
i153	Price of a 3-minute fixed telephone local call (peak rate)	85	32	4	18.1%	22.7%	1.25
i153$	Price of a 3-minute fixed telephone local call (peak rate) (USD)	95	36	4	20.2%	25.5%	1.26
i4213BS_CP	Price per additional GB	456	127	39	97.0%	90.1%	0.93

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

4.11 Demographic and economic indicators

Demographic and economic indicators provide a general context for the ICT indicators. Their availability is in general higher, except for the urban population since they are produced from censuses and there is no international harmonised definition of the urban/rural divide.

Data on foreign trade (*i67700001* and *i67700002*) should not be difficult to compile from international databases such as the UN Commodity Trade Statistics Database (COMTRADE), but there is an obvious lack of timeliness. Gross Domestic Product (GDP) and related national accounts aggregates also suffer from lack of timeliness.

Besides the specific ICT indicators, the demographic and economic indicators should be used (1) to set the country context and (2) to produce regional aggregates when per capita figures or proportion of households are used.

Table 12: Availability of demographic and economic indicators

Code	Indicator	No of missing values in series	No of missing values in last 3 years	Missing countries	% of missing values in 2000-2009 series	% of missing values in 2007-2009	Ratio of missing in 2007-2009 to missing in 2000-2009
i652	Average annual exchange rate per USD	15	8	0	3.2%	5.7%	1.78
i66_00	Consumer price index (2000=100)	13	6	1	2.8%	4.3%	1.54
i67700001	Exports – telecommunication equipment (USD)	192	90	7	40.9%	63.8%	1.56
i63	Gross domestic product (GDP)	69	43	1	14.7%	30.5%	2.08
i63$	Gross domestic product (GDP) (USD)	76	44	1	16.2%	31.2%	1.93
i64	Gross Fixed Capital Formation (GFCF)	184	95	7	39.1%	67.4%	1.72
i64$	Gross Fixed Capital Formation (GFCF) (USD)	188	95	7	40.0%	67.4%	1.68
i62	Households	10	3	1	2.1%	2.1%	1.00
i67700002	Imports – telecommunication equipment (USD)	158	84	7	33.6%	59.6%	1.77
i61	Population	0	0	0	0.0%	0.0%	no missing values
i6111	Urban population (%)	347	141	0	73.8%	100.0%	1.35

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release. Indicators in this domain are not directly collected by ITU from countries, but obtained from other International sources, such as UN, World Bank and IMF

5 Additional proposals for the selection of variables and indicators based on relevance for policy issues

In addition to the selection based on availability, it is important to consider expert opinion on the relevance of the indicators. Therefore, two further criteria are taken into account:

- Indicators which are used to calculate the IDI
- Other indicators relevant for public policies.

Indicators that have lost their relevance can be dropped from the selection.

The absence of data for some of these indicators may be an incentive for countries to promote their production and dissemination.

5.1 Demographic and economic indicators

The selection proposed in the previous section already includes the five indicators on ICT access and the three indicators on ICT use which comprise the IDI. As there are equivalent forms of the indicators in absolute numbers and in relative ones (in relation to 100 inhabitants, or per Internet users in the case of indicator *i994U*), the relative one is preferable for presentation purposes. Those in absolute numbers are necessary for regional aggregates.

No indicators on ICT skills are available in the ITU database.

5.2 Other indicators relevant for public policies

Several indicators could also be included for relevance reasons. They are important for the planning, monitoring and evaluation of ICT policies such as universal geographic coverage, incoming traffic taxation, establishment of termination rates, increase of international revenues, and so on.

This applies to the following indicators:

- ISDN subscriptions (i28)
- Percentage of localities with telephone service (i1163%). Even if the availability is very low, it can be strategically important to show that countries are not providing data that are relevant in terms of geographic coverage of ICT.
- Mobile cellular subscriptions: prepaid subscriptions (i271P). It is expected that postpaid subscriptions will increase as the population enjoys continually improving access to banking services. A derived indicator for the share of prepaid to total mobile cellular subscriptions could be relevant to show whether prepaid subscriptions are indeed a decreasing trend. However, the ratio of prepaid subscriptions is still very high and, with the available data, the expected trend is not clearly visible. This indicator could be considered for future revisions of the selection.

Indicators on traffic:

- *International incoming and outgoing (fixed and mobile) total telephone traffic (minutes)(i132TB)*. This indicator is redundant if separate indicators for incoming and outgoing traffic are considered.
- *International incoming and outgoing fixed telephone traffic (minutes) (i132MB)*. This indicator is redundant for data collection if separate indicators for incoming and outgoing fixed traffic are considered.

Other traffic indicators have very low availability and could, therefore, be considered in further revisions of the selection if they improve:

- Domestic fixed to fixed telephone traffic (minutes) (i131M)
- Domestic mobile telephone traffic (minutes) (i133WM)
- Fixed telephone lines to mobile networks traffic (minutes) (i1313WM)
- Incoming international minutes to mobile network (i1335WM)
- Outgoing mobile minutes to fixed networks (i1332WMF)
- Outgoing/originating mobile minutes to international (i1333WMF)
- SMS sent (*133SMS*)

Over the last three years, particular attention has been paid to indicators on tariffs, especially on mobile telephony, as an issue closely related to public policies designed to foster the access and use of ICT.

While the availability of indicators relating to the tariffs for mobile calls is still low, the effort for data collection is clear: around 80% of values are missing for the 2000-2009 period and 50% for the three last years.

Therefore, as indicators on the price of 3-minute local calls have been included for fixed telephones, the equivalent for mobile telephones should also be included.

Table 13: Breakdown of indicators on the price of 3-minute calls

Price of 3-minute calls	Fixed	Mobile
Off-peak	*i153O / i153O$*	*i153CO / i153CO$*
Peak	*i153 / i153$*	*i153C/ i153C$*

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

The breakdown between prepaid and postpaid mobile calls is certainly relevant for policy purposes. However, the availability of the corresponding indicators suggests that this breakdown could also be considered for future revisions of the selection. These indicators are:

- i151P$ Mobile cellular prepaid connection charge (USD)
- i151C$ Mobile cellular postpaid connection charge (USD)
- i152C$ Mobile cellular monthly subscription charge (USD)

When the availability of data improves, tariff data broken down by the origin and destination of calls (fixed to mobile, fixed to fixed, on-net, off-net, and so on) could be considered for more comprehensive statistical reports.

For international comparability, the indicators in USD should be considered for presentation purposes.

5.3 Indicators which have lost relevance

One indicator has been signaled by experts as having lost relevance for public policy-making:

- Indicator *i1142 Percentage of fixed telephone lines connected to digital exchanges* is no longer of relevance, having reached 100% for almost all countries.

It has been dropped from the final selection of indicators for the factsheets.

6 Final proposal for selection of indicators

6.1 Proposal for grouping of indicators

Based on the availability of indicators (section 4) and the considerations of section 5, the following proposal is made for the preparation of country and regional factsheets. Demographic and macro-economic indicators should also be added as a reference and to produce regional aggregates.

Table 14: Selected indicators by domains according to ITU Indicators Database from December 2010

Domain	Selected indicators (alternative choices are indicated by 'i' and preferred ones in bold)
Fixed telephone network	• Fixed telephone lines (i112) **/ Fixed Telephone lines per 100 inhabitants** (i91=i112*100/i61) • ISDN subscriptions (i28) • Percentage of localities with telephone service (i1163%) • Public payphones per 1000 inhabitants (i98)
Mobile cellular network	• Mobile cellular telephone subscriptions (postpaid + prepaid) (i271) / **Mobile cellular subscriptions per 100 inhabitants (i911= i271*100/i61)** • Mobile cellular subscriptions with access to data communications at broadband speeds (i271MB_ACCESS) / **Mobile cellular subscriptions with access to data communications at broadband speed per 100 inhabitants (i911_MB=i271MB_ACCESS*100/i61).** • Per cent coverage of mobile cellular network (population) (i271POP)
Telephone traffic	• International outgoing total telephone traffic (i132T) • International incoming total telephone traffic (i132TI) • International incoming fixed telephone traffic (minutes) (i132MI) • International outgoing fixed telephone traffic (minutes) (i132M) • International Incoming mobile telephone traffic (minutes) (i1335WM) • International Incoming mobile telephone traffic (minutes) (I1333WM) • SMS sent (i133SMS)
ICT access and use	• Proportion of households with a TV (XHH2) • Proportion of households with a computer (XHH4) • Proportion of households with Internet access at home (XHH6)
Internet	• Internet users (% or per 100 inhabitants) (i99H=i4212*100/i61) • Total fixed broadband Internet subscriptions (i4213TFB) / **Fixed broadband subscriptions per 100 inhabitants (i992=i4213TFB*100/i61)** • Internet subscriptions per 100 inhabitants (i993) • International Internet bandwith in Mbit/s (i4214) / **International Internet bandwith per Internet user (i994U=i4214*1 million/i4212)**
Investment	• Total annual investment in telecommunications (USD) (i81$)
Revenue	• Total revenue for all telecommunications (i75$)
Staff	• Total full-time telecommunication staff (i51)
Tariffs	• Price of a 3-minute fixed telephone local call (off-peak rate) in national currency (i153O)**/in USD (i153O$)** • Price of a fixed telephone local 3-minute call (peak rate) in national currency (i153)**/in USD (i153$)** • Mobile cellular – price of 3 minute local call (off-peak) in USD (i153CO$) • Mobile cellular – price of 3 minute local call (peak) in USD (i153C$) • Installation fee for residential telephone service in national currency (i151)**/in USD (i151$)** • Monthly subscription for residential telephone service in national currency (i152)**/in USD (i152$)** • Fixed broadband Internet monthly subscription in national currency (i4213BS)**/in USD (i4213BS$)** • Fixed broadband Internet connection charge in national currency (i4213BC)**/in USD (i421BC$)**

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

6.2 Alternative proposal for grouping of indicators

An alternative grouping of the selected indicators is proposed in the table below. This may suggest ideas for the display of country indicators in a factsheet.

Table 15: Alternative proposal for grouping of selected indicators

Domain (alternative)	Subdomain	Selected indicators
ICT infrastructure and access	Telephone network	• Fixed telephone lines per 100 inhabitants (i91) • ISDN subscriptions (i28) • Percentage of localities with telephone service (i1163%) • Public payphones per 1000 inhabitants (i98) • Mobile cellular subscriptions per 100 inhabitants (i911)
	Infrastructure for Internet	• International Internet bandwidth per Internet user (i994U)
	Household access to ICT	• Proportion of households with a TV (XHH2) • Proportion of households with a computer (XHH4) • Proportion of households with Internet access at home (XHH6)
ICT use and subscriptions		• Internet users (%) (i99H) • Internet subscriptions per 100 inhabitants (i993) • Total fixed broadband subscriptions (i4213TFB) • Fixed broadband subscriptions per 100 inhabitants (i992) • Mobile cellular subscriptions with access to data communications at broadband speed per 100 inhabitants (i911_MB)
The ICT sector		• Total annual investment in telecommunications in USD (i81$) • Total revenue for all telecommunications in USD (i75$) • Total full-time telecommunication staff (i51)
Cost of ICT access and use	Cost of access to telephone services	• Installation fee for residential telephone service in USD (i151$) • Monthly subscription for residential telephone service in USD (i152$)
	Cost of use of telephone services	• Price of a 3-minute fixed telephone local call (off-peak rate) in USD (i153O$) • Price of a 3-minute fixed telephone local call (peak rate) in USD (i153$) • Mobile cellular – price of 3 minute local call (off-peak) in USD (i153CO$) • Mobile cellular – price of 3 minute local call (peak) in USD (i153C$)
	Cost of access to Internet	• Fixed broadband Internet monthly subscription in USD (i4213BS$) • Fixed broadband connection charge in USD (i4213BC$).

Domain (alternative)	Subdomain	Selected indicators

ICT use	Telephone traffic	• International incoming total telephone traffic (minutes) (i132TI)
		• International incoming fixed telephone traffic (minutes) (i132MI)
		• International outgoing total telephone traffic (minutes) (i132T)
		• International outgoing fixed telephone traffic (minutes) (i132M)
		  • International Incoming mobile telephone traffic (minutes) (i1335WM)
		  • International Incoming mobile telephone traffic (minutes) (I1333WM)

	SMS	SMS sent (i133SMS)

Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

Part 2

PROPOSAL FOR COUNTRY FACTSHEETS

Country factsheets have been produced in Excel to display the selected country indicators.[17] They include data in tabular form (series for 2000-2009) and graphs highlighting the most relevant series.

The factsheets are displayed in four pages, as shown in Figure 2.

Figure 2: Country factsheet

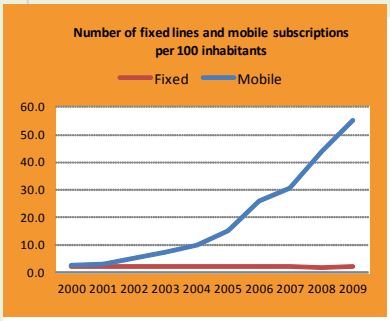
ITU Telecommunications/ICT database: Country fact sheet — Senegal

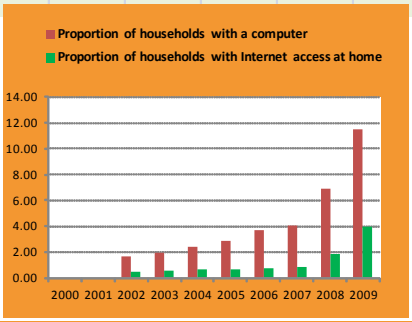
	2008	2009	var. (%)
Population (million):	12.2	12.5	2.6%
GDP (million US$):	13'248.4	n.a.	n.a
GDP (US$) per capita:	1'084.9	n.a.	n.a

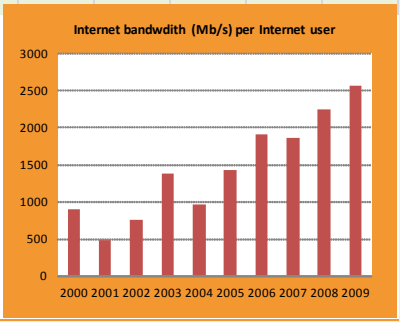
ICT-Development Index (IDI):	2007	2008
Value:	1.34	1.49
Rank:	136	131

ICT infrastructure and access	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Telephone network										
Fixed telephone lines per 100 inhabitants	2.1	2.3	2.2	2.1	2.2	2.4	2.4	2.3	1.9	2.2
Percentage of localities with telephone service										
Percent coverage of mobile cellular network (population)				85.0	85.0	85.0	83.0	85.0	86.0	87.0
Mobile cellular subscriptions per 100 inhabitants	2.5	3.0	5.3	7.3	10.2	15.3	25.8	30.5	44.1	55.1
Public payphones per 1000 inhabitants	1.4	1.5	1.5	1.7	1.9	2.2	2.1	1.5	0.5	0.3
Internet bandwidth										
International Internet bandwidth per Internet user (bit/s)	900.0	480.0	752.4	1377.8	964.7	1435.2	1907.7	1861.8	2240.4	2564.0
Household access to ICT										
Proportion of households with a TV		26.6	29.5	32.7	36.2	40.1	43.1	44.6	46.0	48.0
Proportion of households with a computer			1.7	2.0	2.4	2.9	3.7	4.1	6.9	11.5
Proportion of households with Internet access at home			0.5	0.6	0.6	0.7	0.8	0.9	1.9	4.0

Some data on the proportion of households with a computer and with Internet acces at home are ITU estimates.





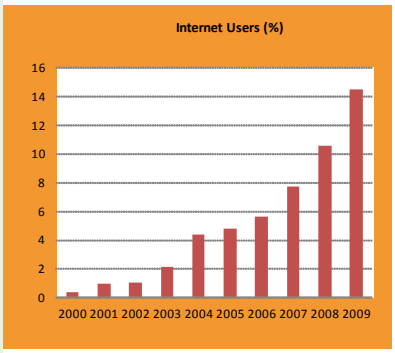


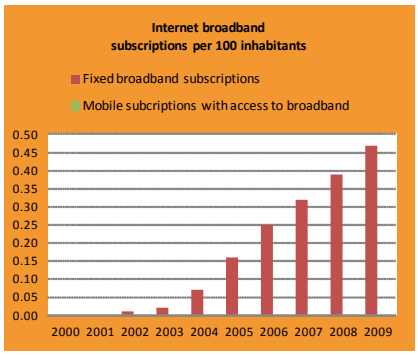
[17] Instructions on how to use the Excel files are given in a separate document not intended for general readers of this report.

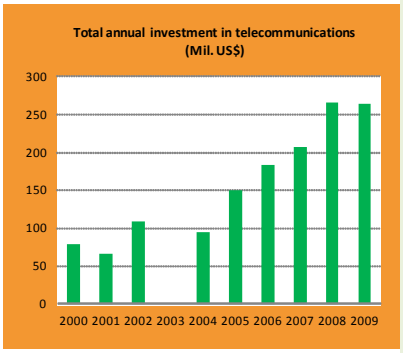
Part 2

Internet	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Internet users (%)	0.4	1.0	1.0	2.1	4.4	4.8	5.6	7.7	10.6	14.5
Internet subscriptions per 100 inhabitants	0.06	0.07	0.09	0.14	0.18	0.18	0.26	0.33	0.39	0.48
Total fixed broadband Internet subscriptions (000)		0.0	1.2	2.4	7.7	18.0	28.9	38.1	47.4	58.7
Fixed broadband subscriptions per 100 inhabitants		0.00	0.01	0.02	0.07	0.16	0.25	0.32	0.39	0.47
Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants.			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The Telecommunications sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total annual investment in telecommunications (Mil. US$)	78.7	66.3	108.6		94.6	149.8	183.6	206.6	265.7	264.7
Total revenue for all telecommunications (Mil. US$)	194.9	216.9	253.8	400.9	548.9	678.7	839.6	1'103.8	1'335.4	1'285.5
Total full-time telecommunication staff (000)	1.4	1.6	1.6	1.6	1.8	1.8	1.9	2.1	1.8	2.2

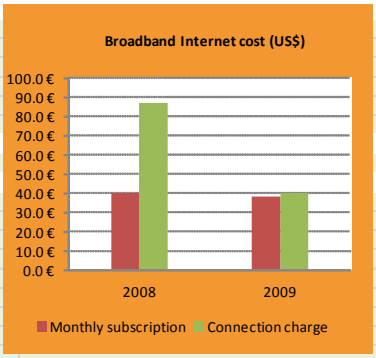


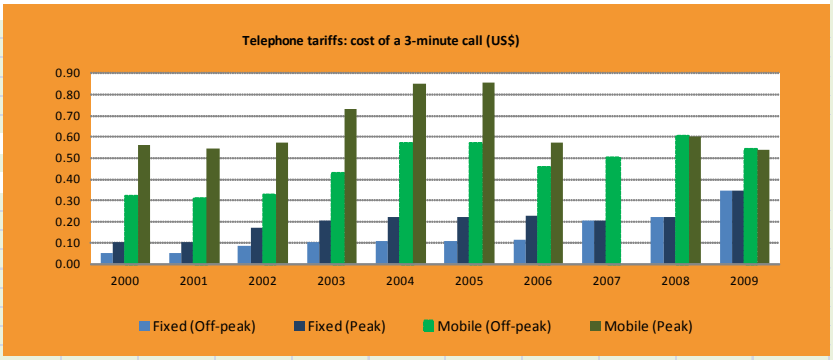




Focus on tariffs

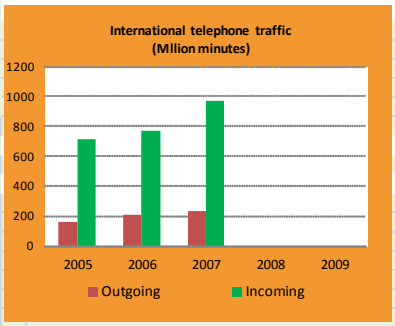
Cost of ICT access and use	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cost of access to telephone services										
Installation fee for residential telephone service (US$)	32.87	31.92	61.71	74.00	44.29	44.36	44.75	20.87	22.33	21.18
Monthly subscription for residential telephone service (US$)	3.39	3.29	3.46	4.16	4.57	4.58	4.62	5.04	10.05	12.50
Cost of use of telephone services										
Price of a 3-minute fixed telephone local call (off-peak rate)	0.05	0.05	0.08	0.10	0.11	0.11	0.11	0.21	0.22	0.35
Price of a 3-minute fixed telephone local call (peak rate) (US$)	0.11	0.10	0.17	0.20	0.22	0.22	0.23	0.21	0.22	0.35
Mobile cellular - price of 3 minute local call (off-peak) (US$)	0.32	0.31	0.33	0.43	0.57	0.57	0.46	0.50	0.60	0.54
Mobile cellular - price of 3 minute local call (peak) (US$)	0.56	0.54	0.57	0.73	0.85	0.85	0.57		0.60	0.54
Cost of access to Internet										
Fixed broadband Internet monthly subscription (US$)									40.20	38.12
Fixed broadband Internet connection charge (US$)									87.09	40.24

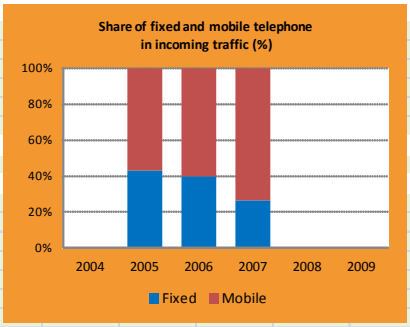


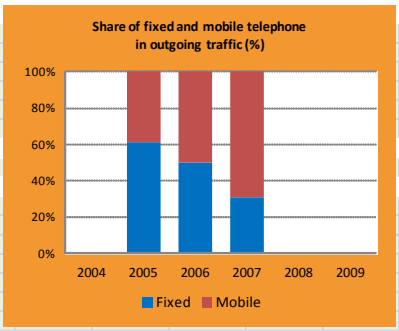


Focus on traffic

Incoming telephone traffic	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
International incoming total telephone traffic (Mil.minutes)						713.0	772.0	973.0		
International incoming fixed telephone traffic (Mil.minutes)	133.0	157.1	282.0	409.0	540.0	306.0	306.0	256.0	191.0	141.0
International incoming mobile telephone traffic (Mil.minutes)						407.0	466.0	717.0		
Share of fixed in international incoming traffic						43%	40%	26%		
Share of mobile in international incoming traffic						57%	60%	74%		
Outgoing telephone traffic	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
International outgoing total telephone traffic (Mil.minutes)						160.0	207.0	232.0		
International outgoing fixed telephone traffic (Mil.minutes)	42.0	69.6	71.0	76.0	84.0	98.0	103.0	71.0	47.0	36.0
International outgoing mobile telephone traffic (Mil.minutes)						62.0	104.0	161.0		
Share of fixed in international outgoing traffic						61%	50%	31%		
Share of mobile in international outgoing traffic						39%	50%	69%		
SMS	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
SMS sent (Million)					22.9			432.0	694.0	813.0







Source: ITU World Telecommunication/ICT Indicators Database, December 2010 release.

The factsheets include the data extracted for the 53 countries ('data' worksheet) from the ITU database, as well as for the IDI (ITU, 2010). They do not include estimates other than those included in the ITU database.

Some indicators have been made easier to read by changing their scale (in thousands or millions).

The Excel files are prepared so that changes in the display of indicators can be made easily, and all country factsheets can be produced from the same file. Updating the country factsheets is straightforward. It only requires uploading the database and making minor changes to the time axis.

Part 3

PROPOSAL FOR REGIONAL FACTSHEETS

Part 3

1 Estimation of indicators for regional aggregates

One of the objectives of this project was to explore the possibility of producing regional aggregates based on the values for each region's country members. In general, regional aggregates represent:

- Total regional values
- Average regional values.

Other aggregates such as maximum, minimum, median values, could be imagined if relevant for the users.

Regional aggregates, which express a total value, can be produced by adding up the indicators at the country level. These can be weighted if they are expressed as ratios (in terms of population or as a proportion of households).

Several types of aggregated ITU indicators at the regional level can be thus defined as:

- Indicators based on absolute numbers, which are obtained by direct sum of the country indicators:

$$I^R = \sum_{c \in R} I^c$$

where *c* indicates a country and *R* a region.

Indicators of this type are those related to:

- Number of lines and subscriptions (and the corresponding breakdowns: fixed/mobile, broadband, prepaid/postpaid)
- Economic indicators of the ICT sector (revenues, investment, staff)
- All traffic indicators expressed in minutes.

Regional indicators expressed as a percentage of the population (per 100 or 1000 inhabitants) and, therefore, representing averages should be weighted according to country population figures:[18]

$$I^R = \frac{\sum_{c \in R} w^c I^c}{\sum_{c \in R} w^c}$$

Indicators of this type are those related to:

- Per cent coverage of mobile cellular network (population)
- Lines and subscriptions per 100 inhabitants (with the corresponding breakdowns)
- Internet users (as a percentage of the population).

The weighting variable for these indicators is *i61 Population.*

- Indicators expressed as proportions of the number of households, which should be weighted according to country household figures (*i62).*
- Proportion of households with a TV
- Proportion of households with a computer

[18] Some of these are already available in absolute number on the ITU database.

- Proportion of households with Internet access at home
- Other indicators, to be weighted by different variables:
- Percentage of localities with telephone service (weighted by number of localities, which is not available in the database)
- International Internet bandwidth per Internet user (weighted by the country Internet user figures).

Finally, other indicators cannot be easily aggregated, in particular those related to the prices of telephone and Internet services. To do so, it would be necessary to develop regional *baskets* of telecommunication services. This may be a subject for further research.

The main issue when producing aggregate indicators is the need to estimate the country data that are missing. There are several options, already used by international organisations, whose impact on the production of regional aggregates should be further investigated:

- Excluding data from missing countries in the aggregate. The impact on the regional aggregate is correlated with the *size* of the missing country (usually in terms of population). Mathematically, the estimator for the regional aggregate would be:

$$\hat{I}^R = \frac{\sum_{c \in R \cap A} w^c I^c}{\sum_{c \in R \cap A} w^c}$$

where *A* is the set of countries for which data are available (this is equivalent to assigning a weight equal to zero for non-available countries). The impact is small if the country's original weight is also small.

- Estimating the missing data from the observed trend. This is not a straightforward procedure, as some series show unexpected structural changes, and may require the intervention of thematic and statistical experts. An example of an unexpected trend is the one observed in some series of *International Internet bandwith*: the connection of a country by a new high capacity connexion cannot be inferred from previous values. Mathematically, the estimator for the regional aggregate would be:

$$\hat{I}^R = \frac{\sum_{c \in R \cap A} w^c I^c + \sum_{c \in R \cap NA} w^c \hat{I}^c}{\sum_{c \in R \cap A} w^c + \sum_{c \in R \cap NA} w^c}$$

where *A* is the set of countries for which data are available and *NA* that of non-available countries. It requires producing estimates at the country level ($\hat{I}^C$) first.

- Estimating the missing data from a regional average of the observed values. This is only possible if the countries are homogeneous with respect to the observed values. The statistical impact of this estimation is an artificial reduction of variance and a bias towards the central values. The estimator for the regional aggregate would be:

$$\hat{I}^R = \frac{\sum_{c \in R \cap A} w^c I^c + \sum_{c \in R \cap NA} w^c \hat{I}^{R \cap A}}{\sum_{c \in R \cap A} w^c + \sum_{c \in R \cap NA} w^c}$$

where $\hat{I}^{R \cap A}$ is an estimate based on the available values in the region.

For the purposes of this exercise, it has been decided that the regional aggregates would be based on the first option, that is considering only the available data. In order to obtain more accurate estimates, further research would be needed to model the indicator series by means of standard statistical procedures (regression analysis, time series – ARIMA models). This may require a *manual* approach since some series do not show regular trends and few data points are generally available. The behaviour for the different countries may require an individual approach to each country's series.

Annex 2 summarises the procedures that could be used for estimating missing values of the series and producing regional aggregates. As the ITU database already includes estimates for some series and countries, any additional estimation procedure should take this into account.

2 Proposal for regional factsheets

As the production of regional statistical reports is one of the objectives of the HIPSSA project, a series of statistical tables and graphs are provided in an Excel file companion to this report. Factsheets for the eight African regional organisations considered in this project (AU, ECOWAS, UEMOA, ECCAS, COMESA, EAC, IGAD, SADC) should account for the fact that the differing number of member countries (from five in the EAC to 53 in the AU) make it difficult to propose a standard factsheet for all regions – table and graph sizes would need to be adjusted.

The proposed factsheets provide three aggregate information pieces:

- A statistical table presenting country values in alphabetical order
- A line graph providing the trend for the regional average, obtained by weighting the country data calculated as $\hat{I}^R = \frac{\sum_{c \in R \cap A} w^c I^c}{\sum_{c \in R \cap A} w^c}$, that is, by considering only the available data for the countries in the region
- A bar chart displaying country values and the regional average. This only considers the available data for the countries in the region.

For indicators that include ITU estimates for a large number of countries, the aggregated total is displayed in a graph. These indicators are:

- i112 Fixed telephone lines
- i271 Mobile cellular telephone subscriptions (postpaid + prepaid)
- i4213TFB Total fixed broadband Internet subscriptions
- i4212 Estimated Internet users.

Annex 1

ANNEX 1:

Indicators in the ITU World Telecommunications/ICT Indicators database, December 2010 release

i652	Average annual exchange rate per USD
i281	Basic rate ISDN subscriptions
i4213CAB	Cable modem Internet subscriptions
i153P	Cellular tariffs – Prepaid per min. local call (peak)
i153P$	Cellular tariffs – Prepaid per min. local call (peak) (USD)
i66_00	Consumer price index (2000=100)
i153O$	Price of a 3-minute fixed telephone local call (off-peak rate) (USD)
i4213D	Dial-up Internet subscriptions
i2712	Digital mobile cellular subscriptions
i965S	Direct to Home satellite antenna subscriptions
i131M	Domestic fixed to fixed telephone traffic (minutes)
i133WM	Domestic mobile telephone traffic (minutes)
i4213DSL	DSL Internet subscriptions
i4212	Estimated Internet users
i67700001	Exports – telecommunication equipment (USD)
i143	Faults per 100 fixed telephone lines per year
i4212F%F	Female Internet users as percentage of female population
i51F	Female telecommunication staff
i4213FTTH/B	Fibre-to-the-home/building
i4213BC	Fixed broadband Internet connection charge
i4213BC$	Fixed broadband Internet connection charge (USD)
i4213BS_C	Fixed broadband Internet monthly cap
i4213BS	Fixed broadband Internet monthly subscription
i4213BS$	Fixed broadband Internet monthly subscription (USD)
i4213BS_S	Fixed broadband Internet speed (Mbit/s)
i992	Fixed broadband subscriptions per 100 inhabitants
i112	Fixed telephone lines
i91	Fixed telephone lines per 100 inhabitants
i1313WM	Fixed telephone lines to mobile networks traffic (minutes)
i83	Fixed telephone service investment
i83$	Fixed telephone service investment (USD)
i841f	Foreign investment
i63	Gross Domestic Product (GDP)
i63$	Gross Domestic Product (GDP) (USD)

Annex 1

i64	Gross Fixed Capital Formation (GFCF)
i64$	Gross Fixed Capital Formation (GFCF) (USD)
i62	Households
i67700002	Imports – telecommunication equipment (USD)
i1335WM	Incoming international minutes to mobile network
i151B	Installation fee for business telephone service
i151B$	Installation fee for business telephone service (USD)
i151	Installation fee for residential telephone service
i151$	Installation fee for residential telephone service (USD)
i132TB	International incoming and outgoing (fixed and mobile) total telephone traffic (minutes)
i132MB	International incoming and outgoing fixed telephone traffic (minutes)
i132MI	International incoming fixed telephone traffic (minutes)
i132TI	International incoming total telephone traffic (minutes)
i4214	International Internet bandwidth (Mbit/s)
i994U	International Internet bandwidth per Internet user (bit/s)
i132M	International outgoing fixed telephone traffic (minutes)
i132T	International outgoing total telephone traffic (minutes)
i1191	International telephone circuits
i1311IM	Internet dial-up traffic (minutes)
i993	Internet subscriptions per 100 inhabitants
i99H	Internet users (%)
i28	ISDN subscriptions
i28c	ISDN voice channel equivalents
i4213L	Leased line subscriptions
i1311M	Local fixed telephone traffic (minutes)
i133MMS	MMS sent
i153CO	Mobile cellular – price of 3-minute local call (off-peak)
i153CO$	Mobile cellular – price of 3-minute local call (off-peak) (USD)
i153C	Mobile cellular – price of 3-minute local call (peak)
i153C$	Mobile cellular – price of 3-minute local call (peak) (USD)
i152C	Mobile cellular monthly subscription charge
i152C$	Mobile cellular monthly subscription charge (USD)
i151C	Mobile cellular postpaid connection charge
i151C$	Mobile cellular postpaid connection charge (USD)
i153POO	Mobile cellular prepaid – price of local call per minute (off-peak, off-net)
i153POO$	Mobile cellular prepaid – price of local call per minute (off-peak, off-net) (USD)
i153PON	Mobile cellular prepaid – price of local call per minute (off-peak, on-net)
i153PON$	Mobile cellular prepaid – price of local call per minute (off-peak, on-net) (USD)
i153POF	Mobile cellular prepaid – price of local call per minute (off-peak, to fixed)
i153POF$	Mobile cellular prepaid – price of local call per minute (off-peak, to fixed) (USD)

Annex 1

i153PO	Mobile cellular prepaid – price of local call per minute (peak, off-net)
i153PO$	Mobile cellular prepaid – price of local call per minute (peak, off-net) (USD)
i153PN	Mobile cellular prepaid – price of local call per minute (peak, on-net)
i153PN$	Mobile cellular prepaid – price of local call per minute (peak, on-net) (USD)
i153PF	Mobile cellular prepaid – price of local call per minute (peak, to fixed)
i153PF$	Mobile cellular prepaid – price of local call per minute (peak, to fixed) (USD)
i153PWO	Mobile cellular prepaid – price of local call per minute (weekend/evening, off-net)
i153PWO$	Mobile cellular prepaid – price of local call per minute (weekend/evening, off-net) (USD)
i153PWN	Mobile cellular prepaid – price of local call per minute (weekend/evening, on-net)
i153PWN$	Mobile cellular prepaid – price of local call per minute (weekend/evening, on-net) (USD)
i153PWF	Mobile cellular prepaid – price of local call per minute (weekend/evening, to fixed)
i153PWF$	Mobile cellular prepaid – price of local call per minute (weekend/evening, to fixed) (USD)
i153SMS_PO	Mobile cellular prepaid – price of SMS (off-net)
i153SMS_PO$	Mobile cellular prepaid – price of SMS (off-net) (USD)
i153PSMS	Mobile cellular prepaid – price of SMS (on-net)
i153PSMS$	Mobile cellular prepaid – price of SMS (on-net) (USD)
i151P	Mobile cellular prepaid connection charge
i151P$	Mobile cellular prepaid connection charge (USD)
i911	Mobile cellular subscriptions per 100 inhabitants
i911_MB	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants
i271MB_ACCESS	Mobile cellular subscriptions with access to data communications at broadband speeds
i271P	Mobile cellular subscriptions: prepaid subscriptions
i271	Mobile cellular telephone subscriptions (postpaid + prepaid)
i841M	Mobile communication investment
i841M$	Mobile communication investment (USD)
i51W	Mobile telecommunication staff
i152B	Monthly subscription for business telephone service
i152B$	Monthly subscription for business telephone service (USD)
i152	Monthly subscription for residential telephone service
i152$	Monthly subscription for residential telephone service (USD)
i1312M	National fixed trunk telephone traffic (minutes)
i133RM	Number of countries with which there is a roaming agreement
i422	Number of personal computers
i955	Number of radio sets
i965C	Number of terrestrial multi-channel TV subscribers
i965	Number of TV sets
i4213OB	Other fixed (wired) broadband Internet subscriptions

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i1332WMF	Outgoing mobile minutes to fixed networks
i1333WM	Outgoing/originating mobile minutes to international
i1332WM	Outgoing/originating mobile minutes to other mobile networks
i1331WM	Outgoing/originating mobile minutes to same mobile network
i271POP	Per cent coverage of mobile cellular network (population)
i4212F	Percentage female Internet users
i141	Percentage of fixed telephone faults cleared by next working day
i1142	Percentage of fixed telephone lines connected to digital exchanges
i1162	Percentage of fixed telephone lines in urban areas
i116	Percentage of fixed telephone lines which are residential
i1163%	Percentage of localities with telephone service
i981	Personal computers per 100 inhabitants
i61	Population
i153O	Price of a 3-minute fixed telephone local call (off-peak rate)
i153	Price of a 3-minute fixed telephone local call (peak rate)
i153$	Price of a 3-minute fixed telephone local call (peak rate) (USD)
i4213BS_CP	Price per additional GB
i282	Primary rate ISDN subscriptions
XHH4	Proportion of households with a computer
XHH3F	Proportion of households with a fixed line telephone
XHH3M	Proportion of households with a mobile cellular telephone
XHH1	Proportion of households with a radio
XHH2	Proportion of households with a TV
XHHR1	Proportion of households with electricity
XHH6	Proportion of households with Internet access at home
YHH5	Proportion of individuals who used a computer (from any location) in the last 12 months
YHH10	Proportion of individuals who used a mobile cellular telephone in the last 12 months
YHH7	Proportion of individuals who used the Internet (from any location) in the last 12 months
i1112	Public payphones
i98	Public payphones per 1000 inhabitants
i71	Revenue from fixed telephone service
i71$	Revenue from fixed telephone service (USD)
i741	Revenue from mobile networks
i741$	Revenue from mobile networks (USD)
i1334WM	Roaming minutes (outside home network)
i1336WM	Roaming minutes by foreign subscribers
i133SMS	SMS sent
i9651	Televisions per 100 inhabitants
i4213	Total fixed Internet subscriptions
i81	Total annual investment in telecommunication

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i81$	Total annual investment in telecommunication (USD)
i117	Total capacity of local public switching exchanges
i4213TFB	Total fixed broadband Internet subscriptions
i51	Total full-time telecommunication staff
i965M	Total number of multi-channel TV subscribers
i271L	Total number of subscriptions to low and medium speed access to data communications
i75	Total revenue from all telecommunication services
i75$	Total revenue from all telecommunication services (USD)
i6111	Urban population (%)
i123	Waiting list for fixed telephone lines

Summary of procedures

Summary of procedures for the aggregation of selected indicators

Domain (alternative)	Subdomain		Selected indicators for country factsheet	Selected indicators for regional aggregation	Weighting variable for aggregation	Remarks for estimating country missing values
ICT infrastructure and access	Telephone network	i91	Fixed telephone lines per 100 inhabitants	Fixed telephone lines (i112)	Population (i61) if the aggregated relative measure (i91) is presented. No weights needed if totals (i112) are presented.	Missing data only for Liberia 2003-2006: break in time series, first years are estimates, later years are from national sources.
		i28	ISDN subscriptions		No weighting needed as i28 is an absolute number	
		I98	Public payphones per 1000 inhabitants		Population (i61)	
		i1163%	Percentage of localities with telephone service		Number of localities (not available in the ITU database)	
		i271POP	Per cent coverage of mobile cellular network (population)		Population (i61)	Requires expert knowledge on the establishment of coverage by the existing mobile telephone companies.
		i911	Mobile cellular subscriptions per 100 inhabitants	Mobile cellular telephone subscriptions (postpaid + prepaid) (i271)	Population (i61) if relative indicator (i911) is presented. No need for weight if total (i271) is presented.	Very few missing data and ITU estimates for i271. Linear interpolation might be possible.
	Infrastructure for Internet	i994u	International Internet bandwidth per Internet user (bit/s)	International Internet bandwith in Mbit/s (i4214)	Internet users (i4212) if the relative measure (per Internet user) is presented.	Unexpected jumps in time series due to new infrastructure.

Summary of procedures

Domain (alternative)	Subdomain		Selected indicators for country factsheet	Selected indicators for regional aggregation	Weighting variable for aggregation	Remarks for estimating country missing values
	Household access to ICT	xHH2	Proportion of households with a TV		Households (i62)	
		xHH4	Proportion of households with a computer		Households (i62)	Mainly ITU estimates: no missing data for i62 except for GNQ (no data at all). Linear growth.
		xHH6	Proportion of households with Internet access at home		Households (i62)	Mainly ITU estimates: no missing data for i62 except for GNQ (no data at all). Linear growth. Max = 100
Internet use and subscriptions	Internet use	i99H	Internet users (%)	Estimated Internet users (i4212)	Population (i61) if relative indicator (i99H) is presented. No need for weight if total (i4212) is presented.	Obtained from estimates of i4212. Max = 100
		i993	Internet subscriptions per 100 inhabitants		Population (i61)	Linear interpolation/growth rates
		i992	Fixed broadband subscriptions per 100 inhabitants	Total fixed broadband Internet subscriptions (i4213TFB)	Population (i61) if relative indicator (i992) is presented. No need for weight if total (i4213TFB) is presented.	Most data are estimates. Data for 2009 can be forecast by applying growth rates
		i911_MB	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants.	Mobile cellular subscriptions with access to data communications at broadband speeds (i271MB_ACCESS)	Population (i61) if relative indicator (i911_MB) is presented. No need for weight if total (i271MB_ACCESS) is presented.	Data only for 2007-2009, many 0's

Summary of procedures

Domain (alternative)	Subdomain		Selected indicators for country factsheet	Selected indicators for regional aggregation	Weighting variable for aggregation	Remarks for estimating country missing values
The ICT sector	The ICT sector	i81$	Total annual investment in telecommunication (USD)		No weighting needed	Very different trends
		i75$	Total revenue from all telecommunication services (USD)		No weighting needed	Very different trends
		i51	Total full-time telecommunication staff		No weighting needed	Linear interpolation/growth rates
Cost of ICT Access and use	Cost of access to fixed telephone services	i151$	Installation fee for residential telephone service (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates
		i152$	Monthly subscription for residential telephone service (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates
	Cost of use of telephone services	i153O$	Price of a 3-minute fixed telephone local call (off-peak rate) (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates. Some values are equal to 0
		i153$	Price of a 3-minute fixed telephone local call (peak rate) (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates. Some values are equal to 0
		i153CO$	Mobile cellular – price of 3-minute local call (off-peak) (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates. Some values are equal to 0
		i153C$	Mobile cellular – price of 3-minute local call (peak) (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates. Some values are equal to 0
	Cost of access to Internet	i4213BS$	Fixed broadband Internet monthly subscription (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates. Some values are equal to 0

Summary of procedures

Domain (alternative)	Subdomain		Selected indicators for country factsheet	Selected indicators for regional aggregation	Weighting variable for aggregation	Remarks for estimating country missing values
		i4213BC$	Fixed broadband Internet connection charge (USD)		Cannot be aggregated without a regional basket	Linear interpolation/growth rates. Some values are equal to 0
Traffic	Incoming telephone traffic	i132TI	International incoming total telephone traffic (minutes)		No weighting needed	Most countries have less than five data points
		i132MI	International incoming fixed telephone traffic (minutes)		No weighting needed	Very different trends
		I1335WM	International Incoming mobile telephone traffic (minutes)		No weighting needed	Very different trends
	Outgoing telephone traffic	i132T	International outgoing total telephone traffic (minutes)		No weighting needed	
		i132M	International outgoing fixed telephone traffic (minutes)		No weighting needed	
		i1333WM	International outgoing mobile telephone trafic (minutes)		No weighting needed	Very different trends
	SMS	i133SMS	SMS sent		No weighting needed	

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Geneva, 2013