

Handbook for the collection of administrative data on telecommunications/ICT

2020 edition



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Acknowledgements

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Foreword

Welcome to the new edition of the *ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT*. This handbook, which contains over 90 internationally-agreed indicators to help track global ICT developments, is an important reference document for collecting and analysing data on the telecommunication services sector. It is designed to help countries monitor progress towards becoming information societies, based on international statistical standards, and is an important contribution to improving analysis and benchmarking across countries.

ITU has a long history of collecting, harmonizing and disseminating statistics on telecommunications and ICTs, and is recognized as the prime source of internationally comparable data in this field. The first version of the ITU Handbook was published 26 years ago, in 1994, with a revised version in 2011. Since then, ICT indicators and definitions have undergone important amendments, reflecting a rapidly changing telecommunication/ICT environment in terms of technologies, market trends and regulations. These changes are reflected in this substantially revised edition, which has been considerably enhanced in terms of scope and level of detail.

The expansion and revision of indicators over the past two and a half decades reflects not only the changes in the telecommunication/ICT services sector, but also the fact that ICT developments have become a key feature in today's overall development debate.

Some of the indicators included in this handbook are part of a wider effort to monitor the information society – for example, the *Core List of ICT Indicators* and the *Thematic List of ICT indicators for the SDGs*, both by the *Partnership on Measuring ICT for Development*, as well as indicators to measure the achievement of the World Summit on the Information Society (WSIS) targets. This new edition of the handbook also covers indicators included in other international development initiatives, including the Sustainable Development Goals (SDGs).

ITU was founded on the principle of international cooperation between governments and the private sector. As in other areas, its statistical work benefits from close collaboration with Member States and Sector Members, as well as with regional and international organizations working in the area of ICT measurement. Their input and expertise over the years has allowed ITU to produce a set of harmonized and internationally comparable telecommunication/ICT statistics that will serve as a solid, impartial and reliable foundation for policymaking.

I am confident that this handbook will remain a key reference document for all those involved – directly or indirectly – in measuring digital development.



Doreen Bogdan-Martin
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I. Introduction

1. The main purpose of the *Handbook for the Collection of Administrative Data on Telecommunications/ICT* is to provide a key reference document for a set of internationally comparable telecommunication and information communications technology (ICT) indicators based on administrative sources. The Handbook includes definitions and methodological clarifications for over 90 internationally agreed indicators and corresponding sub-indicators. Indicators included in the Handbook refer mainly to telecommunication activities within the ICT services sector, and in some specific cases also to broadcasting activities within the content and media sector as defined in ISIC Revision 4.¹ The Handbook is primarily intended for data collectors, such as national telecommunication regulatory authorities (NRAs) or ministries.

2. This is the latest edition of the ITU *Handbook for the Collection of Administrative Data on Telecommunications/ICT* published in 2011.² Over the past nine years, there have been additions and revisions to the 81 original indicators, most notably in Internet traffic, quality of service, and telecommunication prices³. This edition incorporates the modifications that reflect the outcomes of the Expert Group on Telecommunication/ICT Indicators (EGTI), as endorsed by the World Telecommunication/ICT Indicators Symposium.

3. The *Handbook* has a long history. It has evolved from the original *Telecommunication Indicators Handbook* issued by ITU in 1994.⁴ Since then, there have been tremendous changes in the telecommunication sector, such as the growth of mobile-cellular communications and the continuing development of the Internet. This Handbook reflects these developments, with indicators covering mobile-cellular and Internet networks and services in addition to the traditional public switched telephone network (PSTN) and fixed-telephony services. Convergence of networks, services and devices, is also changing the way people access and use telecommunication services, and blurring the boundaries between traditionally distinct categories, such as broadcasting and telecommunication activities. The Handbook includes a set of indicators on broadcasting. When new developments in terms of convergence materialize, additional indicators may be needed to further track the phenomenon. The Handbook also reflects the growing importance of ICT in helping to implement national development strategies, with reference to indicators proposed for monitoring the Sustainable Development Goals (SDGs),⁵ the targets of the World Summit on the Information Society (WSIS)⁶ and the core ICT infrastructure and access indicators of the Partnership on Measuring ICT for Development (see Table 1).⁷

¹ ISIC is the International Standard Industrial Classification of All Economic Activities. A small number of indicators may be covered by the category *Television programming and broadcasting activities* within the content and media sector in ISIC Rev. 4. More information on the classification of information economy activities within ISIC, Revision 4, can be found in Annex 4.

² See https://www.itu.int/pub/D-IND-ITC_IND_HBK-2011.

³ See *New telecommunication/ICT indicators from administrative data sources, 2011-2013*, https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-C1-PDF-E.pdf and the *Methodology for the collection of revenue and investment data on telecommunications* https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-C2-PDF-E.pdf

⁴ ITU (1994), *Telecommunication Indicator Handbook*. For one of the earliest applications of telecommunication indicators, see: Tim Kelly (1990), *Performance Indicators for Public Telecommunications Operators*, OECD.

⁵ See *United Nations Sustainable Development Goals* at <https://sustainabledevelopment.un.org/>.

⁶ See ITU (2003), 'Plan of Action', *World Summit on the Information Society outcome documents*, Geneva, available at <http://www.itu.int/wsis/docs/geneva/official/poa.html>.

⁷ See *Partnership* (2016), *Core list of ICT Indicators*, available at <https://www.itu.int/en/ITU-D/Statistics/Pages/coreindicators/default.aspx>.

4. The revision of existing indicators and the definition of new indicators are carried out in close consultation with the ITU membership and international experts. The annual ITU World Telecommunication/ICT Indicators Symposium (WTIS) provides a global forum for discussing emerging issues related to ICT measurement. The Expert Group on Telecommunication/ICT Indicators (EGTI), created in 2009 and open to ITU members and ICT experts, provides an online discussion forum. It has a mandate to revise the ITU telecommunication/ICT indicators and reports back to WTIS. The indicators included in this Handbook have been subject to, and reflect the outcomes of, discussion in EGTI.
5. Administrative statistics form the basis of the indicators discussed in this Handbook. They cover operational, technical and financial data from operating entities in the telecommunication services sector, and some operational data from entities engaged in broadcasting activities. The indicators cover numbers of subscriptions, minutes of usage and revenues generated from the provision of telecommunication/ICT services, as well as subscription data for some television broadcasting services. These data are usually collected by government agencies (NRAs or ministries), which then compile the statistics to produce country-level indicators.
6. The types of indicators in this Handbook are different from statistics collected from ICT users, often through household or business surveys. Such surveys collect information on the ownership or use of ICTs within households and businesses or by individuals.⁸
7. The advantage of administrative statistics is that they are usually readily available for a large number of countries. They are also generally up to date and relatively inexpensive to produce, as they are based on administrative records. On the other hand, administrative data do not necessarily provide as accurate an insight into usage as survey data. For example, subscription indicators can include inactive or duplicate accounts that may provide a misleading interpretation of penetration; this is not a problem with survey data, where respondents are specifically asked if they have used a service. A particular advantage of survey data is that they may be tabulated by respondent characteristics, thus providing important additional information. Data may be classified by individual demographic characteristics (such as age and gender), household characteristics (such as number of members) and business characteristics (such as size and industry).

⁸ For information about core ICT indicator data for households and individuals, see ITU (2020), *Manual for measuring ICT access and use by households and individuals*. For information about core ICT indicator data for businesses, see UNCTAD (2009), *Manual for the Production of Statistics on the Information Economy*.

Table 1: Telecommunication indicators in global development agendas

	SDG Indicators	Partnership on Measuring ICT for Development
Indicators covered in this Handbook	<ul style="list-style-type: none"> • Target 9c – SDG indicator 9.c.1: Percentage of the population covered by a mobile network, broken down by technology • Target 17.6 – SDG indicator 17.6.2: Fixed Internet broadband subscriptions, broken down by speed 	<ul style="list-style-type: none"> • A1: Fixed-telephone subscriptions per 100 inhabitants • A2: Mobile cellular telephone subscriptions per 100 inhabitants • A3: Fixed broadband Internet subscriptions per 100 inhabitants, broken down by speed • A4: Active mobile-broadband subscriptions per 100 inhabitants • A5: International Internet bandwidth per inhabitant (bits/second/inhabitant) • A6: Percentage of the population covered by a at least a 3G mobile network • A7: Fixed broadband Internet prices per month • A8: Mobile cellular telephone prepaid prices per month • A9: Mobile broadband Internet prices per month • A10: TV broadcasting subscriptions per 100 inhabitants

8. The remainder of this Handbook is structured as follows: Section II discusses issues related to the collection, compilation and dissemination of indicators. Chapters 1 to 9 present each indicator and provides definitions, along with clarifications on the definitions and terms used, scope, method of collection, relationship with other indicators, methodological issues and examples. Annex 1 provides a summary table of the indicators and their relationships. Annex 2 shows a list of indicators previously collected by ITU and not included in this Handbook. Annex 3 provides a list of useful terms and abbreviations, and Annex 4 presents the ISIC Rev. 4 breakdown of sectors and activities pertaining to the information economy.

II. Data collection, compilation and dissemination

9. This chapter provides guidance on the methodological and technical aspects of collecting, compiling and disseminating telecommunication/ICT indicators (Figure 1). It is aimed at agencies responsible for these tasks, but should also be useful for others interested in the underlying concepts and statistical challenges associated with the indicators. The range of stakeholders involved in processing or using these indicators is shown in Figure 2.

Figure 1: Indicator processing cycle

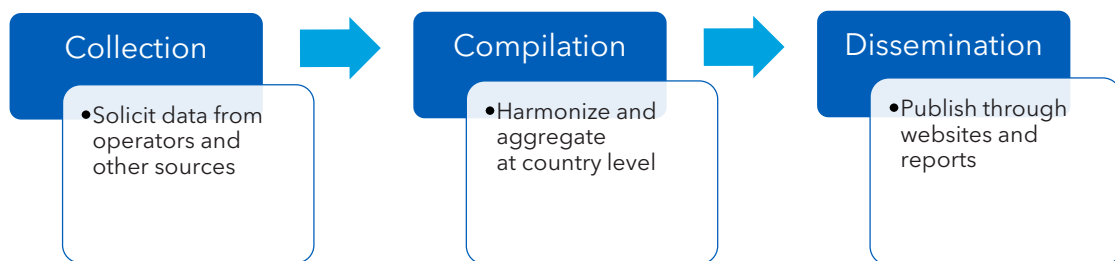
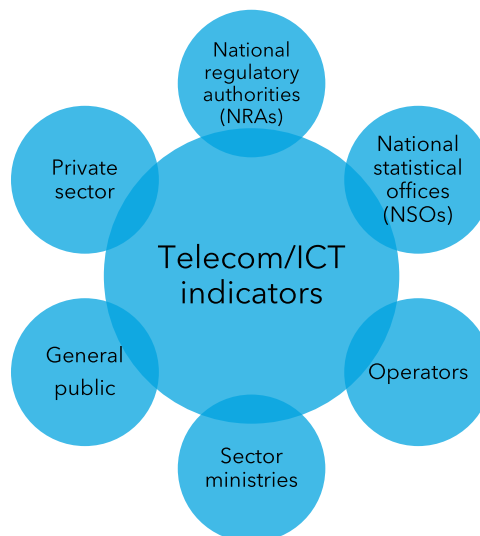


Figure 2: Telecommunication/ICT indicators stakeholders



Source: ITU

10. *Operators* in Figures 1 and 2 refer to service providers, including fixed- and mobile-telephone operators, Internet service providers, and some television broadcasters.

Data Collection

Responsibility

11. In most countries, the national telecommunication regulatory authority (NRA) is responsible for collecting, compiling and disseminating statistics covering the telecommunication/ICT services sector. This typically arises out of the authority mandate to regulate, analyse and monitor the sector (Box 1). In some countries, sector ministries or national statistical offices (NSOs) are responsible for collecting telecommunication/ICT indicators based on administrative sources.

12. The sector ministry may also play an important role in some countries in respect of telecommunication/ICT data compilation and analysis. A ministry might draw data from other sources to provide a comprehensive portrait of the status of ICT in the country. In Egypt, for instance, the NRA collects basic telecommunication network statistics, whereas the Ministry of Communications and Information Technology (MCIT) produces monthly data, quarterly bulletins and annual reports that are wider in scope, with analyses of trends and progress towards sector goals. The data are disseminated through the MCIT ICT statistics portal.¹

13. In different countries specific aspects of regulation are allocated to different entities. For example, universal service or spectrum allocation and management in many countries are responsibility of the ministry in charge of telecommunications, and not in the realm of the national regulatory authority (NRA). In these cases, relevant (i.e., spectrum) data shall be available from the ministry or governmental agency responsible for its implementation.

14. Many countries have designed specific digital agendas by which they establish objectives of penetration, coverage and usage to be reached in different time periods. These plans usually convey efforts by different governmental agencies and coordination may rest in a specific ministry or governmental agency. These are the agencies that coordinate the collection of the data needed for the planning and monitoring of the activities and are, hence, the ones to provide the relevant data².

15. Regardless of responsibility, there should be close collaboration between the sector ministry, the NRA and the NSO. This is necessary for several reasons. First, the ministry and NRA are likely to be aware which telecommunication/ICT infrastructure indicators are important and should be collected. Second, even if the NRA collects the data, the NSO statistical expertise can be very valuable. Third, the NSO may collect ICT household and individual usage data through surveys that can be complemented by – and often combined with – the telecommunication/ICT data from administrative sources.

¹ See the ministry ICT Indicators portal at <http://www.egyptictindicators.gov.eg/en/Pages/default33.aspx>.

² Network coverage and quality of service is monitored in many countries, often by NRAs, ministries or specific public agencies. For examples on coverage maps and indicators, <https://www.oecd.org/sti/broadband/broadband-statistics/>

Box 1: Legal basis for information collection and dissemination, Malaysia

Malaysia's ICT sector laws establish the legal basis for the national regulatory authority, the Malaysian Communications and Multimedia Commission (MCMC), to collect and disseminate ICT sector information.

Under Section 73 of the *Communications and Multimedia Act 1998* (incorporating amendments up to 1 January 2006), MCMC is allowed to obtain information necessary for carrying out its functions:

73. (1) This section applies to any person if the Commission has reason to believe that the person -

(a) has any information (including but not limited to accounts and records) or any document that is relevant to the performance of the Commission's powers and functions under this Act or its subsidiary legislation; or

(b) is capable of giving any evidence which the Commission has reason to believe is relevant to the performance of the Commission's powers and functions under this Act or its subsidiary legislation.

(2) Notwithstanding the provisions of any other written law, the Commission may, by a written notice, direct any person -

(a) to give the Commission, within the period and in the manner and form specified in the notice, any such information;

(b) to produce to the Commission, within the period and in the manner specified in the notice, any such documents, whether in a physical form or in an electronic media;

(3) The Commission shall allow the person so directed under subsection (2) a reasonable time to give and to produce any information and/or documents specified in the notice.

(4) Any person required to provide information under subsection (2) shall ensure that the information provided is true, accurate and complete and such person shall provide a representation to that effect, including a representation that he is not aware of any other information which would make the information provided untrue or misleading

Furthermore, Section 80 of the Act gives MCMC the right to publish information received in regard to executing its duties:

80. (1) The Commission may publish information received in the course of exercising its powers and functions under this Chapter if it is satisfied that the publication is consistent with the objects of this Act.¹

¹ Section 73 and 80, "Provision of information" in *Communications and Multimedia Act 1998, Incorporating all amendments up to 1 January 2006*, available at <https://www.skmm.gov.my/en/legal/acts/communications-and-multimedia-act-1998-reprint-200>.

Box 2: Data collection in the European Union

Data requests on operators is an essential input for national regulatory authorities (NRAs) adequate decision making, monitoring of market developments and regulation as well as for the planning of Digital Agenda objectives. The new Electronic Communications Code (2018) in the EU provides explicit powers to any NRA for collecting all the necessary information to develop the goals established by the Code and the domestic legislation.

Any NRA is empowered to request from operators any information needed to fulfil their tasks, including accounting data of the retail services that relate to wholesale services that may be regulated by the NRA. The data requests must be proportional to the objective sought and should not impose an undue burden to the undertakings. The NRA shall respect the confidentiality rules existing in domestic legislation.

Given the service innovations and the convergence that takes place in the industry NRA may, in specific circumstances, request market information from undertakings that even if not offering an electronic communication service themselves, their activity is closely related to the electronic communication services industry, inasmuch as the information is needed for fulfilling the regulatory tasks.

The concept of electronic communication service has been enlarged in the European Code, as it encompasses as well services, as voice or video calls over the open Internet, that are functionally equivalent to traditional ones even if they are offered via an Internet access provider. Hence, interpersonal communication services fall into the realm of the NRA, i.e., services that offer interpersonal and interactive exchange of information between a finite number of persons predetermined by the sender of information. Additionally, the EU Code empowers NRAs to collect information with geographical detail on network coverage of existing networks and possible plans for future deployment or upgrading of any fixed and mobile networks by active operators.

The EU Code introduces the mandate to publish the information gathered by the competent NRA in as much as this may contribute to an open and competitive market and conveys information to end users on the quality and conditions of coverage of the different networks. The publication and sharing of any data collected by an NRA shall respect in any case confidentiality rules existing in domestic legislation. Confidentiality clauses should be defined prior to the information requests and communicated to market players or affected institutions.

Source

16. Telecommunication operators, Internet service providers (ISPs) and broadcasters compile statistical information to support their operational, technical, billing, marketing and financial activities. For example, subscription and traffic information is used to generate invoices, which are in turn aggregated to derive revenue. Publicly listed operators publish varying degrees of statistical information in operating reports.

17. NRAs maintain a register of licences that can be used to identify sources of telecommunication/ICT indicators. One challenge is defining the scope of operators as information sources. For example, a country may have resellers of ICT services, such as companies that purchase wholesale capacity from facilities-based operators in order to provide fixed-telephone, mobile or Internet services. In this Handbook, data refer to the retail level – the reselling activity in this example. In countries where ISPs can operate without a licence, data collection is more difficult. Nevertheless, there is generally some type of administrative application required to provide Internet access and this could be exploited for information purposes.

18. Occasionally, operators express confidentiality concerns about the data being collected. In such cases, the NRA may guarantee the non-disclosure of disaggregated data. In the case of publicly listed operators, much of the information solicited is similar to data reproduced in company operating reports. In the case of state-owned operators, the government owners should have access to information about operations.

19. Making the data requirement provisions of the law clear to operators when they accept their licence can minimize confidentiality concerns. For example, in many countries the right of the NRA to solicit information is embedded in telecommunication law or licence conditions. Confidentiality can also be addressed by aggregating data and not disclosing the data of individual operators. The NRA should meet with stakeholders to explain why data are needed and emphasize the benefits to operators in terms of their understanding of the industry in which they work.³ NRAs can also point to the indicators available from other countries as evidence that the information being requested is not generally considered confidential, at least at the aggregate level.

20. Data are sometimes available from industry associations. This ensures consistency, since each operator supplies data to the association in the same form. The data are often more timely than those produced by government agencies. The drawback is that the indicators tend to cover only one market segment, thus requiring collection from additional sources to obtain a comprehensive picture of the telecommunication service sector. Definitions may not be exactly the same as those used by official national or international agencies. Nevertheless, industry associations can be a timely and detailed source of information and may allay operator confidentiality concerns.

21. There are several examples of industry associations compiling data, primarily emanating from the mobile sector. For example, the Canadian Wireless Telecommunications Association (CWTA) publishes quarterly data on mobile subscriptions in Canada, broken down by operator and between prepaid or postpaid.⁴ In Japan, the Telecommunications Carrier Association (TCA) compiles comprehensive quarterly data on the mobile sector, as well as annual reports on the overall telecommunication market.⁵

22. Regarding mobile networks, the GSM Association (GSMA) offers detailed information as provided by telecommunication operators around the world on the coverage of 2G, 3G and 4G networks with great geographical detail⁶. It also informs of recent deployments of 5G networks.

³ Indeed, a number of operators rely on NRA data to provide overall market information in their operating reports. For example, see Singapore Telecommunications Limited (2019), *Management discussion and analysis of financial condition, results of operations and cash flows for the fourth quarter and year ended 31 March 2019*, available at <https://www.singtel.com/content/dam/singtel/investorRelations/financialResults/2019/Q4FY19-MDA.pdf>.

⁴ See *Industry Statistics* at <https://www.cwta.ca/facts-figures/>.

⁵ See <http://www.tca.or.jp/english/database/index.html>.

⁶ See <https://www.gsma.com/coverage/>

Periodicity

23. Telecommunication/ICT indicators are structured as time series. Each observation in the series refers to a specific date or time period (e.g., monthly, quarterly, semi-annual, annual) and ideally should be maintained in this structure to support trend analysis. The indicators in this Handbook generally refer to annual data, ideally sufficiently consistent to enable the construction of time series (i.e., a set of comparable observations over time).

24. There may be reasons for compiling data on a more frequent (sub-annual) basis. The ICT sector is dynamic, with some segments growing rapidly and warranting more frequent measurement. Shorter time intervals also generally reduce the timeliness gap. Among NRAs that produce statistics on a sub-annual basis, quarterly is the most frequent period. This is also consistent with the practices of publicly listed operators, which generally report to their shareholders on a quarterly basis. A few NRAs produce indicators on a monthly or semi-annual basis.

25. Data may be point-in-time (e.g., counts at a specific date) or cover a period (e.g., revenue for a given year). Revenue, investment, portability, quality of service and traffic indicators included in this Handbook refer to annual data, while the remaining indicators correspond to point-in-time data. The Handbook assumes that point-in-time data are provided in respect of the end of the calendar year (i.e., 31 December) and that period data refer to the year ending 31 December. Some countries report period and/or point-in-time data on the basis of a year not ending on 31 December. Where this is the case, countries should specify this in a note along with the date/time period to which the data refer. The data should be disseminated closest to the end of the year to which they refer (e.g., fiscal year data ending 31 March should be published as the previous year with a note stating that the data refer to the year beginning 1 April).

Compilation

26. In most countries, telecommunication/ICT administrative statistics are solicited from operators, typically through questionnaires. The data are then aggregated to generate country-level data. National data may also feature breakdowns by operator or by geographical unit. The former allows market-share analysis to be conducted, while the latter support analysis of the dispersion of networks and services throughout different regions of a country. Different network statistics may also be aggregated to generate overall totals, such as adding together fixed-telephone and mobile-telephone traffic to obtain total telephone traffic for the country.

27. The agency responsible for the data collection at the national level may use separate questionnaires for each type of network (e.g., fixed-telephone line, mobile). Questionnaires should also ask about several reference periods in case operators need to make revisions to previous data. In the case of Luxembourg and Portugal, the NRA has different questionnaires for fixed-telephone, mobile and broadcast networks, which are downloadable from its website.⁷

28. One compilation issue relates to indicators that are derived or calculated. In this Handbook, most indicators refer to a base number that may then be used to derive another indicator. For example, the Handbook defines the number of mobile-cellular subscriptions; this statistic can then be used to calculate the number of mobile-cellular subscriptions per 100

⁷ Institut Luxembourgeois de Régulation, *Questionnaires ILR*, <https://web.ilr.lu/FR/Professionnels/Communications-electroniques/Statistiques/Questionnaires>, and ANACOM, Portugal, *Listagem de informação periódica a remeter à ANACOM - empresas que fornecem redes e serviços de comunicações eletrónicas*, <https://www.anacom.pt/render.jsp?contentId=1500202>

inhabitants. Derived indicators are identified in Chapter 3, which also addresses compilation issues for other relevant indicators.

Disaggregation by operator

29. Disaggregation of data by operator allows market-share analysis to be conducted. This can be necessary, for example, to make a significant market power (SMP) determination.⁸ When an operator is declared to have SMP in a market, it is usually subject to different regulatory treatment.

30. Another use of operator market-share data is to measure concentration. The Herfindahl-Hirschman index (HHI) is a widely used indicator of market concentration.⁹ The HHI is constructed by adding up the squares of the market shares of each operator. Its value ranges between zero and 10 000 – the closer the HHI is to zero, the less concentrated the market. The HHI was used in a case before the Chile competition authority, with the market shares of mobile operator revenue used to derive the HHI (see Table 2).¹⁰ The Mexico Instituto Federal de Telecomunicaciones publishes several concentration measures, as CR1, CR4 and HHI, in a number of markets (mobile, fixed broadband, pay TV, among other) calculated based on revenues, active lines, subscribers or volumes of traffic¹¹.

Table 2: Market share by revenues in the national mobile telephone market, Chile, September 2006

Company	Market share (%)	Market share squared
TEM	45.4	2 061
ENTEL PCS	38.4	1 475
Claro	16.2	262
HHI		3 798

31. Market-share information is also useful to construct weighted averages for indicators that do not lend themselves to aggregation or simple averaging (e.g., pricing data). An example is the calculation of average mobile interconnection rates for countries by weighting each operator rate according to the number of subscriptions.¹²

Disaggregation by administrative unit

32. Some NRAs present telecommunication/ICT indicators at the level of administrative units within the country, such as provinces or states. This allows data to be analysed for disparities between different geographic regions. Countries also sometimes provide a more general

⁸ See <http://www.ictregulationtoolkit.org/toolkit/2.2.2.2>.

⁹ ICT Regulation Toolkit, *Quantitative Tests for Market Power*, http://www.ictregulationtoolkit.org/practice_note?practice_note_id=2880.

¹⁰ Fiscalía Nacional Económica (2007), *Requerimiento en contra de Telefónica Móviles de Chile s.a., Telefónica Móviles Chile s.a., Claro Chile s.a., y Entel Pcs Telecomunicaciones s.a., por exclusión de operadores móviles virtuales*, 14 August, available at https://www.fne.gob.cl/wp-content/uploads/2011/03/requ_0004_2007.pdf.

¹¹ Banco de Información de Telecomunicaciones, <https://bit.ift.org.mx/BitWebApp/>

¹² For example, the Body of European Regulators for Electronic Communications (BEREC) uses the market shares of operators (based on subscriptions) to calculate average mobile interconnection rates for countries. See *Termination rates at the European level (July 2019)*, BoR (19) 234Rev.1 https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8900-termination-rates-at-european-level_0.pdf.

disaggregation between urban and rural areas. Information that lends itself well to this kind of analysis is data on fixed networks, where the subscribers are known and their locations are fixed. It has been more problematic to provide a breakdown by administrative unit for mobile networks, particularly because of a lack of information about prepaid subscriptions. This is changing to the extent that prepaid registration requirements are being adopted by countries.

33. One use of geographic breakdowns is to monitor the spread of telecommunication/ICT networks and services. This might be tied to specific regulatory remedies for reducing disparities. In Malaysia, for example, universal service assistance for broadband access is available for underserved areas; these are defined as areas where the penetration rate for broadband subscriptions is below the national rate.¹³ The NRA in Malaysia publishes broadband subscriptions based on residential or business use, thus allowing it to compile the ratio of residential broadband subscriptions per 100 households per state.¹⁴ This determines which states would be eligible for universal service support.

34. In many countries digital agendas have been approved and are being implemented. Usually they encompass a set of objectives to be reached, both for coverage of fixed and mobile networks and quality of service parameters and for the usage or adoption of specific services, as mobile or fixed broadband. For the monitoring of these objectives, it is fundamental to monitor the deployment of fixed and mobile networks with a high geographical detail. Digital agendas objectives may be coordinated by the NRA, a specific ministry in charge of telecommunication policy or a specific public agency in charge of the agenda. The responsible institution coordinates as well the collection of data needed for the monitoring of the various objectives to follow, which usually imply the collection of coverage of networks, adoption rates of traditional services, penetration of digital services offered by new agents that use the Internet as a distribution system, as well as connectivity measures among machines and cloud computing usage, among others. Two examples that illustrate the variety and extension of the data to be collected can be found in Brazil and Spain.

35. The Regional Center for Studies on the Development of the Information Society - Cetic.br (<https://cetic.br>), linked to the Brazilian Network Information Center (NIC.br), is a non-governmental think tank responsible for the production of ICT-related statistics and data analysis to monitor the digital transformation agenda in Brazil. Based on a multi-stakeholder approach, Cetic.br works in close cooperation with the National Telecommunications Agency - Anatel (NRA), the Brazilian Institute of Geography and Statistics - IBGE (NSO), the Ministry of Science, Technology, Innovation and Communications and other relevant actors from the government, academy, international organizations and civil society to develop an ICT measurement ecosystem that allows for the production of sound and updated data for policymaking and research. It publishes periodic demand side ICT standalone surveys and sectoral studies on the use of ICTs and the Internet by several segments of society (such as households, enterprises, government, schools, healthcare facilities, cultural institutions and non-profit organization). Cetic.br also conducts supply-side indicators, such as the nationwide survey on Internet service providers (ISPs). As a UNESCO Category II Centre, Cetic.br provides capacity-building to decision-makers and data producers in Portuguese speaking countries in Latin American and Africa in order to support evidence-based policymaking and the development of tools to monitor and assess

¹³ MCMC, *Universal Service Provision Annual Report 2018*, available at <https://www.mcmc.gov.my/en/sectors/universal-service-provision>.

¹⁴ MCMC, *Communications and Multimedia: Pocket Book of Statistics 2018*, available at <https://www.mcmc.gov.my/en/resources/statistics>.

the socioeconomic impacts of the digital economy. Notably, Cetic.br makes survey micro-data available to the public for re-use and analysis purposes.

36. Red.es is a public agency in Spain devoted to monitor and help implementing the digital agenda goals established by the government in Spain. For this purpose, it coordinates an extensive amount of data being collected by other institutions, collects information directly from the relevant agents in the economy and conducts a number of analysis and studies that aim to identify the use of ICTs by firms and individuals in Spain and evaluate public policies that promote its usage (<https://red.es/redes/>).

Dissemination

37. There are a number of ways that telecommunication/ICT indicators are disseminated. These include national regulatory authority or ministry websites and published reports. Some countries opt only to send data to international organizations for dissemination. However, this may lack the context and commentary that is associated with national reporting. Furthermore, there may be some indicators not considered in international lists that are relevant to the country. As noted earlier, disaggregation at the operator or country level also serves important analytical purposes. Periodicity and timeliness are relevant, too. Some countries strike a balance between periodicity and detail, with frequent online updates to a few indicators on a website and more detailed analytical reports on a less frequent basis.

38. Most regulatory authorities around the world have a specific section in their web sites where indicators on the telecommunication markets are published. These data portals vary greatly in functionalities and data sets offered. Some offer a list of reports, i.e., quarterly or monthly, which can be downloaded. Some, by contrast, offer many functionalities with a specific software with which the user may select different indicators, transform them and construct different figures, graphs and tables with them online. All data portals offer the possibility to download the data, usually in open or easy to use formats.

39. The majority of NRAs around the world publish periodic reports with indicators collected (usually on a quarterly basis) on telecommunication/ICT markets. Some examples are provided in Table 3. Very often the data collected, or at least a subset of it, are offered for download in open access format. As of today, many NRAs do not yet provide detailed geographical coverage of networks deployed, be it either fixed or mobile.

40. Regional and international entities also collect and disseminate telecommunication/ICT data. Cross-country comparisons are facilitated because the data have been collected using common standards and are accessed via a standard interface. The European Commission¹⁵ publishes many indicators on telecommunication and ICT services with information usually collected by each NRA at the domestic level. Eurostat, the statistical service of the European Union, publishes indicators for its member states through an online database.¹⁶ The Commission also produces additional indicators, such as the annual benchmarking of broadband prices across the European Union, specific telecommunication/ICT surveys or the Digital Economy and Society Index (DESI). The OECD, for example, offers through its broadband portal a rich

¹⁵ See <https://ec.europa.eu/digital-single-market/en/news/study-broadband-coverage-europe-2018>

¹⁶ See <https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database>

set of indicators on penetration of main services, links to digital agendas and network coverage information as well as price benchmarking of main retail services for its member countries.¹⁷

41. Many regulatory agencies have also created regional associations of NRAs where they can coordinate telecommunication/ICT policies, exchange experience in the areas of regulation, policy monitoring and data collection¹⁸. Some associations offer specific sets of indicators in their data portal. These experiences help individual countries in achieving greater homogeneity in the definitions, scope and methodologies for data collection and dissemination, as well as in conducting benchmarking of indicators, policies and trends which may help in the design of objectives, policies and their monitoring.

Table 3: Selected examples of data portals on network coverage and market data by region

Region	Country	Network coverage / Quality of service	Market data
Africa	Botswana	https://www.bocra.org.bw/sites/default/files/Mobile_Network_Coverage.pdf	https://www.bocra.org.bw/telecoms-statistics
	Nigeria	https://www.ncc.gov.ng/applications-databases/qos-state-level-data	https://www.ncc.gov.ng/statistics-reports/industry-overview#view-graphs-tables-2
	Rwanda	https://www.mobilecoveragemaps.com/map_tz#7/-6.249/35.021	https://www.rura.rw/index.php?id=194_
	South Africa		https://www.icasa.org.za/legislation-and-regulations/state-of-ict-sector-in-south-africa-2019-report
	Tanzania	https://www.mobilecoveragemaps.com/map_tz#7/-6.249/35.021	https://www.tcra.go.tz/images/documents/telecommunication/TelCom_Statistics_Sept_2019.pdf
The Americas	Brazil	https://www.anatel.gov.br/dados/mapeamento-de-redes	https://www.anatel.gov.br/dados/component/content/article/124-manchetes/364-nova-interface-facilita-a-visualizacao-de-dados-do-setor-de-telecom
	Costa Rica	https://mapas.sutel.go.cr	https://sutel.go.cr/sites/default/files/sutel_informe-esp_18_junio_ver_baja_0.pdf
	Mexico	https://bit.ift.org.mx/BitWebApp/	https://bit.ift.org.mx/BitWebApp/
	Peru	https://serviciosweb.osiptel.gob.pe/CoberturaMovil/	https://punku.osiptel.gob.pe
	United States	https://broadbandmap.fcc.gov/	https://www.ntia.doc.gov/data/digital-nation-data-explorer#sel=callConfUser&disp=map

¹⁷ See <https://www.oecd.org/sti/broadband/broadband-statistics/>

¹⁸ There are many such regional associations around the world, see: https://www.itu.int/ITU-D/treg/Documentation/Table_region_reg_assoc.pdf.

Table 3: Selected examples of data portals on network coverage and market data by region (continued)

Region	Country	Network coverage / Quality of service	Market data
Arab States	Egypt	https://tra.gov.eg/en/industry/quality-of-service/Pages/Quality-of-Services-Reports.aspx	http://www.egyptictindicators.gov.eg/en/Publications/PublicationsDoc/Indicators%20Bulletin%20Quarterly%20Issue%20-%20June%202019%20(English).pdf
	Morocco	https://www.gsmarena.com/network-bands.php3?sCountry=MOROCCO	https://www.anrt.net.ma/indicateurs/observatoires
	Oman	https://www.tra.gov.om/pdf/5_years_at_glance_2013_2017.pdf	https://tra.gov.om/market/quarterly-telecom-statistics_
	Tunisia	http://www.intt.tn/fr/index.php?typeactu=91&actu=334	http://www.intt.tn/fr/index-rapports-trimestriels-266-403.html
	United Arab Emirates	https://www.tra.gov.ae/en/open-data.aspx	https://www.tra.gov.ae/en/open-data.aspx
Asia & Pacific	India	https://analytics.trai.gov.in	https://main.trai.gov.in/release-publication/reports/performance-indicators-reports
	Malaysia	https://www.mcmc.gov.my/en/home	https://www.mcmc.gov.my/en/resources/statistics/communications-and-multimedia-pocket-book-of-statistics
	Pakistan	https://www.pta.gov.pk	https://www.pta.gov.pk/index.php/en/telecom-indicators
CIS	Russian Federation	https://digital.gov.ru/opendata/	https://digital.gov.ru/opendata/
Europe	France	https://www.data.gouv.fr/fr/datasets/mon-reseau-mobile/	https://www.data.gouv.fr/fr/datasets/indicateurs-dactivite-des-operateurs-de-communications-electroniques/
	Georgia	https://analytics.gncc.ge/en/statistics-share/?c=internet&f=subscribers	https://analytics.gncc.ge/en/
	Ireland	https://coveragemap.comreg.ie/map	https://www.comreg.ie/industry/electronic-communications/data-portal/
	Portugal	https://www.anacom.pt/render.jsp?categoryId=385712	https://www.anacom.pt/render.jsp?categoryId=520&tab=379826
	Spain	https://avancedigital.gob.es/banda-ancha/cobertura/Paginas/informes-cobertura.aspx	http://data.cnmc.es/datagraph/
	United Kingdom	https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/advice/ofcom-checker	https://www.ofcom.org.uk/research-and-data/data/opendata

Box 3: The Mexican Telecommunications Databank

The Instituto Federal de Telecomunicaciones (IFT) created in 2016 what is probably the most comprehensive and modular telecommunication and broadcasting databank offered by any regulatory authority. The Mexico Telecommunications Databank (*Banco de Información de Telecomunicaciones* (BIT)) is a state-of-the-art website based on a business intelligence logic. Both in terms of data series available in the BIT (indicator frequency and time span) and the possibilities offered to work, exploit, visualize, and export data and reports from the application offered, are exceptional.

Quarterly and annual reports (historic series) for general industry data (GDP, revenues, national and foreign direct investment, employment, prices and concentration indices, among others), mobile and fixed networks services, open air TV and pay TV services, radio, as well as major wholesale services are offered for long time series periods (some of them since 1971) and at low disaggregation levels. All data can be visualized as well by operator, federal state and even municipalities. Since 2018, the BIT also includes information related to radioelectric spectrum tenure by operator and frequency band.

The BIT was designed to be accessed by a range of users, from basic to specialized users. The databank flexibility allows users to select indicator subsamples, filtering variables, time series selection, numerical operations on existing data series, as well as adding/removing/subtracting variables in a given table or plot. With a wide variety of figures, plots, styles and scales, the user can easily define table and figure templates and forecasts.

Data and figures can be easily visualized on computers, smartphones or tablets, and downloaded in the form of standardized reports or personalized queries for specialized users.

International benchmarks are also available. It is possible to compare Mexico among economies with similar GDP per capita and its main trade partners (Argentina, Brazil, Canada, Chile, China, Colombia, Turkey, and the United States of America). Comparisons not only cover traditional fixed and mobile telecommunication services, but also penetrations of audiovisual over-the-top subscriptions. In addition, in partnership with Regulatel (Association of regulators not only from Latin America and the Caribbean but also from Europe—Italy, Portugal, and Spain), the IFT receives and processes quarterly statistics from 22 countries (including Cuba). Visualization and exploitation of this data is available by country, telecommunication service, and degree of connectivity.

In accordance with IFT policies, the BIT includes gender related statistics. Moreover, the BIT now publishes survey data, as well as data from operators, collected by the Mexican National Statistical Office (INEGI) in collaboration with IFT and the Ministry of Communications and Transport (SCT). The "National Survey of ICT & Internet Use by Mexican Households (ENDUTIH)" is prepared on an annual basis, has a sample of more than 150 000 households, and collates national and state level data, including 49 cities, which represent almost 50 per cent of the Mexico population.

Source: Banco de Información de Telecomunicaciones (BIT): <https://bit.ift.org.mx/BitWebApp/>

Role of ITU in the collection and dissemination of telecommunication/ICT data

42. ITU collects, verifies and harmonizes telecommunication/ICT data from about 200 economies worldwide.¹⁹ There are three key sets of data that ITU collects directly from countries:

- Telecommunication/ICT infrastructure and access data – collected from national telecommunication/ICT ministries and regulatory authorities. These administrative data are collected based on indicators included in this Handbook.
- Data on household access to, and individual use of, ICTs – collected from national statistical offices (NSOs). These survey data are collected based on the indicators defined in the ITU Manual for measuring ICT access and use by households and individuals (ITU, 2020). Therefore, these indicators are not covered in this Handbook.
- Price data – collected from national regulatory authorities and telecommunication/ICT ministries, covering retail prices for fixed-telephony, mobile-cellular and fixed-broadband services. These data are collected based on indicators included in this Handbook.

43. ITU disseminates ICT statistics in a number of ways, such as via the World Telecommunication/ICT Indicators (WTI) Database and through the ICT Eye.²⁰ Additionally, ITU publishes regional and global reports that benchmark ICT developments and provide further dissemination of the data collected, such as the *Measuring Digital Development* report series or the *Yearbook of Statistics*. ITU also contributes to the monitoring of internationally agreed goals and targets (such as the MDGs and the WSIS targets) through the collection and dissemination of key ICT indicators.

44. ITU standardizes and reviews indicators in close cooperation with other regional and international organizations and bodies, including the United Nations, Eurostat, OECD and the Partnership on Measuring ICT for Development. The World Telecommunication/ICT Indicators Symposium (WTIS) is organized annually by ITU to discuss pertinent issues related to ICT measurement.

45. In order to further advance the harmonization of international telecommunication/ICT indicators, the ITU Expert Group on Telecommunication/ICT indicators (EGTI) was created in May 2009 (see Chapter 1). EGTI is a working party open to ITU members and ICT experts; it has a mandate to review, revise and finalize the ITU telecommunication/ICT indicators and reports back to WTIS.

46. This Handbook is a major output of the international review process; its role is to harmonize telecommunication/ICT indicator definitions, thereby promoting the availability of internationally comparable data.

¹⁹ For more information on ITU questionnaires and their collection periods, see <http://www.itu.int/ITU-D/ict/datacollection/>.

²⁰ See <http://www.itu.int/ITU-D/ICTEYE/Indicators/Indicators.aspx>

III. Indicators

1 Fixed-telephone networks

47. Fixed telephony is one of the oldest telecommunication networks, with over a century of history. It has been a key focus of telecommunication statistics for many years. Fixed-telephone penetration was plotted against Gross Domestic Product (GDP) to create the Jipp Curve in 1963.¹ ITU launched its *Yearbook of Common Carrier Statistics* in 1972, featuring a number of telephone network indicators.² In 1985, *The Missing Link* report proposed bringing "... all mankind within easy reach of a telephone by the early part of the next century."³

48. The public switched telephone network (PSTN) has traditionally used twisted-pair copper wire to connect a subscriber to a telephone exchange, where calls are switched and routed to their destination. Over time, the PSTN has evolved to support digital services using integrated services digital network (ISDN) technology, dial-up Internet access and fixed-broadband Internet access based on digital subscriber line (DSL) technologies. Another development has been fixed wireless or wireless local loop (WLL) where, instead of using a copper wire to connect the subscriber to the telephone exchange, radio technology is used.

49. As telecommunication markets have liberalized, new entrants provide fixed telephone services using new technologies. Fixed telephone services are offered by cable television operators that use hybrid fibre-coaxial (HFC) cable networks as well as by operators that deploy fibre-based networks, or fibre to the premise (FTTP).

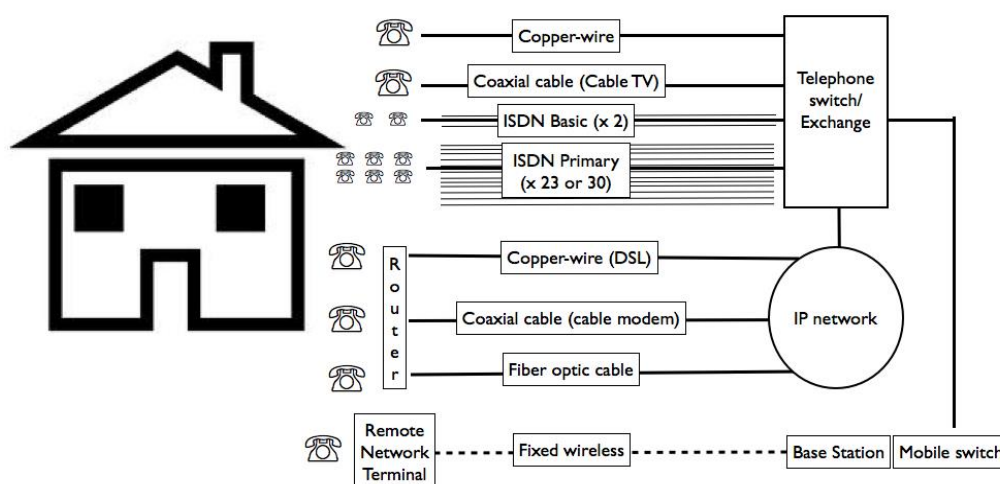
50. Cable and fibre networks today typically provide voice based on Internet protocol (IP). Hence, the voice services provided by these operators is called managed voice over IP protocol (VoIP). The term *managed* implies that the voice service is subject to certain quality of service provisions imposed by regulation when providing public voice services.

¹ Jipp, A. (1963), *Wealth of nations and telephone density*, Telecommunications Journal, July 1963, pp. 199-201.

² CCITT Recommendation C.1, *Yearbook of Common Carrier Statistics* (Geneva, 1972).

³ Independent Commission for World-Wide Telecommunications Development (1985), *The Missing Link*.

Figure 3: Fixed telephone lines



Source: ITU

51. Over a number of years, new actors have entered the telecommunication market that do not have a network of their own but use the Internet as the means by which their service is provided. These actors are called over-the-top providers (OTT) in that they offer services (video, messaging, voice) over the open Internet. Since the Internet works under the best effort principle and these OTT actors do not in general own the network that provides the service to the user, quality of service is not guaranteed. So, while OTT voice services use VoIP, in contrast managed VoIP offered over the fixed network has certain quality of service provisions.

52. Broadly speaking the services provided by OTT actors are often provided at no or limited cost (though users generally pay for the data OTT services consume). OTT actors are rarely registered as telecommunication operators and in many countries have no commercial presence. Their business activities are generally not reported. In some parts of the world legislation has been adopted to include some OTT services as telecommunication services when they are close substitutes to traditional services (e.g., voice). In order to measure the penetration and usage of services provided by OTT actors, other sources of information need to be relied on such as surveys or big data.

53. This evolution has affected the way the fixed-telephone networks are conceptualized, measured and analysed. On the one hand, there is a *physical* or network aspect, where the focus is on the use of wire to provide telephone services. On the other hand, there is a *services* aspect, where the focus is on different telecommunication services and the characteristics of each delivered over a fixed infrastructure. These developments have introduced methodological issues that cannot always be easily resolved. The indicators in this category strike a compromise by disaggregating the various ways that telephone services can be delivered over fixed networks. This creates analytical flexibility, since the indicators can be arranged to support different concepts of fixed-telephone networks. The indicators covered in this section also include several relating to accessibility.

54. Most of these indicators are collected from fixed-telephone operators that have been licensed by the national telecommunication regulatory authority (NRA). It is expected that most NRAs would have information about entities licensed to provide fixed-telephone line services.

55. This group of indicators is based on annual (reference year) data in respect of the year ending 31 December. Where data are not available for the year ending 31 December, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data). Where countries report data on the basis of a year not ending on 31 December, this should be specified in a note.

Total capacity of local public switching exchanges

56. This indicator makes sense in the context of a copper-based network, i.e., public switched telephone network (PSTN), a network based on local exchanges from where the copper lines are deployed to the user premises. At the local exchange a total planned number of exchanges is available and this total usually is higher than the actual copper-based connections activated due to a number of reasons. Operators when defining the capacity of a local exchange (in terms of copper wired cables that fit) usually include exchanges in excess for future demand, because of security reasons and very often for testing purposes as well. Hence, it is of interest given this topology of exchanges to measure activated lines, on the one side, and potential lines (installed exchanges), on the other.

57. But while the indicator "total capacity of PSTN" reflects copper-based telephone network capacity, it does not reflect the capacity of new fixed networks, such as cable networks, fibre-based networks, or next generation access (NGA) networks. These new networks have a completely different topology, are not based on a distributed set of local exchanges, and their capacity is not restricted by a local node at end user premises.

58. In the Expert Group on Telecommunication/ICT Indicators (EGTI 2017) meeting, an indicator that measures the availability of fixed networks was approved: *Fixed network coverage*. It was specifically mentioned that the approved indicator should collect data on the availability of the network, but not subscriptions nor usage, and exclude fixed-wireless coverage. Coverage is defined as "the network provider provisions or could provision a last-mile connection to the fixed-wired network within a short period of time (i.e., few days) and without an extraordinary commitment of resources". In order not to overestimate coverage, perfect network overlap will be assumed in the absence of more detailed geographical information on the network deployments.

59. Given that in most countries both types of network (i.e., copper based (PSTN) and NGA) will coexist for a while, "total capacity" of fixed networks is best measured with the new approved indicator "Fixed network coverage", which consists of:

1. all installed (potentially activated) PSTN lines in the local exchanges, corresponding to the copper-based traditional network installed, and
2. newly deployed optical fibre based (NGA) or cable-based (HFC) connections.

60. The *Total capacity of public local switching exchanges* indicator is left in the Handbook as it still may be relevant in some countries, but it will not be collected by ITU in the future and it is embedded in the new indicator *Fixed network coverage*, which is of more interest and wider in scope.

Indicator 1.1: Total capacity of local public switching exchanges (i117)

Definition:

Total capacity of public switching exchanges refers to the maximum number of fixed-telephone lines that can be connected. This number includes fixed-telephone lines already connected and fixed lines available for future connection, including those used for technical operation of the exchange (test numbers). The measure is the actual capacity of the system, rather than the theoretical potential when the system is upgraded or if compression technology is employed.

Clarifications and scope:

This indicator measures the total number of physical lines available in the PSTN, regardless of whether they are in use or not. The number of fixed-telephone lines in use can be divided by the total capacity to indicate the amount of capacity used. It excludes the capacity of other networks (Internet protocol or mobile).

Method of collection:

Data can be collected at the country level by asking all licensed fixed-telephone line operators for the number of lines they have that are already connected and the number of fixed lines that are available for future connection. Both residential and business lines should be included.

Relationship with other indicators:

This indicator (i117) is the sum of the values of Indicator 1.4: Analogue fixed-telephone lines (i112a), inactive prepaid analogue fixed-telephone lines, Indicator 1.8: ISDN voice-channel equivalents (i28c) and any fixed lines available for future connection.

Methodological issues:

A capacity usage indicator can be compiled by dividing the number of analogue fixed-telephone lines (Indicator i112a) by the total capacity (Indicator i117).

The capacity of PSTN lines used to be more relevant in the past. The closer networks were to full capacity, the greater the risk of potential bottlenecks and the possible need for additional investment. The availability of virtual lines through, for example, ISDN, and the popularity of mobile-cellular networks and voice over IP (VoIP) have meant that there is a growing gap between total fixed-line capacity and fixed-telephone lines in use.

Relevance:

Capacity of public switched telephone networks provides one perspective on the lines available for possible connections. However, given the transition to next generation IP-based fixed networks, public switched telephone networks are becoming less relevant.

Fixed network coverage

61. Fixed network coverage is fundamental to monitor policy objectives and regulatory obligations, as well as to inform market analyses and guide investment. It is also relevant in understanding infrastructural barriers to ICT access and use over time and across geographies.

62. This indicator has two parts: (1) number of connections available but not necessarily subscribed of any fixed network (numerator), and (2) number of households (denominator). The denominator to be used for comparability is the total number of households in a country, although deployed connections are available for any kind of user (business, household, institution) and may cover any kind of building, premise or dwelling. While this indicator is not meant to measure only household (e.g., residential) coverage by a fixed network, data on the number of premises is lacking for many countries. The use of "households" in the denominator is thus done for comparability purposes.

Indicator 1.2: Number of households covered by a fixed wired network, by network technology (i4213cv)

Definition:

The number of households covered by a fixed network is also referred to as cabled households or homes passed by a fixed wired network. The number of households covered by a fixed wired network, cabled households or homes passed denotes the availability of but not necessarily the subscription to or usage of fixed network services.

Households should be classified as covered, cabled or passed if the network provider already provisions or could provision a connection to the fixed network within a short period of time (i.e., a few days) and without an extraordinary commitment of resources. An extraordinary commitment of resources involves any of the following: installing or extending cable from local switching centre, a DSLAM, CMTS, OLT, fibre node, optical splitter, FTTC cabinet, HFC node, building a duct, installing poles, leasing a line.

This indicator is broken down by (but IS NOT the sum of):

Indicator 1.2a: Number of households covered by the public switched telephone network (i4213cv_pstn)

Refers to the number of households covered by the public switched telephone network (PSTN), using copper wire in the "last mile". Excludes households covered by DSL-enhanced networks.

Indicator 1.2b: Number of households covered by digital subscriber lines networks (i4213cv_dsl)

Refers to households covered by copper wire which allows broadband access using digital subscriber line (DSL) technology. Asynchronous digital subscriber line technology (i.e., ADSL, ADSL2, ADSL2+), very-high-bit-rate digital subscriber (VDSL) technology and other DSL technologies are included.

Indicator 1.2c: Number of households covered by cable TV networks (i4213_cab)

Refers to the number of households covered by cable TV (CATV) networks using coaxial cable. Households covered by standard (i.e., DOCSIS 1) and advanced cable broadband standards (including DOCSIS 3.x) are included.

Indicator 1.2d: Number of households covered by fibre-to-the-premises networks (i4213_fttp)

Refers to the number of households covered by fibre-to-the-premises (FTTP) networks. This indicator includes the fibre-to-the-home (FTTH) and fibre-to-the-building (FTTB) network configurations. Fibre-to-the-cabinet and fibre-to-the-node are excluded.

Indicator 1.2e: Number of households covered by other fixed-wired networks (i4213_o)

Refers to households covered by other fixed wired networks (other than copper/DSL, CATV, and FTTP).

In some cases, countries may use other definitions to determine fixed network coverage. In these cases, and until the present definition is implemented, a note should be inserted in the comments section detailing the differences.

(continued)

Clarifications and scope:

The indicator measures coverage or availability and not subscription or usage. Operators sometimes use the term "homes passed". Only fixed wired networks should be considered. Fixed wireless networks, mobile networks, nomadic networks and satellite networks are excluded from this indicator. Coverage should be measured at the level of access networks (i.e., "last mile"). The definition of coverage is included in the previous section. The indicator is NOT the sum of its sub-indicators.

In the case of network overlap in a given geographical unit (i.e., several networks/operators covering the same locations), perfect overlap should be assumed unless available information justifies a different conclusion. Please refer to the Methodological issues section for more detailed information.

Note that two measures are used to construct this indicator: (1) number of fixed network connections deployed (numerator); and (2) number of households (denominator). The indicator refers to households, but coverage is usually measured for any kind of dwelling or premises such as, households, offices, shops, institutions or premises in general. Hence, in the numerator any deployed or available connection is to be counted, no matter if oriented to the residential or business segment. For comparability purposes in the denominator the total number of households is to be used.

Data collection methods:

There are two different data collection methods:

- Method 1:
 1. Telecommunication operators report the number of cabled households or homes passed for all of the country's geographical units. The data collection should be conducted at the lowest possible level of geographical granularity (e.g., region, city/municipality, block, postal code, address, etc.).
 2. The data collection entity proceeds to determine at the lowest possible level of geographical granularity what is the largest network operator in terms of cabled households or homes passed (i.e., what is the largest network/operator in each of the geographical units reported).
 3. These figures are then aggregated at the national level.
- Method 2:
 1. Telecommunication operators provide the geolocation of certain "last mile" network elements or diagrams of their networks.
 2. A digital map/database of the total number of households is obtained through the national statistics office or other official sources.
 3. The two sets of data are overlaid using a GIS tool. The GIS tool calculates the coverage area around each "last mile" network element (using certain engineering, demographic distribution and mapping assumptions) and computes the number of households covered by the network (homes passed).

In some cases, countries may use other methods to compute network coverage. In these cases, a note should be inserted in the comments section detailing the differences.

Relationship with other indicators:

This indicator (i4213cv) includes a previous indicator "Total capacity of public local switching exchanges", which covered only copper-based telephone networks. The new indicator covers any deployed connection available to the end user, in or very close to its premises, that can be activated in a very short period of time. Hence, it covers cable television (HFC) and fibre-based network deployments that provide access to fixed network services.

(continued)

Methodological issues:

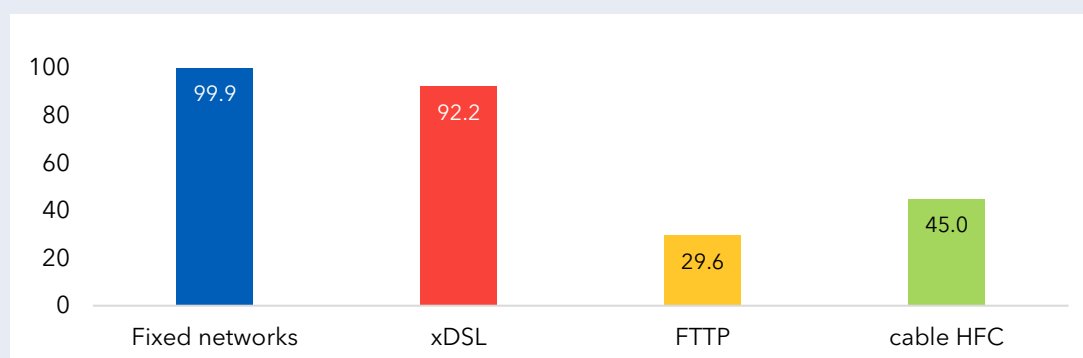
When coverage estimates are based on cabled households or homes passed that are reported directly by telecommunication operators, network overlap may lead to overestimation. Network overlap occurs in areas where there is facilities-based competition and the same household is cabled/passed by more than one operator.

In the case of network overlap, perfect overlap should be assumed. That is, to limit the effects of network overlap, only the data reported by the largest operator at the lowest possible level of geographical granularity should be considered for aggregation purposes. This applies in all cases except when, for a certain geographical unit, available information justifies a different conclusion. When coverage is estimated by using the location of “last mile” network elements, the engineering assumptions used should strictly conform to the technical capabilities of the network in question (i.e., line length and quality, maximum number of homes served by each node/splitter, etc.). Engineering assumptions, demographic distribution assumptions (i.e., assumptions associated with juxtaposing network and household maps) and mapping assumptions (i.e., contours of maps, assumptions made in translating straight line to actual route), or others should be briefly mentioned in the comments section.

Example:

The European Commission collects fixed network coverage data from national regulatory authorities differentiating the coverage by technology. In 2018 more than 99 per cent of all households in the European Union were covered by a fixed network, mostly by legacy DSL networks, but significant increases in cable as well as FTTX coverage have occurred over the last few years.

Figure 4: Households covered by a fixed (wired) network, by network technology (%), 2018



Source: European Commission, 2019, *Study on Broadband Coverage in Europe 2018* [<https://ec.europa.eu/digital-single-market/en/news/study-broadband-coverage-europe-2018>]

Relevance:

The emergence of new fixed networks, such as cable (HFC) or optical fibre (FTTX) based networks, calls for a measurement that encompasses any fixed network deployed with a last mile connection up to the end-user premises. This measure of availability of fixed network provides a clear status of the development and coverage of fixed networks and the availability, hence, for the citizens to access to best-class and highest quality of broadband and other services.

Fixed telephony subscriptions

63. Fixed telephone service is provided through a variety of technologies (e.g., copper-wire, coaxial cable, fibre, fixed wireless networks). In order to capture these, first a total of fixed telephone subscriptions is required and then, as sub-indicators, the technology supporting fixed telephony is specified. The total of all sub-indicators should be equal to the total subscriptions. In case there are difficulties in providing the number of subscriptions by technology, at least the total of fixed telephone subscriptions is to be reported.

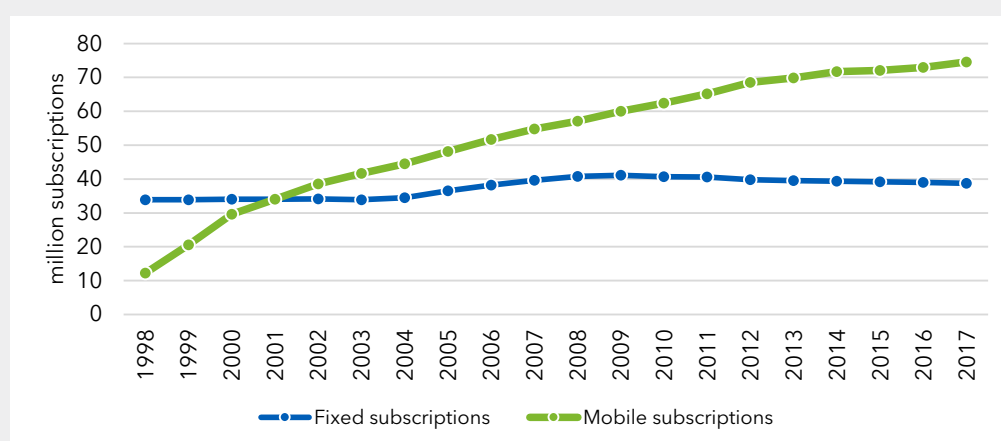
64. This indicator was previously called "Main telephone lines in operation". Hence, the interpretation of fixed telephone subscriptions is in line with the previous indicator, meaning "connections" that are active and capable of providing fixed telephone services. Except for ISDN subscriptions, which can be contracted as two fixed active lines for telephony or in packs of 28 active lines, the concept of subscription and active lines is the same. ISDN subscriptions for voice services in any case is declining in importance with respect to the total of fixed telephone lines in the market.

65. In many countries voice services are as well offered by over-the-top (OTT) companies that use the open Internet for the transmission of services. For these services to be used, a broadband connection must be activated. However, OTT "voice services" are rarely measured. They are considered as *unmanaged* VoIP and are not included in this indicator.

Box 4: Mobile-fixed substitution in telephone services

Given the widespread success of mobile communications, it is clear that users rely increasingly on mobile devices and less so on fixed lines for placing calls. This trend is clear when comparing voice traffic in fixed and mobile lines in recent years, or the total stock of fixed lines and comparing it with the evolution of active mobile lines. The stock of fixed telephone lines is constant or in some cases decreases over time, while the stock of mobile lines increases.

Figure 5: Evolution of fixed telephone and active mobile telephony subscriptions (millions), France



Source: ARCEP 2019. [www.arcep.fr]

Indicator 1.3: Fixed-telephone subscriptions (i112)

Definition:

Fixed-telephone subscriptions refers to the sum of all active i) analogue fixed-telephone lines, ii) voice-over-IP (VoIP) subscriptions, iii) fixed wireless local loop (WLL) subscriptions, iv) ISDN voice-channel equivalents, v) fixed public payphones and vi) satellite-based subscriptions provided to fixed locations that allow for a voice communication. This indicator was previously called *Main telephone lines in operation*.

Clarifications and scope:

This indicator refers to all accesses over fixed infrastructure that provide voice telephony, including telephone lines using copper wire and voice services using IP delivered over fixed (wired) broadband infrastructure, for example digital subscriber line (DSL), optical fibre, and coaxial cable networks (cable modem). It also includes fixed WLL connections, which are defined as services provided by licensed fixed-line telephone operators that provide last-mile access to the subscriber using wireless technology (the call being subsequently routed over a fixed-line telephone network and not a mobile-cellular network).

It includes both post-paid and prepaid subscriptions. If prepaid, the fixed-telephone subscription should be active (i.e., used at least once in the last three months). If the subscription is being paid recurrently (every month, or under the contract modality), the subscription is assumed to be active.

It should include data from all licensed fixed-telephone line providers. In the case of VoIP, it should include all operators that have been licensed to provide IP telephony, provided that the service includes a subscriber telephone number, allows the ability to place and receive calls at any time and does not require a computer. Both residential and business subscriptions should be included.

Services offered by over-the-top providers (OTT) that use the public Internet should not be included. These services do not normally use numbering resources nor guarantee specific quality of service conditions imposed by regulations.

The indicator does not cover mobile-cellular telephony subscriptions, computer-mediated IP telephony services or the unused capacity of the fixed-telephone line network. If it is not possible to include public payphones (Indicator 75a), then this should be indicated. Some countries may not include all the elements mentioned. In this case, countries should specify the items included in this indicator in a note.

Method of collection:

Data can be collected at the country level by asking all licensed fixed-telephone line operators how many fixed-telephone subscriptions they have. Generally, the provision of any fixed-telephone service requires a licence, whether provided by an operator using the PSTN, a coaxial cable television provider, a VoIP provider or a fixed wireless provider.

Relationship with other indicators:

This Indicator (i112) is the sum of values of Indicator 1.4: Analogue fixed-telephone lines (i112a), Indicator 1.5: VoIP subscriptions (i112IP), Indicator 1.6: Fixed wireless local loop subscriptions (i112w), Indicator 1.8: ISDN voice-channel equivalents (i28c), and Indicator 1.9: Public payphones (i1112). It encompasses as well satellite-provided fixed telephony connections.

(continued)

Methodological issues:

The definition of this indicator includes virtual items and items with regulatory implications, which may restrict comparability. For example, the indicator includes the number of ISDN channels, which are not physical lines, and which some countries do not include or instead include the number of ISDN subscriptions. Whenever possible please indicate the number of available voice channels contracted (Basic: 2 channels, Primary: 30 possible channels of voice).

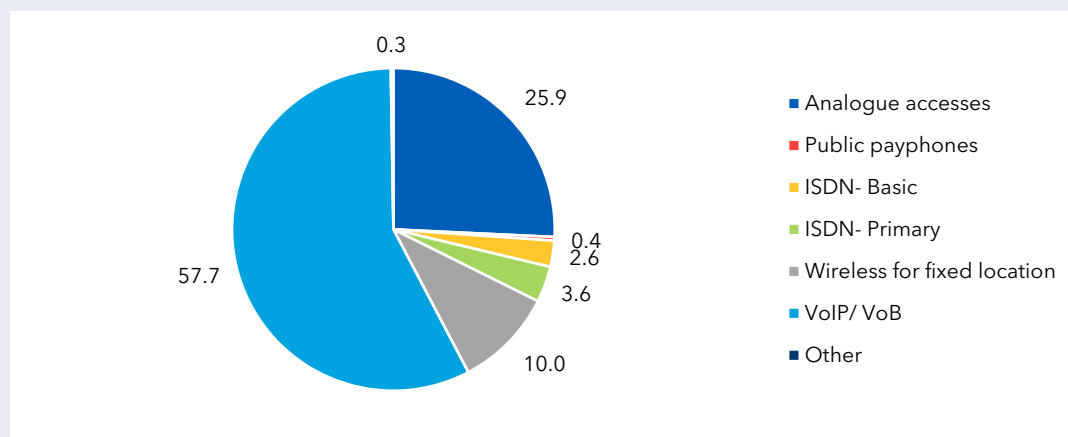
The inclusion of fixed wireless subscriptions is premised on a regulatory distinction and on the final use to be made of the connection rather than on physical topology, since the network architecture of most fixed wireless services is the same as a mobile-cellular network. In areas where fixed telephony is provided in the last segment to reach the end user via a terrestrial wireless link (e.g., Wi-Fi, WiMAX antenna) but the service is provided to a "fixed location" in the sense that it does not allow for mobility then it is "fixed wireless access" and included in the "fixed telephony" total.

This indicator is divided by the population and multiplied by 100 to derive the number of fixed-telephone lines per 100 inhabitants, Partnership on Measuring ICT for Development core ICT indicator A1 (Fixed-telephone subscriptions per 100 inhabitants).

Example:

The regulatory authority in Portugal, ANACOM, collects periodically the number of fixed telephony accesses with details of the underlying technology. The total fixed telephony accesses correspond to the sum of the indicators "number of analogue accesses" (PSTN) and "number of equivalent ISDN accesses", that is number of voice channels offered by each type of subscription. It encompasses as well "Wireless for fixed location connections" and the "number of VoIP/VoB accesses", that is, cable (HFC) and fibre based (FTTx) connections activated for fixed telephony using VoIP. It includes as well public payphones.

Figure 6: Fixed telephone subscriptions by technology in Portugal (% of total), 2018



Source: Anacom. 2018. *Fixed Telephone Service*. https://www.anacom.pt/streaming/en_STF1S2018.pdf?contentId=1463678&field=ATTACHED_FILE

Relevance:

Fixed telephony subscriptions is a key indicator for measuring telecommunication service penetration, since it refers to a fundamental service, voice calls. Even if voice communications is migrating to mobile networks, or to alternative service providers using the public Internet (e.g., OTT), fixed telephony that uses the national numbering plan and is carried by fixed networks has retained popularity in some countries sometimes due to being cheaper to make calls than mobile networks. This indicator is useful as well in measuring the scope of other services such as fixed broadband as well as to evaluate the degree of bundling as for example fixed telephony and fixed broadband.

Indicator 1.4: Analogue fixed-telephone lines (i112a)

Definition:

Analogue fixed-telephone lines refers to the number of active lines connecting subscribers' terminal equipment to the public switched telephone network (PSTN) and which have a dedicated port in the telephone-exchange equipment. It includes all post-paid lines and those prepaid lines that have registered an activity in the past three months. This term is synonymous with the terms 'main station' and 'direct exchange line' (DEL) that are commonly used in telecommunication documents.

Clarifications and scope:

This indicator refers to the number of active analogue fixed-telephone lines with a direct connection to the PSTN. It covers the physical line (typically copper wire) that is in use. It also includes analogue fixed lines used for DSL services. It excludes fixed wireless accesses, optical fibre lines, coaxial cable television lines, ISDN channels and ISDN subscriptions. Both residential and business lines should be included.

Method of collection:

Data can be collected from licensed fixed-telephone line operators in the country, and then aggregated at the country level.

Relationship with other indicators:

This Indicator (i112a) is a component of Indicator 1.3: Fixed-telephone subscriptions (i112).

Methodological issues:

This indicator reports the physical number of analogue fixed-telephone lines in operation that are connected to the PSTN. It provides a consistent indicator for trend analysis. Wholesale line rental, or different modalities of local loop unbundling regulations allow for any entrant to supply the fixed telephony service to the consumer using the last mile network of the incumbent. In essence, this changes the service provider from the incumbent to a new entrant. They refer to activated lines, and hence, should be counted as active fixed telephony subscriptions. However, such wholesale line rentals should not be double counted (i.e., include either the incumbent wholesale line rentals or new entrant subscriptions but not both).

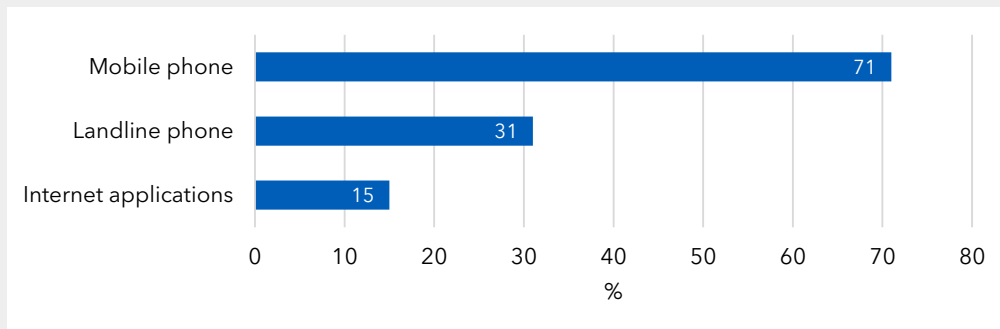
Relevance:

One trend is the substitution of fixed telephony in favour of mobile (and over-the-top (OTT) voice services). An additional trend is observed in a number of countries: as many operators deploy cable or optical fibre-based networks, the traditional PSTN fixed telephony is abandoned.

Box 5: Fixed, mobile, and Internet calls

Over the last decade it has been observed that globally fixed telephony is less used. Both the number of subscriptions as well as the traffic originated in fixed networks have decreased. As an example, in the European Union in 2017, of all individuals sampled age 15 and over, 71 per cent declared using mobile voice services daily, 15 per cent reported making calls over the Internet, and less than a third stated using a fixed line telephone.

Figure 7: Proportion of individuals making or receiving daily telephone calls by service, EU, 2017



Source: European Commission. 2018. E-Communications and the digital single market. <http://dx.doi.org/10.2759/043384>

On top of the substitution effect of fixed networks in favour of mobile networks to place voice calls, there is another trend which merits attention: placing calls via over-the-top (OTT) applications (e.g., WeChat, Skype, WhatsApp, Facetime, etc.). The number of people that use these OTT services is growing substituting again for part of the consumption from both fixed and mobile operators by a new provider, that usually does not charge users for use of the application (although users do have to pay data usage charges). Among OECD members, 43 per cent of Internet users reported using online telephony in 2016 ranging from 24 per cent in the Republic of Korea to 69 per cent in Lithuania.¹

¹ OECD. Broadband Portal. <https://www.oecd.org/sti/broadband/broadband-statistics/>

Indicator 1.5: VoIP subscriptions (i112IP)

Definition:

VoIP subscriptions refers to the number of managed voice-over-Internet protocol (VoIP) fixed-line subscriptions. It is also known as voice over broadband (VoB), and includes VoIP subscriptions through fixed wireless, DSL, cable, fibre optic, and other fixed-broadband. VoIP subscriptions are "managed" in that operators must satisfy certain quality of service obligations defined in domestic regulations regarding voice calls over fixed networks (e.g., calling emergency numbers, maximum number of calls dropped, etc.). It excludes software-based VoIP applications provided over the public Internet. Those VoIP subscriptions without a recurrent monthly fee should only be counted if they have generated inbound or outbound traffic within the past three months.

Clarifications and scope:

VoIP subscribers have their own telephone number and are able to call and be called by other telephone subscribers at any time. The key distinction between a managed VoIP service and a software-based VoIP application (e.g., Skype, WeChat, WhatsApp, Facetime, etc.) is that the former includes a telephone number, is always connected, can both make and receive telephone calls to and from other telephone subscribers, and does not require the intermediation of a computer. If VoIP is not yet allowed in the country, even though licensed telephone operators, this should be specified in a note. Both residential and business subscriptions should be included.

Method of collection:

IP telephony, as defined above, generally requires licensing as a telephone service, therefore the number of IP telephone subscriptions can be collected from licensed telephone operators in the country, and then aggregated at the country level. Where Internet service providers offer a VoIP service to retail consumers that complies with the definition but is not licensed as a fixed-telephone service, then data should be collected from those ISPs. Data collectors may want also to enquire about the type of network over which IP telephony is provided (e.g., DSL, cable modem).

Relationship with other indicators:

This Indicator (i112IP) is a component of Indicator 1.3: Fixed-telephone subscriptions (i112).

Methodological issues:

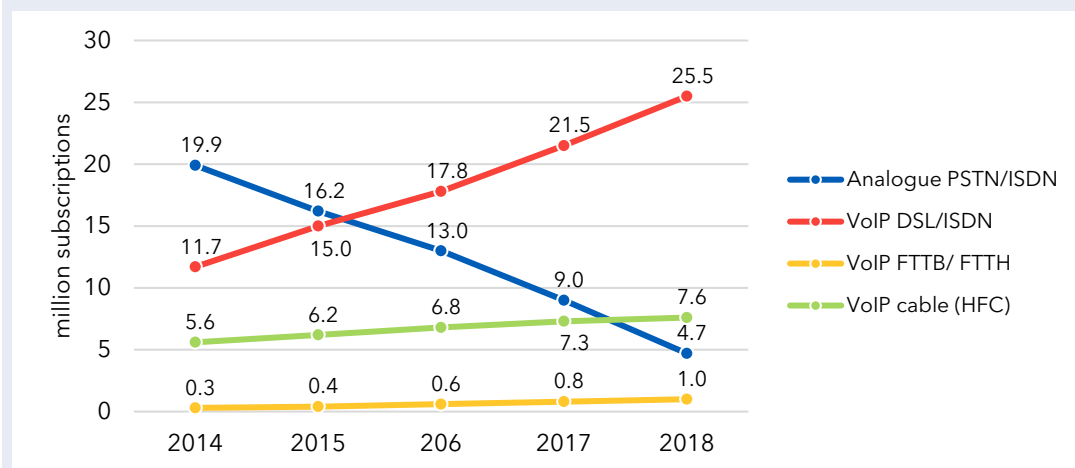
Normally operators that offer fixed telephony based on cable HFC (upgraded to Docsis 3.0 standard) or optical fibre-based networks (FTTx) transmit the voice service using IP-protocol. In fact, any fixed network – even copper wired based networks – that offer sufficiently high data speed transmission may provide VoIP fixed-line telephony service.

The legal status of VoIP may be uncertain in some countries. If VoIP is not yet allowed, even through licensed telephone operators, then it is unlikely that the service as defined above is available in the country. In the case where the provision of VoIP is illegal only for unlicensed operators, the number of VoIP subscriptions, as defined above, should be obtained from licensed telephone operators.

(continued)

Example:

The regulatory authority for telecommunications in Germany, Bundesnetzagentur (BNetzA), compiles data on the technologies used for fixed telephony service. The number of VoIP connections provided by fixed network telecommunication operators has risen drastically, from 17.6 connections in 2014 to 34.1 million in 2018. The stock of analogue (PSTN) connections dropped from 19.9 million to 4.7 million over the same period. BNetzA includes additional details in relation to VoIP connections by differentiating the underlying network: xDSL, cable (HFC) or fibre to the home (FTTH).

Figure 8: VoIP subscriptions (millions), Germany

Source: Bundesnetzagentur. 2019. *Jahresbericht 2018*. <https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2019/JB2018.html?nn=643972>

Relevance:

With the emergence of next generation access (NGA) networks (optical fibre based FTTx, cable HFC, and VDSL) services are provided using the IP protocol. Fixed telephony is provided in these networks through voice over IP (VoIP) in contrast to the circuit switching used in legacy analogue public switched telephone networks. One way of analysing next generation networks and their usage is by measuring the number of VoIP subscribers.

Indicator 1.6: Fixed wireless local loop subscriptions (i112w)

Definition:

Fixed wireless local loop subscriptions refers to subscriptions provided by licensed fixed-line telephone operators that provide 'last-mile' access to the subscriber using radio technology and where the subscriber terminal equipment is either stationary or limited in its range of use.

Clarifications and scope:

Fixed wireless local loop (WLL) has proven popular in a number of countries where it is cheaper and faster to deploy wireless technologies between the telephone switching equipment and the user. A number of technologies have been deployed around the world. Although some use cellular technologies, the key distinction is that the end user is restricted in terms of the distance (range) within which they can use their telephone (limited mobility). Both residential and business subscriptions should be included.

Method of collection:

Data can be collected from licensed fixed-telephone operators in the country that provide a service using WLL technologies, and then aggregated at the country level.

Relationship with other indicators:

This Indicator (i112w) is a component of Indicator 1.3: Fixed-telephone subscriptions (i112).

Methodological issues:

Some WLL technologies are based on cellular technologies, the main distinction between mobile cellular and WLL being that, for the latter, subscribers cannot make calls from their handset when beyond the range of their calling area. Since this is a legal rather than a technical distinction, if the regulation changes, then WLL subscriptions based on cellular technologies are liable to be reclassified as mobile-cellular subscriptions.

Relevance:

The use of wireless local loop solutions to provide fixed telephone service, varies from country to country. Partially determined by the topology of rural areas, some operators that find it very costly to deploy a wired network may deploy Wi-Fi, WiMAX, or other wireless technologies.

Indicator 1.7: ISDN subscriptions (i28)

Definition:

ISDN subscriptions refers to the number of subscriptions to the integrated services digital network (ISDN). This can be separated into basic-rate and primary-rate interface service (ITU-T Rec. I.420). The indicator can therefore be broken down, as follows:

Indicator 1.7a: Basic-rate ISDN subscriptions (i281)

Refers to the number of subscriptions to the ISDN basic-rate interface service.

Indicator 1.7b: Primary-rate ISDN subscriptions (i282)

Refers to the number of subscriptions to the ISDN primary-rate interface service.

Clarifications and scope:

An ISDN is implemented over the PSTN to provide digital telephone and data transmission services. ISDN consists of 'B-channels' of 64 kbit/s each. Both residential and business subscriptions should be included. This indicator refers to subscriptions rather than voice equivalent channels.

Method of collection:

Data should be collected from all licensed fixed-telephone line operators in the country that offer ISDN services, and then aggregated at the country level. Care should be taken that only subscriptions and not channels are included.

Relationship with other indicators:

This Indicator (i28) is equal to the sum of values of Indicator 1.7a: Basic-rate ISDN subscriptions (i281) and Indicator 1.7b: Primary-rate ISDN subscriptions (i282).

Methodological issues:

This indicator will not be relevant for countries that do not have ISDN services.

Relevance:

ISDN services are in declining demand due to the emergence of networks based on DSL, cable and optical fibre that provide faster speeds. Nevertheless, in some countries the stock of ISDN subscribers and the underlying voice equivalent channels active for fixed telephony remains relevant.

Indicator 1.8: ISDN voice-channel equivalents (i28c)

Definition:

ISDN voice-channel equivalents refers to the sum of basic-rate and primary-rate voice-channel equivalents (B-channel equivalents). Basic-rate voice-channel equivalents is the number of basic-rate ISDN subscriptions (Indicator 1.7a) multiplied by 2, and primary-rate voice-channel equivalents is the number of primary-rate ISDN subscriptions (Indicator 1.7b) multiplied by 23 or 30, depending on the standard implemented.

Clarifications and scope:

An ISDN is implemented over the PSTN to provide digital telephone and data transmission services. ISDN consists of 'B-channels' of 64 kbit/s each.¹ Both residential and business channels should be included.

Method of collection:

Data should be collected from all licensed fixed-telephone line operators in the country that offer ISDN services, and then aggregated at the country level. Care should be taken that only channels and not subscriptions are included. Alternatively, the number of basic-rate and primary-rate subscriptions can be requested and the calculation made by multiplying each basic-rate subscription by 2 and each primary-rate subscription by 23 or 30, depending on the standard implemented.

Relationship with other indicators:

This Indicator (i28c) is a component of Indicator 1.3: Fixed-telephone subscriptions (i112). This Indicator (i28c) is related to Indicator 1.7a: Basic-rate ISDN subscriptions (i281) and Indicator 1.7b: Primary-rate ISDN subscriptions (i282), as follows: Indicator i28c value = (Indicator i281 value * 2) + (Indicator i282 value * (23 or 30)).

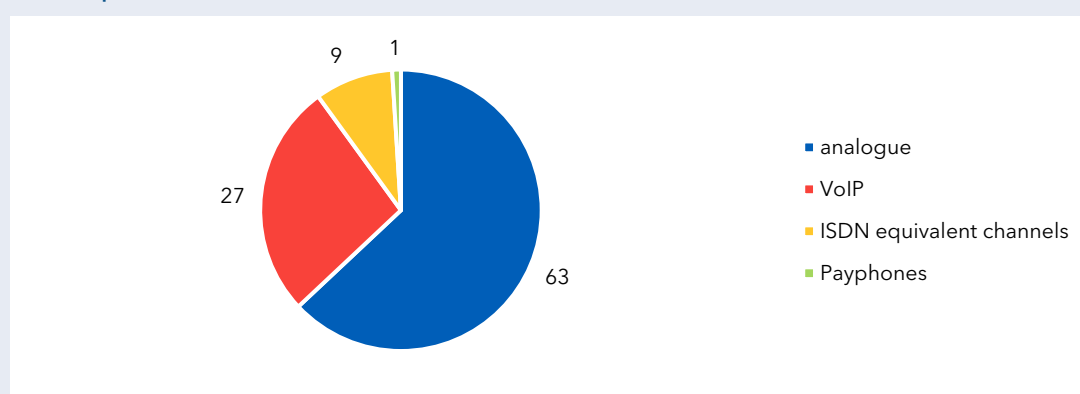
Methodological issues:

This indicator will not be relevant for countries that do not have ISDN services.

Example:

In Oman, the Telecommunications Regulatory Authority publishes periodically the split by technology of the active fixed telephony subscriptions including ISDN equivalent channels.

Figure 9: ISDN voice-channel equivalents (% share of all fixed telephone subscriptions), Oman, 2017



Source: Telecom sector indicators in Oman. 5 years at a glance, 2013-17, TRA, 2018. https://www.tra.gov.om/pdf/5_years_at_glance_2013_2017.pdf

Relevance:

ISDN reflects a similar pattern as PSTN (or analogue) fixed telephone lines: they are decreasing over time in favour of new technologies that provide faster connections. Nevertheless, ISDN persists primarily in the business sector and its evolution is worth monitoring.

¹ For more on ISDN, see the ITU I series Recommendations at <http://www.itu.int/rec/T-REC-I/e>.

Indicator 1.9: Public payphones (i1112)

Definition:

Public payphones refers to the total number of all types of public telephones, including coin- and card-operated phones and public phones in call offices. Publicly available phones installed in private places should also be included, as should mobile public payphones. All public telephones, regardless of capability (e.g., local calls or national only), should be counted. Public payphones should be broken down as:

Indicator 1.9a: Fixed public payphones

Fixed public payphones refers to payphones that are available to the public using the fixed network.

Indicator 1.9b. Mobile public payphones

Mobile public payphones refers to payphones that are available to the public using the mobile-cellular network.

Clarifications and scope:

A payphone is a telephone where payment is made upon use. Payphones may be located in telecentres. This indicator covers all public telephones. Only physical payphones should be reported. If the national definition of payphone differs from that above (e.g., by excluding payphones in private places or payphones where no licensing is required, or including informal calling arrangements through resellers), then respondents should provide their definition in a note.

Method of collection:

The data could be collected from all licensed public telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

This Indicator (i1112) is a component of Indicator 1.3: Fixed-telephone subscriptions (i112).

Methodological issues:

Depending on the licensing framework in the country, data on the number of public payphones may not cover unlicensed provision of public telephone services. Some countries report broader coverage, including informal calling arrangements - typically through resellers, while others report only physical payphones. Lack of comparability may arise through such variations. Public telephones are an important facility for users who do not have access to a telephone at home or who wish to use public telephones because tariffs are cheaper. This indicator is often divided by a country's population and multiplied by 1 000 to derive the number of payphones per thousand inhabitants.

Indicator 1.10: Percentage of fixed-telephone subscriptions that are residential (i116)

Definition:

Percentage of fixed-telephone subscriptions that are residential refers to the percentage obtained by dividing the number of active fixed-telephone subscriptions serving households (i.e., lines that are not used for business, government or other professional purposes or as public telephone stations) by the number of fixed-telephone subscriptions (Indicator 1.3) and then multiplying by 100. A household is defined as consisting of one or more people, who may or may not be related to each other, who share accommodation and who make common provision for food. Active subscriptions include all post-paid subscriptions and those prepaid subscriptions that have registered an activity in the past three months.

Clarifications and scope:

This indicator refers to the total number of fixed-telephone subscriptions in operation in households, divided by the number of fixed-telephone subscriptions (Indicator 2). It does not refer to the percentage of households with a telephone (which is obtained from surveys), nor does it cover the percentage of mobile-cellular subscriptions that are residential.

Method of collection:

Data can be obtained from licensed fixed-telephone operators in the country, and then aggregated at the country level. In countries where there are different subscription charges for residences, it should be easy to identify the number of residential telephone subscriptions. Instead of asking for the percentage, data collectors could ask for the number of fixed-telephone subscriptions that are used by households and carry out the calculation themselves (number of residential telephone subscriptions / total number of fixed-telephone subscriptions). The data may be difficult to collect in countries where there is no distinction between residential and non-residential subscriptions.

Relationship with other indicators:

The denominator of this indicator (i116) is Indicator 1.3: Fixed-telephone subscriptions (i112).

Methodological issues:

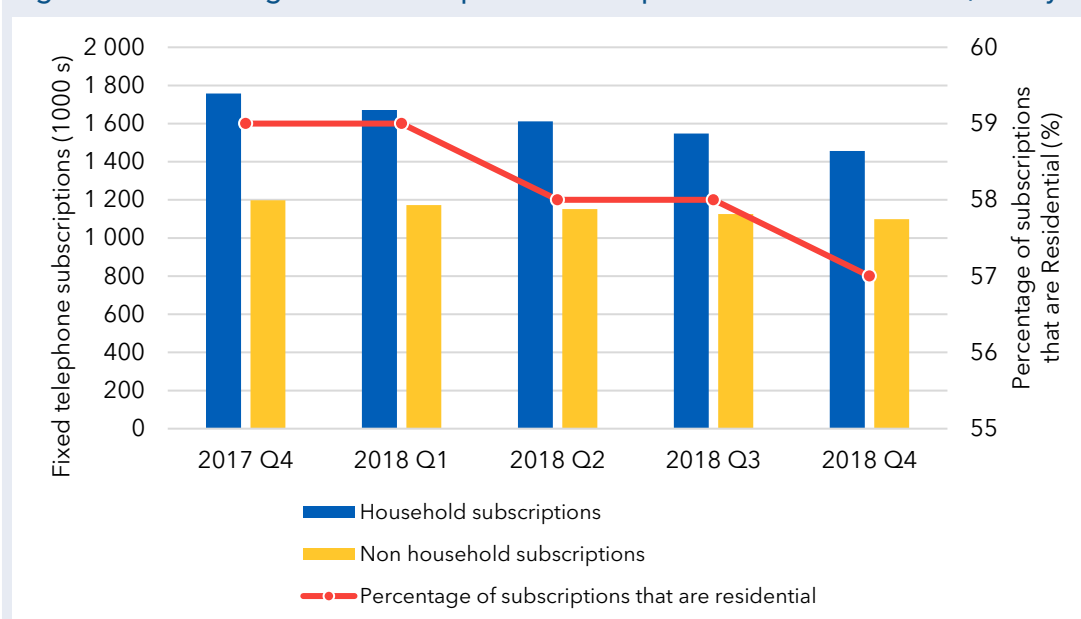
The proportion of residential fixed-telephone subscriptions is a useful indicator for showing the distribution of fixed-telephone subscriptions. It can also be used to calculate the proportion of residential subscriptions per 100 households. However, as it only refers to fixed-telephone subscriptions, it cannot be used to derive the percentage of households with any type of telephone.

The criteria used to distinguish between residential and non-residential subscriptions may vary from country to country. Operators sometimes have different plans based on whether the subscriber is residential or business. However, unless this is enforced, some business users, particularly small and medium enterprises, may sign up for the residential plan if it is cheaper. Another way the type of user could be distinguished is if a tax identification or fiscal identify is provided through the registration process.

(continued)

Example:

The Malaysia Communications and Multimedia Commission (MCMC) collects quarterly data on residential telephone subscriptions. In the fourth quarter of 2018 there were 1.456 million residential fixed-telephone subscriptions out of a total 2.555 million fixed-telephone subscriptions in Malaysia. Therefore, the percentage of fixed-telephone subscriptions that were residential was 57 per cent ($1.456 \div 2.555$). MCMC compiles a household availability measure based on this indicator. This is based on the number of fixed-telephone subscriptions that are residential divided by the number of households and multiplied by 100. The figure in Malaysia for the fourth quarter of 2018 was 18.0 (compared to an overall figure of 7.8 fixed telephone subscriptions per 100 inhabitants).

Figure 10: Percentage of fixed-telephone subscriptions that are residential, Malaysia

Source: MCMC. 2019. Communications and Multimedia Pocket Book of Statistics. <https://www.mcmc.gov.my/en/resources/statistics/communications-and-multimedia-pocket-book-of-statistics>

Relevance:

This indicator is useful as a proxy on the household rate of adoption of fixed telephone service and its evolution over time. This is relevant when household surveys asking about fixed telephony availability are not conducted or carried out infrequently. It is also useful for monitoring the evolution of substitution patterns between fixed telephony and mobile telephony at the household level.

Indicator 1.11: Percentage of fixed-telephone subscriptions in urban areas (i1162)

Definition:

Percentage of fixed-telephone subscriptions in urban areas refers to the percentage obtained by dividing the number of fixed-telephone subscriptions in urban areas by the number of fixed-telephone subscriptions (Indicator 1.3: Fixed-telephone subscriptions (i112)) in the country and then multiplying by 100. The definition of urban used by the country should be provided.

Clarifications and scope:

This indicator tracks the proportion of fixed-telephone subscriptions in urban areas and therefore, by implication, in rural areas. It can help monitor the distribution of fixed-telephone subscriptions between urban and rural areas. The proportion should reflect active subscriptions (i.e., all post-paid subscriptions and those prepaid subscriptions used in the last three months). This excludes mobile-telephone accesses in urban areas. Both residential and business subscriptions should be included.

Method of collection:

Data can be collected by asking licensed operators to provide the proportion of fixed-telephone subscriptions they have in urban areas. This should be aligned with the definition of urban areas used in the country. Alternatively, the number of fixed-telephone subscriptions in urban areas can be collected and the calculation performed by the data collector (fixed-telephone subscriptions in urban areas / total fixed-telephone subscriptions).

Relationship with other indicators:

The denominator of this Indicator (i1162) is Indicator 1.3: Fixed-telephone subscriptions (i112).

Methodological issues:

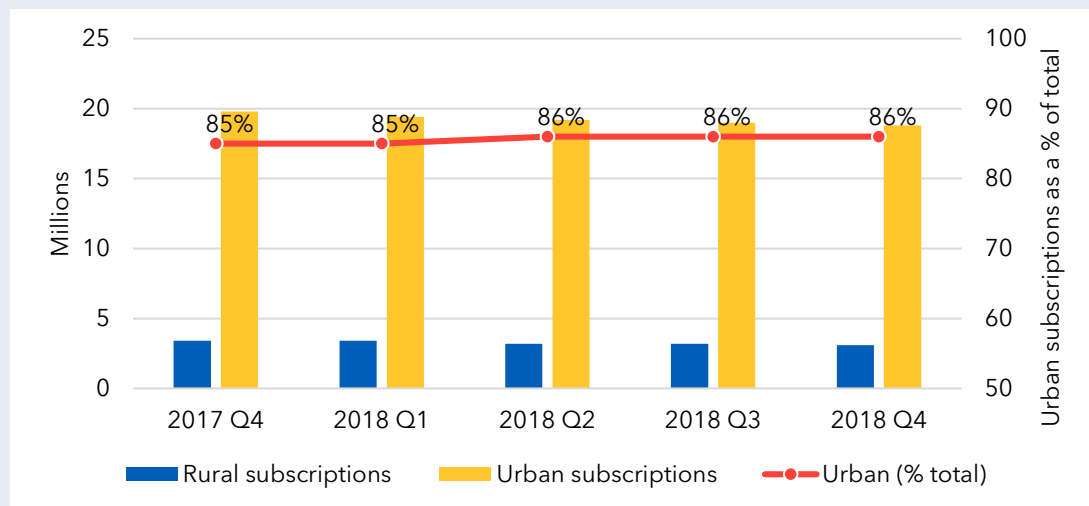
The indicator by itself is insufficient to reflect disparities in the distribution of telephone subscriptions. To gauge inequalities, a linkage needs to be made between the indicator and the percentage of the population living in urban areas. Most countries are keen to monitor access in rural areas, which tend to be underserved, so this indicator is often reversed to indicate the proportion of fixed-telephone subscriptions in rural areas.

(continued)

Example:

The Telecommunications Regulatory Authority of India (TRAI) collects quarterly data on fixed telephone subscriptions broken down by rural and urban locations.

Figure 11: Percentage of fixed-telephone subscriptions in urban areas, India



Source: Telecommunications Regulatory Authority of India (TRAI). 2019. The Indian Telecom Services Performance Indicators. <https://main.trai.gov.in/release-publication/reports/performance-indicators-reports>

Relevance:

This indicator (i1162) is useful for comparing the access to fixed telephone subscriptions between urban and rural locations for monitoring differences between the two areas. This is particularly relevant for countries with significant rural populations. Its utility has become less over time due to the popularity of mobile telephone networks, which are less expensive to deploy in rural areas.

Indicator 1.12: Fixed-telephone numbers ported (i112pt)

Definition:

Fixed-telephone numbers ported refers to the number of porting transactions within the fixed-telephone line network that have been carried out for fixed-telephone numbers during the reference year.

Clarifications and scope:

Number portability is defined in terms of the number of porting transactions (a transaction occurs each time a number is ported, and one number can be ported several times). This indicator refers to the ability of residential and business subscribers to keep their telephone number if they switch service providers. In other words, it refers to the number of transactions whereby fixed-line telephone numbers have been transferred from one fixed-telephone line operator to another fixed-telephone line operator for users who have requested to keep the same telephone number. The data should refer to actual porting transactions that have been completed, and not pending transactions. The indicator excludes mobile telephone number porting, fixed-telephone line to mobile-cellular network number porting and mobile-cellular network to fixed-telephone network number porting.

Method of collection:

The data for this indicator can be collected from the portability administrator where one exists in the country. The portability administrator is the entity responsible for managing the database of ported numbers that operators access in order to route calls to the correct network. If there is no portability administrator, the national regulatory authority may compile the data. Portability data can be collected as well from operators by asking them how many incoming ported numbers they handled during the year.

Relationship with other indicators:

This Indicator (i112pt) is not related to other indicators in the Handbook.

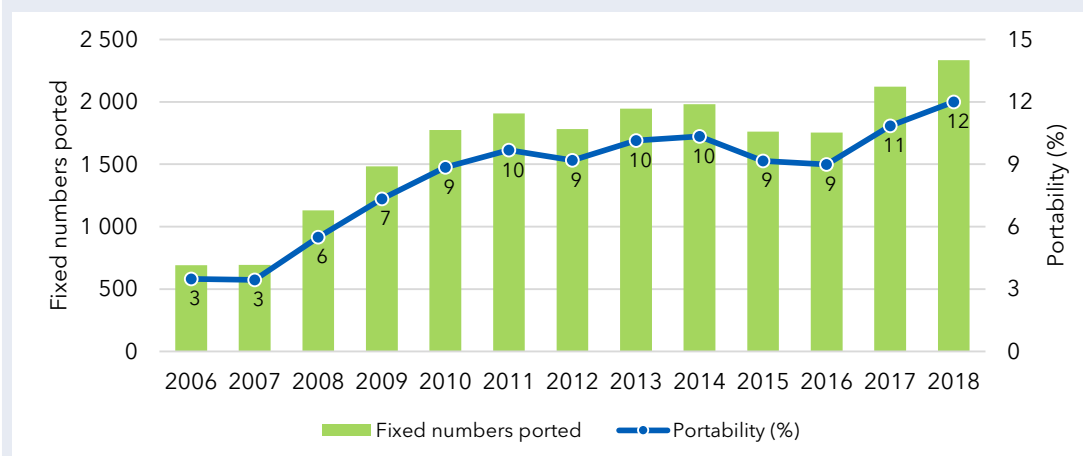
Methodological issues:

Fixed number portability needs to be available in the country for this indicator to be relevant. The indicator is also only relevant for countries with more than one operator providing fixed-telephone services. If operators or the regulator have established a centralized number portability system, it should be possible to query how many numbers have been ported or request this from the portability administrator. Data should refer to the sum of the incoming numbers ported to each operator or, alternatively, to the sum of the outgoing numbers ported from each operator. The total obtained should be the same as long as all operators report the same portability figures (either incoming or outgoing). Data should not refer to the sum of the net portability of each operator. Data refers to completed portability (i.e., those where the service has been activated by the new service provider - the receiver operator). In some cases, portability applications may be rejected, deferred, or cancelled. These operations are not to be included in this indicator.

(continued)

Example:

In Spain, the telecommunication regulatory authority compiles data on fixed number portability. Porting has gone through three phases since 2006. Initially, there was a large rise with the ratio of numbers ported to total fixed lines rising from 3 per cent in 2006 to 10 per cent in 2011. This was followed by a period of stabilization where the numbers ported were equivalent to around one tenth of the fixed telephone lines. Since 2016, there has been a slight increase in consumers switching their fixed telephone line provider.

Figure 12: Fixed telephone numbers ported, Spain

Source: Comisión Nacional de los Mercados y la Competencia. CNMC Data. <http://data.cnmc.es/datagraph/>

Relevance:

Portability is the capability of the subscriber to switch service provider, while maintaining the same telephone number. Portability facilitates the change of service provider by reducing costs when switching provider. Portability tends to enhance a more competitive retail market. Portability is often used to analyse consumer behaviour and to identify operators that gain subscribers or those that lose them over time for competition analysis.

2 Mobile-cellular networks

66. This section of the Handbook considers indicators related to mobile-cellular subscriptions, network coverage, portability and spectrum. Mobile cellular networks are increasingly used for a number of services: voice, messaging, accessing the Internet, cloud services, gaming, and to carry out digital activities, such as e-banking, e-commerce and e-administration.

67. Mobile networks show a rapid degree of technological innovation in that every decade a new standard comes into place. Mobile communications began with analogue first generation (1G) networks that launched the mobile revolution but equipment was bulky and prices high for both services and devices. This was followed by 2G networks that used digital technology and introduced simple messaging. Later came the 3G/UMTS set of technologies by which broadband (data rates at speeds above 256 kbit/s) became a reality. Less than ten years ago a new standard was deployed: 4G/LTE, supporting much higher data connection speeds and with it came a whole new world of applications that demanded high capacity and speed networks. Recently, the new 5G standard is being implemented, which will make ultra-high speed and minimal latency for new services a reality.

68. Mobile cellular is the predominant form of voice telephony. Subscriptions to mobile network services continue increasing, reaching higher and higher penetration levels. Voice traffic in many countries has shifted from fixed networks to mobile networks.

69. This section includes indicators on data subscriptions via mobile networks. Mobile broadband is widely available across the globe although speeds and quality vary. ITU estimated⁴ that 90 per cent of the world's population had access to at least a 3G network able to provide broadband. The mobile broadband subscriber base is augmenting at high rates both in developed and in less developed countries.

70. The 4G/LTE standard is extensively deployed as well in most parts of the world. In 2018, ITU estimated a coverage higher than 40 per cent of the worldwide population, though big differences across regions and countries are present. As 4G/LTE networks are deployed, significant increases in per user consumption of data are being recorded as well.

71. Innovation in networks and standards keeps developing and 5G networks are a reality in some countries, even if its deployment is still limited in specific case scenarios and constrained geographical areas. 5G networks demand very high-density cell and base station deployments and offer very high speeds, low latency and high quality data driven connectivity. It is clear that as these 5G networks are deployed new business models, new services and higher consumption of data driven by devices being connected will take place.

72. This group of indicators is based on annual (reference year) data in respect of the year ending 31 December. Where data are not available for the year ending 31 December, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data). Where countries report data on the basis of a year not ending on 31 December, this should be specified in a note.

73. Both residential and business subscriptions should be included.

⁴ ITU. 2018. *Measuring the Information Society Report 2018*. <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/misr2018.aspx>

74. Subscription indicators are presented, followed by the network coverage indicators. One indicator is included for switching of mobile provider while keeping the same number (portability). One indicator is also included for machines connected to a mobile network (i.e., machine-to-machine (M2M)), which is expected to grow rapidly in the near future. Finally, two indicators relating to spectrum are defined. Each indicator definition includes an example, mainly from national regulatory agencies.

2.1 Subscriptions

75. There are different types of mobile cellular subscriptions. The two most demanded services are voice and data connectivity. Voice services are possible with any of the existing standards for mobile networks: 2G, 3G/UMTS and 4G/LTE. Messages, short-message service (SMS), multimedia-messaging service (MMS) over the traditional networks are provided commercially together with the voice plan, even if in some instances they are charged separately.

76. Data connectivity is also possible with any of the standards mentioned but broadband (i.e., a connection that allows the user to connect at a speed of at least 256 kbit/s) is possible only with 3G/UMTS or higher standards (4G/LTE and 5G). Hence, when considering mobile broadband in practice it means connections that use 3G/UMTS or later networks.

77. In mobile network services the bundling (i.e., a set of two or more final services under one integrated offer with a single bill and payment) has been observed for quite a while. In many countries the degree of bundling of voice together with a data service is widespread so that these two services when contracted together are often not even thought of as a bundle.

78. On top of user-based subscriptions, be it for voice or for broadband services, machines and in general all sorts of devices are being connected to mobile networks. Be it for metering purposes, for having a specific terminal connected always while in mobility or for any other reason, more and more devices, machines and things in general are being linked to the mobile networks, the Internet of Things (IoT). These machines and devices demand data with different qualities of service attached.

79. One category of connections based on machines or devices has been measured by ITU for a number of years: machine-to-machine (M2M) connections. These connections work in devices without human intervention and may be contracted in the post payment (contract) mode - the majority of them - or as well in the prepayment mode. The indicator on M2M is presented in this section as well.

80. Mobile cellular services are sold in two contracting modalities: (1) prepayment, or (2) contract (or post payment). When measuring the number of subscriptions, it is important to account only for those subscriptions that are *active*. The criteria used by ITU and other international and national organizations for activity and that apply to any service being measured is twofold. For subscriptions in the contract or post payment modality where consumers pay a recurrent fee for the service contracted, irrespective of their intensity of usage, they are to be counted as active. For subscriptions in the prepaid modality, by contrast, it is required that the subscription has made a recharging or a use of any of the services contracted at least once in the last three months. That is, the subscriber has used the connection at least once for making/receiving calls or SMS or Internet connection or has induced a retail or a wholesale revenue in the last 90 days. These criteria, one applying for the contract modality and the other for prepaid subscriptions, are to be applied to any final service considered, i.e., voice, messaging or data.

Indicator 2.1: Mobile-cellular telephone subscriptions, by postpaid/prepaid (i271)

Definition:

Mobile-cellular telephone subscriptions refers to the number of subscriptions to a public mobile-telephone service that provide access to the public switched telephone network (PSTN) using cellular technology. The indicator includes the number of postpaid subscriptions and the number of active prepaid accounts (i.e., that have been used during the last three months). The indicator applies to all mobile-cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, data-only subscriptions, M2M and subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.

Mobile-cellular subscriptions can be broken down by type of contract, as follows:

Indicator 2.1a: Prepaid mobile-cellular telephone subscriptions (i271p)

This Indicator refers to the total number of mobile-cellular telephone subscriptions that use prepaid refills. These are "subscriptions" where, instead of paying an ongoing monthly fee, users purchase blocks of usage time. Only active subscriptions should be included i.e., those used at least once in the last three months for making or receiving a call or carrying out a non-voice activity such as sending or reading an SMS or accessing the Internet.

Indicator 2.1b: Postpaid mobile-cellular telephone subscriptions (i271pd)

This Indicator refers to the total number of mobile-cellular subscriptions where subscribers are billed after their use of mobile services at the end of each month. The postpaid service is provided on the basis of a prior arrangement with a mobile-cellular operator. Typically, the subscriber contract specifies a limit or allowance of minutes, text messages, etc. The subscriber will be billed at a flat rate for any usage equal to or less than that allowance. Any usage above that limit incurs extra charges. Theoretically, a subscriber in this situation has no limit on use of mobile services and, as a consequence, unlimited credit.

Clarifications and scope:

This indicator refers to telephone subscriptions to networks using mobile-cellular technology. It includes both postpaid and prepaid subscriptions. It includes mobile-cellular telephone subscriptions with access to data communications at low and medium speeds and mobile-cellular subscriptions with access to data communications at broadband speeds. It excludes trunked radio, radio-paging machine subscriptions and data-only subscriptions. Both residential and business subscriptions should be included.

Method of collection:

Data can be collected from all licensed mobile-cellular operators in the country, and then aggregated at the country level. If retail mobile-cellular services are also provided by non-facilities-based operators (i.e., mobile virtual network operators), care should be taken to avoid double counting. One difficulty that may arise is that operators may have different definitions of 'active' and therefore may not be able to provide the data according to the recommended definition (i.e., used in the last three months).

Relationship with other indicators:

This Indicator (i271) is equal to the sum of the values of Indicator 2.1a: Prepaid mobile-cellular telephone subscriptions (i271p) and Indicator 2.1b: Postpaid mobile-cellular telephone subscriptions (i271pd). Indicator i271 complements the indicator on mobile-cellular telephone subscriptions, by speed of data access, in which the number of mobile-cellular subscriptions is broken down by access speed.

(continued)

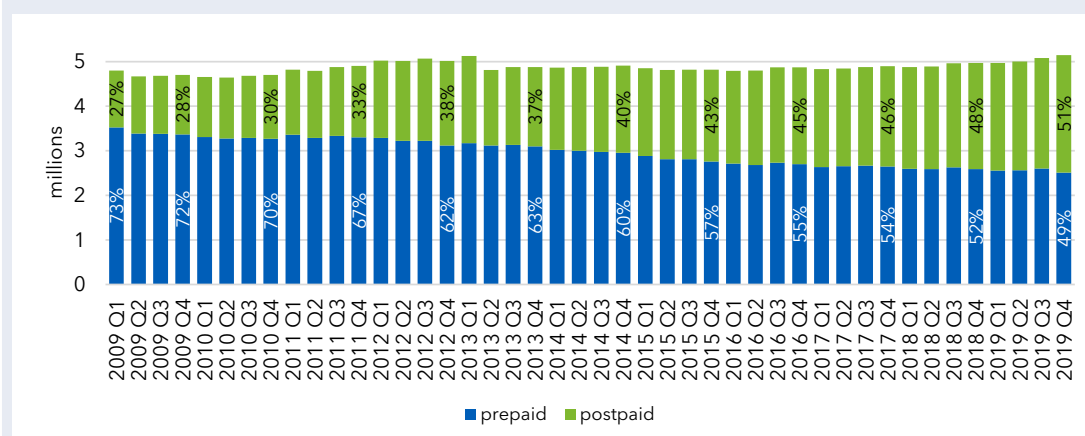
Methodological issues:

This indicator (i271) refers to mobile-cellular telephone subscriptions and therefore does not include subscriptions to mobile networks based on other technologies. Since the indicator refers to subscriptions, it does not represent the number of users. The indicator is divided by the population and multiplied by 100 to derive Partnership on Measuring ICT for Development core ICT indicator A2 (Mobile-cellular telephone subscriptions per 100 inhabitants).

Example:

The prepayment modality is usually the predominant way of contracting cellular services in the initial stages of cellular telephony. One of the reasons is that operators offer different prices for small volume consumption. In Ireland, the Commission for Communications Regulation (ComReg) monitors the evolution of subscribers based on the payment mode. In 2009, 73 per cent of all mobile subscriptions were prepaid. Ten years later, prepaid cards accounted for 49 per cent of the total (Figure 13).

Figure 13: Mobile-cellular telephone subscriptions, by postpaid/prepaid, Ireland



Note: Excluding dedicated broadband and M2M.

Source: ComReg QKDR Data Portal at: <https://www.comreg.ie/industry/electronic-communications/data-portal/>

Relevance:

Mobile cellular is the most popular telecommunication service in the world. Each of the two contracting modalities have different relevance depending on the country, commercial practices by the operators, and level of development.

Indicator 2.2: Mobile-cellular telephone subscriptions, by technology (i271)

Definition:

The number of mobile-cellular subscriptions (i271) can be broken down by the technology or standard used, as follows:

Indicator 2.2a: Mobile-cellular telephone subscriptions with access to data communications with 2G (i271data)

Refers to the number of mobile-cellular telephone subscriptions with access to data communications (e.g., Internet) with the 2G standard. This includes mobile-cellular technologies such as GPRS, CDMA2000 1x and most EDGE implementations, i.e., standards that allow downloading speeds lower than 256 kbit/s (narrowband). The indicator refers to the theoretical ability of subscribers to use non-broadband speed mobile data services, rather than the number of active users of such services.

Indicator 2.2b: Mobile-cellular telephone subscriptions with access to data communications with 3G (i271dataG)

Refers to the number of mobile-cellular telephone subscriptions with access to data communications (e.g., the Internet) with the standard 3G/UMTS. This includes all high-speed mobile-cellular telephone subscriptions with access to data communications and includes mobile-cellular technologies such as WCDMA (UMTS) and associated technologies such as HSPA and CDMA2000 1x EV-DO. It excludes low-speed mobile-broadband subscriptions (i.e., that offer speeds lower than 256 kbit/s) and fixed (wired) Internet subscriptions as well as excludes subscriptions that use regularly 4G/LTE technology.

Indicator 2.2c: Mobile-cellular telephone subscriptions with access to data communications with 4G/LTE (i271dataGA)

Refers to the number of mobile-cellular telephone subscriptions with access to data communications (e.g., Internet) with the standard 4G/LTE or with WiMAX 802.16e. It excludes subscriptions that regularly use 2G or 3G standards.

Clarifications and scope:

The three sub-indicators combined should provide the total of mobile cellular subscriptions that use data communications, be it with narrowband or with broadband speeds. Hence, the total (sum of the three sub-indicators) should be greater than Indicator 2.2: Active mobile-broadband subscriptions (i271mw).

The sub-indicators by technology/standard require operators to identify which subscription has access to and uses regularly a specific standard (2G, 3G and 4G/LTE). Any subscriber with a 4G/LTE coverage, for example in his home, may be using over the course of a month both 2G and/or 3G standards depending on his/her location, travel patterns, coverage of his/her own service provider and other factors. In order to match one subscription with one, and only one, technology or standard, the operator must identify which is the most frequently used network made by the subscriber. Operators regularly measure and bill consumption patterns by subscribers and should be able to identify each subscriber with one specific technology or standard.

Both residential and business subscriptions should be included.

Method of collection:

Data can be collected from all licensed mobile-cellular operators in the country, and then aggregated at the country level. If retail mobile-cellular services are also provided by non-facilities-based operators (i.e., mobile virtual network operators), care should be taken to avoid double counting. One difficulty that may arise is that operators may have different definitions of 'active' (i.e., use during the three months) and therefore may not be able to provide the data according to the recommended definition.

(continued)

Relationship with other indicators:

The sum of two of the sub-indicators: (1) Mobile-cellular telephone subscriptions with access to data communications with 3G (i271dataG), and (2) Mobile-cellular telephone subscriptions with access to data communications with 4G/LTE (i271dataGA) provide a measure the total of mobile broadband subscriptions (271mw). Hence, this total should equal the total obtained by summing:

- (a) Data and voice mobile-broadband subscriptions (or Standard broadband) (i271_mb_active), and
- (b) Data-only subscriptions (or Dedicated broadband) (i271md).

Methodological issues:

This indicator refers to mobile-cellular telephone subscriptions and therefore does not include subscriptions to mobile networks based on other technologies. In practice, country data is often presented by the generation of network technology available to subscribers (e.g., 2G, 3G, 4G and 5G).

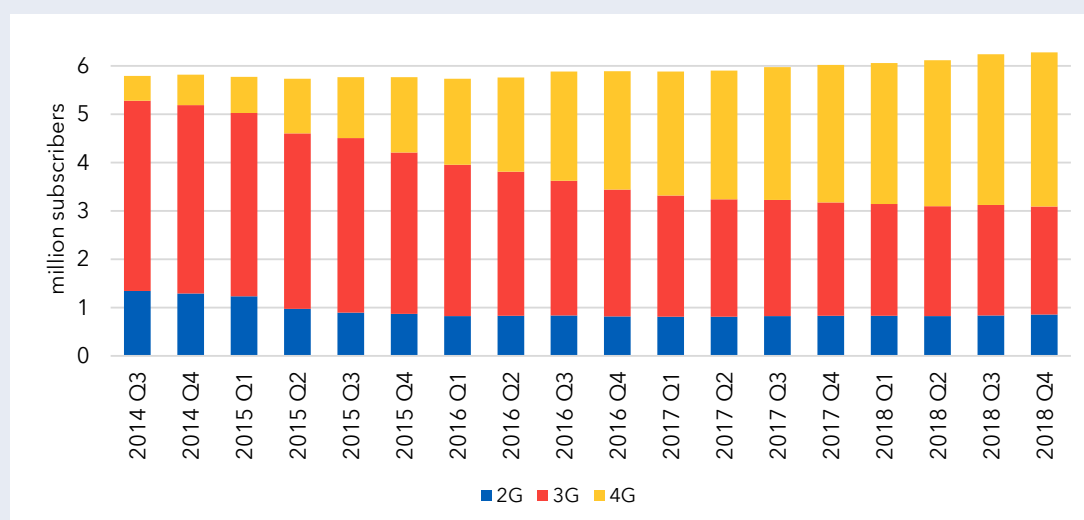
ITU has identified use cases for 5G (IMT-2020) supporting peak download speeds of at least 20 Gbit/s and a user experience data rate of 100 Mbit/s in urban areas.*

Example:

Each mobile technology offers different quality of service, especially speed of the connection. While 2G/GPRS standard provides narrowband speeds (lower than 256 kbit/s), 3G/UMTS and 4G/LTE offer broadband speeds. 4G/LTE offers much higher speeds, though the effective connection speed depends on the number of simultaneous users in the same cell.

In Ireland, the Commission for Communications Regulation (ComReg) monitors the evolution of subscriptions based on the technology they use. As new mobile technologies are implemented into the market, users are migrating and so benefit from the better quality and speeds offered.

Figure 14: Active subscriptions to mobile cellular communications by technology (millions), Ireland



Note: Including dedicated mobile broadband and M2M. Categories are mutually exclusive in that subscribers who have generated traffic on multiple networks (e.g., 2G and 3G) are categorized as users of the higher quality network (3G in this example).

Source: ComReg Data Portal at: <https://www.comreg.ie/industry/electronic-communications/data-portal/>

(continued)

Relevance:

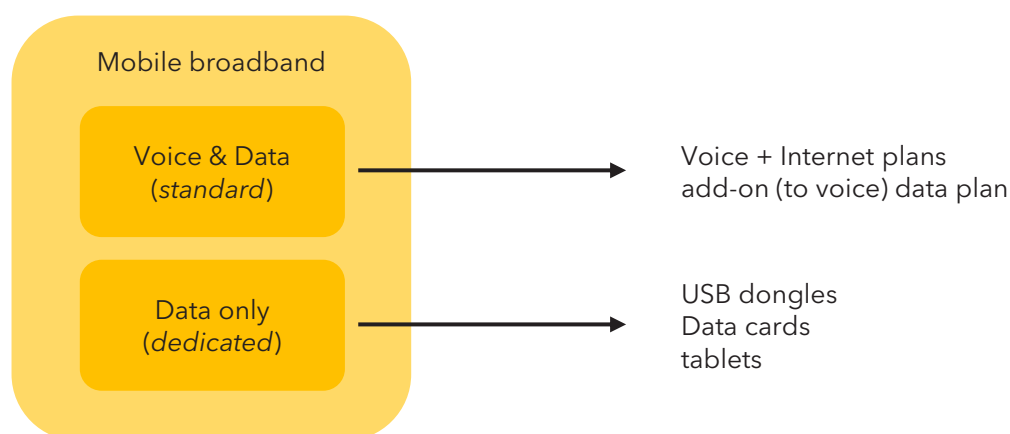
The type of mobile technology is linked to the development of new applications and services. By measuring the number of subscriptions that connect to different generations of mobile technology, it is possible to evaluate the degree of transition.

* ITU. 2017. *Minimum Requirements Related to Technical Performance for IMT-2020 Radio Interface(s)*. https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2410-2017-PDF-E.pdf

Mobile broadband subscriptions

81. Broadband services supported by mobile networks may be contracted in two ways: (1) either together with a voice plan (possibly also including messaging), or (2) as a stand-alone service: only broadband, be it via a dongle/modem/USB key card or with a device such as a smartphone or tablet. In order to differentiate between types of contracts, ITU collects data on subscriptions distinguishing between data *and* voice subscriptions, or else *only data* (broadband) subscriptions. Both set of services can be contracted through either prepayment or post payment modality. The distinction based on the set of services contracted together with mobile broadband, or mobile broadband as a stand-alone service, is relevant when collecting data from operators and is depicted in the next graph.

Figure 15: Mobile broadband, standard and dedicated subscriptions



Indicator 2.3: Active mobile-broadband subscriptions (i271mw)

Definition:

Active mobile-broadband subscriptions refers to the sum of *active handset-based* and *computer-based* (USB/dongles) mobile-broadband subscriptions that allow access to the Internet. It covers actual subscribers, not potential subscribers, even though the latter may have broadband-enabled handsets.

Subscriptions must include a recurring subscription fee or if in the prepayment modality, pass a usage requirement – users must have accessed the Internet in the last three months.

This indicator (i271_mw) is composed of two sub- indicators:

Indicator 2.3a: Data and voice mobile-broadband subscriptions (or Standard broadband) (i271_mb_active)

Refers to subscriptions to mobile-broadband services that allow access to the open Internet via HTTP and in which data services are contracted together with voice services (mobile voice and data plans) or as an add-on package to a voice plan. These are typically smartphone-based subscriptions with voice and data services used in the same terminal.

Data and voice mobile-broadband subscriptions with specific recurring subscription fees for Internet access are included regardless of actual use. Prepaid and pay-per-use data and voice mobile-broadband subscriptions should only be counted if they have been used to access the Internet in the last three months. M2M subscriptions should be excluded. The indicator includes subscriptions to mobile networks that provide download speeds of at least 256 kbit/s (e.g., WCDMA, HSPA, CDMA2000 1x EV-DO, WiMAX IEEE 802.16e and LTE), and excludes lower-speed technologies such as GPRS, EDGE and CDMA 1xRTT.

Indicator 2.3b: Data-only mobile-broadband subscriptions (i271md)

Data-only mobile-broadband subscriptions or dedicated mobile broadband refers to subscriptions to mobile broadband services that allow access to the open Internet and that do not include voice services, i.e., subscriptions that offer mobile broadband as a stand-alone service, such as mobile-broadband subscriptions for datacards, USB modem/dongle and tablets or any computer based device.

Data-only mobile-broadband subscriptions with recurring subscription fees are included regardless of actual use. Prepaid and pay-per-use data-only mobile-broadband subscriptions should only be counted if they have been used to access the Internet in the last three months. M2M subscriptions should be excluded. It excludes data subscriptions that are contracted together with mobile voice services.

Clarifications and scope:

For mobile data subscription to be considered broadband, the operator must advertise a connection that will be capable of using at least a 3G/UMTS network, so that a nominal downloading speed of 256 kbit/s is at a minimum expected. Hence, subscriptions that are only to use GPRS and EDGE technologies are to be excluded.

A contract (post pay) subscription pays a recurrent bill with a predetermined frequency. It should be counted as an active mobile broadband subscription no matter the effective data consumption realized by the user. A prepayment or a pay-as-you-go subscription needs to pass the activity criterion to be considered as 'active': a billable Internet connection must have occurred in the last three months.

Note that for a mobile subscription to be considered broadband it must allow access to the public open Internet, hence, any subscription that limits access only to walled garden or services provided in exclusivity by the mobile operator, are not counted as access to the open Internet, and hence, are not 'broadband'. Several cases are defined below.

(continued)

Table 4: Different contracting modalities offered for mobile broadband

Type of plan	voice	data	activity	how to count for this
stand-alone voice	standard voice subscription	pay-as-you-go	if internet used in last 3 months: active broadband	Data + voice mobile broadband
stand-alone voice	standard voice subscription	add-on data plan contracted	if recurrent fee paid for data plan: active	Data + voice mobile broadband
stand-alone voice	standard voice subscription	add-on data plan contracted	if prepayment or pay-as-you-go data plan: use of internet in last 3 months	Data + voice mobile broadband
3G/4G modem/ USB	no voice calls	limited plan (GB/month)	data contract (recurrent fee)	Data only broadband
3G/4G modem/ USB	no voice calls	limited plan (GB/month)	if prepayment: internet used in last 3 months	Data only broadband
Bundled voice and data	limited minutes	limited data cap (GB/month)	if both voice and data plan paid in recurrent fee (contract)	Data + voice mobile broadband
Bundled voice and data	limited minutes	limited data cap (GB/month)	if data paid as prepayment: internet accessed in last 3 months	Data + voice mobile broadband

Both residential and business subscriptions should be included.

Method of collection:

The data can be collected from licensed mobile operators in the country that offer mobile-broadband services providing access to the Internet. These operators should have mobile-broadband networks that provide download speeds of at least 256 kbit/s (e.g., WCDMA, HSPA, CDMA2000 1x EV-DO, WiMAX IEEE 802.16e and LTE). Data are then aggregated at the country level.

Relationship with other indicators:

Mobile broadband has been enabled since the deployment of 3G/UMTS standards all over the world. As new mobile network standards emerge, as 4G/LTE and more recently 5G, much higher speeds are reached and this leads to greater consumption of data by consumers. It is of interest to relate this indicator with the Indicator Mobile internet (domestic) traffic (136mwi).

(continued)

Methodological issues:

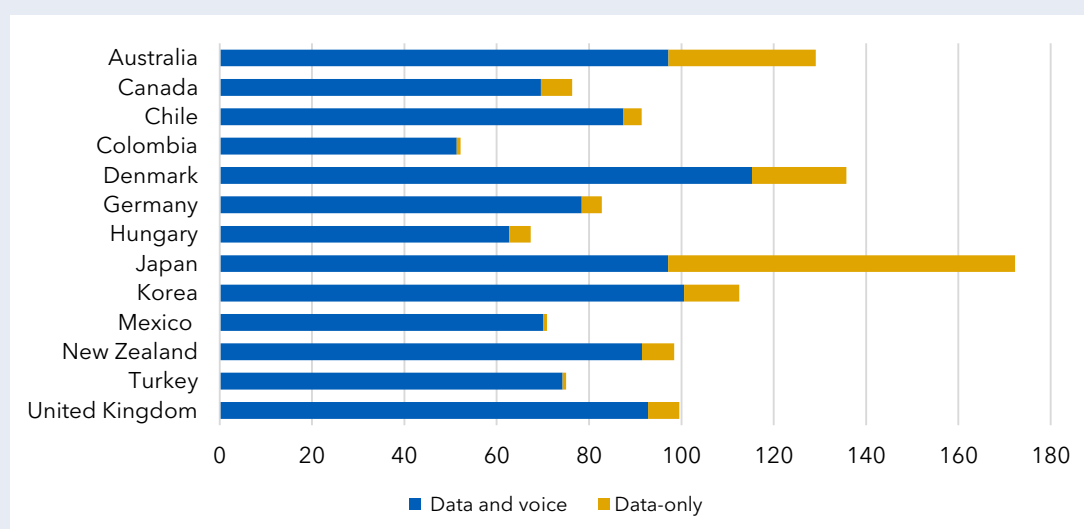
Comparability may be affected if countries do not adhere to the requirement that subscriptions should be active through access to the Internet. Some countries report the total number of mobile subscriptions with theoretical access to mobile-broadband services (Indicator 12b: Mobile-cellular telephone subscriptions with access to data communications at broadband speeds (i271mb_access)) rather than the number of active subscriptions (i.e., those that have actually been used to access the Internet via the service).

The distinction between this service and terrestrial fixed wireless broadband can be subtle; see Indicator 3.5f: Terrestrial fixed wireless broadband subscriptions (i271fw) for more information.

Example:

The mobile broadband indicators presented in this Handbook are harmonized with those proposed by the OECD. In the figure below the penetration rate (over 100 inhabitants) in selected OECD members is presented with the distinction between data-only subscriptions (Dedicated) and data and voice (Standard) subscriptions. Japan is particularly notable where over 40 per cent of subscriptions are data-only. Note that overall mobile broadband subscriptions are mainly driven by smartphone-based demand, where subscriptions typically bundle together voice and data services.

Figure 16: Data and voice and data-only mobile broadband subscriptions (per 100 inhabitants) in selected OECD members, 2018



Source: OECD Broadband statistics [<http://www.oecd.org/sti/broadband/broadband-statistics>]

Relevance:

Mobile broadband is the fastest growing service in the telecommunication industry, both in terms of new subscribers to the service as well as intensity of usage. Data consumption grows at two-digit rates every year. This indicator is one measure of the extent to which mobile broadband has been adopted.

Indicator 2.4: Active subscriptions to LTE/WiMAX mobile broadband (i271mwa)

Definition:

Active subscriptions to LTE/WiMAX mobile-broadband networks refer to subscriptions that have generated Internet traffic in the last 90 days in LTE/mobile WiMAX and other advanced mobile-broadband networks, such as LTE-Advanced and Wireless MAN. It excludes subscriptions having generated Internet traffic only in HSPA, UMTS, EV-DO and previous 3G networks, and also excludes fixed WiMAX subscriptions.

Clarifications and scope:

This indicator refers to telephone subscriptions to networks using a 4G/LTE mobile-cellular technology. It includes both postpaid and prepaid subscriptions. Both residential and business subscriptions should be included.

Method of collection:

Data can be collected from all licensed mobile-cellular operators in the country, and then aggregated at the country level. If retail mobile-cellular services are also provided by non-facilities-based operators (i.e., mobile virtual network operators), these subscriptions should also be counted. One difficulty that may arise is that operators may have different definitions of 'active' and therefore may not be able to provide the data according to the recommended definition (i.e., in the last three months).

Relationship with other indicators:

This indicator (i271mwa) is a subset of Indicator 2.2: Active mobile-broadband subscriptions (i271mw).

(continued)

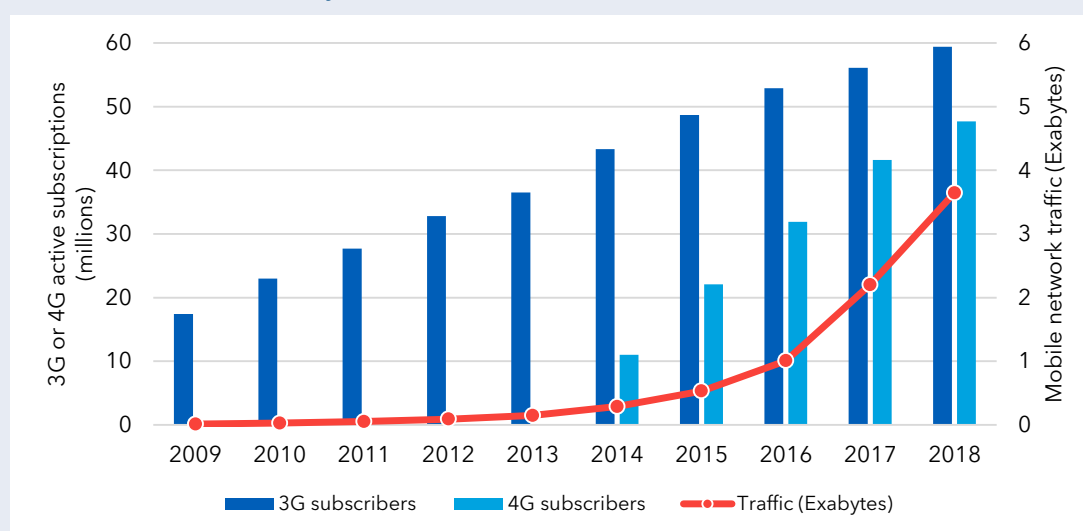
Methodological issues:

This indicator (i271mwa) refers to mobile-cellular telephone subscriptions that use 4G/LTE standard and therefore does not include subscriptions to mobile networks based on other technologies or standards. Since the indicator refers to subscriptions, it does not represent the number of users.

Example:

As 4G/LTE networks have been extended over land and population, data traffic consumed has increased. ARCEP, the electronic communications regulatory authority in France, monitors closely these trends. In 2009, no significant 4G/LTE deployment had yet taken place in France and the average mobile broadband user consumed 0.06 gigabytes (GB)/month (approximately 60 MB) using the available 3G/UMTS networks. Eight years later and with a very extensive 4G/LTE population coverage, a representative mobile user consumed 2.83 GB/month, forty-five times as much data.

Figure 17: 3G and 4G/LTE active mobile-broadband subscriptions (millions) and mobile data traffic (Exabytes) in France



Source: ARCEP, 2019. *L'Arcep et les marchés régulés. Rapport d'activité, 2018*. <https://www.arcep.fr/larcep/les-rapports-publics-dactivite-de-larcep.html>

Relevance:

The jump in individual consumption of mobile data was clear when the networks shifted from 2G to the 3G set of standards, and with the commercial launch in 2010-2012 of 4G/LTE networks, an additional hike in mobile data consumption can be observed.

In the near future, 5G deployment will bring about much higher transmission (and consumption) capacity while the user or device is in mobility. For network planning, configuration of final services, pricing and quality of service, it is fundamental to know the availability of the different network standards and the number of users of each technology. Innovation on the other side of the market, the applications and services where the over-the-top agents introduce new services and possibilities, hinges on the quality and capacity of the available mobile networks.

2.2 Coverage

82. Since mobile network usage has become the predominant form of telecommunications across the world, it is highly important to measure land area coverage and especially population coverage. Population coverage provides a good approximation of the universality of Internet access and is used as a tracking indicator for Sustainable Development Goal (SDG) 9c.

83. ITU collects information on four dimensions of coverage: coverage of any mobile cellular network over the land area and over the population and two measures of population coverage by specific mobile technologies: 3G/UMTS and 4G/LTE networks.

84. Coverage implies that a specific population (or land area) receives an adequate signal offered by an operator such that the service, be it making calls or accessing the Internet, is possible. An individual covered by a cellular network implies potential access but does not necessarily mean usage since the individual may not have a subscription or may not have an appropriate device with which to access the network. Coverage indicators are a good measure of accessibility to ICT services, not a measure of activity or penetration.

85. The measurement of coverage can be performed with different methods. Very often regulatory authorities or operators use theoretical prediction-based estimations. These are based on analysis performed with software using information on antennas, locations, base stations, sites, frequencies, strength of emission and other parameters that calculate the coverage over the land area of the frequency signal in each relevant location. Measurements can also be obtained with field measurements by testing a sample of devices and a sample of locations to determine if the signal received has enough strength to make the service available. Field measurements are often used by regulatory authorities in order to monitor quality of service and coverage obligations that operators have to abide by due to the licence conditions.

86. In order to measure coverage of a mobile network, a number of variables need to be taken into account and be predefined *ex ante*.⁵ Among them: (1) data service to measure (i.e., if it is a high quality (high speed demanding) or a low quality one, if data streams or only voice are to be considered); (2) location of the user (if the signal is to be measured indoors, outdoors, or while moving); (3) the type of device (i.e., tablets, smartphones, feature phones, etc.) and (4) strength of the signal to be considered (or minimum probability threshold for a successful service (for voice or data)). For each technology considered, 2G, 3G/UMTS, or 4G/LTE, different mobile signal levels may be appropriate. Each national regulatory authority when measuring coverage may select different values and methods.

⁵ Body of European Regulators for Electronic Communications (BEREC). 2018. *Draft Common Position on monitoring mobile coverage*. https://berec.europa.eu/eng/document_register/subject_matter/berec/public_consultations/8165-draft-common-position-on-monitoring-mobile-coverage

Indicator 2.5: Percentage of the land area covered by mobile-cellular network (i271Land)

Definition:

Percentage of the land area covered by mobile-cellular network refers to the total mobile-cellular coverage of the land area in per cent. This is calculated by dividing the land area covered by a mobile-cellular signal by the total land area and multiplying by 100. Note that this indicator refers to the mobile network with the widest coverage regardless of technology.

Clarifications and scope:

This indicator refers to the proportion of a country's land area covered by a mobile-cellular network signal. It does not measure the percentage of the population covered by a mobile-cellular signal, nor the percentage of the population subscribing to a mobile-cellular service. Coverage should refer to all mobile-cellular technologies. If this is not the case, it should be specified in a note.

Method of collection:

The data can be collected from licensed mobile-cellular operators in the country. However, they are likely to have different locations of coverage. Another method would be to request operator coverage maps. These could then be compared in order to determine the total land area covered by any mobile-cellular signal.

Relationship with other indicators:

Indicator i271Land is not related to other indicators in the Handbook, although it complements Indicator 2.6: Percentage of the population covered by a mobile-cellular network (i271pop).

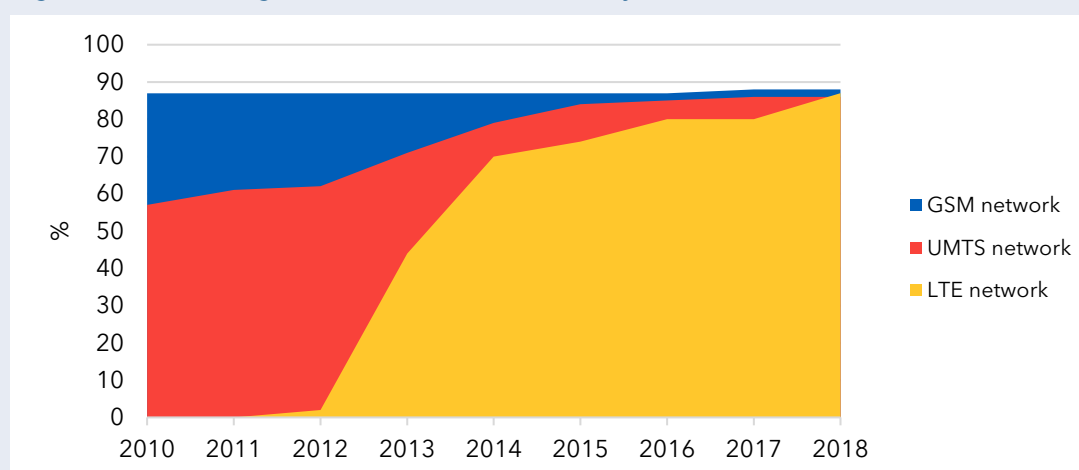
Methodological issues:

Some countries have difficulty calculating overall mobile-cellular land area coverage. In many cases, data refer only to the operator with the largest coverage, and this may understate the true coverage. If the coverage only refers to one operator, this should be specified in a note.

Example:

The national regulatory authority in Switzerland publishes data on land and population coverage of GSM and mobile broadband networks. Mobile broadband networks have progressively covered more of the country over time and by 2018 reached almost the same level of land coverage as 2G (GSM).

Figure 18: Percentage of the land area covered by mobile-cellular network, Switzerland



Source: Federal Office of Communication (OFCOM) Statistical observatory. <https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/facts-and-figures/statistical-observatory.html>

Relevance:

Land coverage of the mobile network provides another perspective to ascertain the extent of the terrestrial mobile network infrastructure.

Indicator 2.6: Percentage of the population covered by a mobile-cellular network (i271pop)

Definition:

Percentage of the population covered by a mobile-cellular network refers to the percentage of inhabitants within range of a mobile-cellular signal, irrespective of whether or not they are subscribers or users. This is calculated by dividing the number of inhabitants within range of a mobile-cellular signal by the total population and multiplying by 100. Note that this indicator refers to the mobile network with the widest coverage regardless of technology.

Clarifications and scope:

This indicator refers to proportion of the population that lives within range of a mobile-cellular network signal, regardless of whether they subscribe to the service or use it. It is based on where the population lives, and not where they work or go to school, etc. The indicator is not the same as the mobile subscription density or penetration. When there are multiple operators offering the service, the maximum population number covered should be reported. Coverage should refer to all mobile-cellular technologies. If this is not the case, it should also be specified in a note.

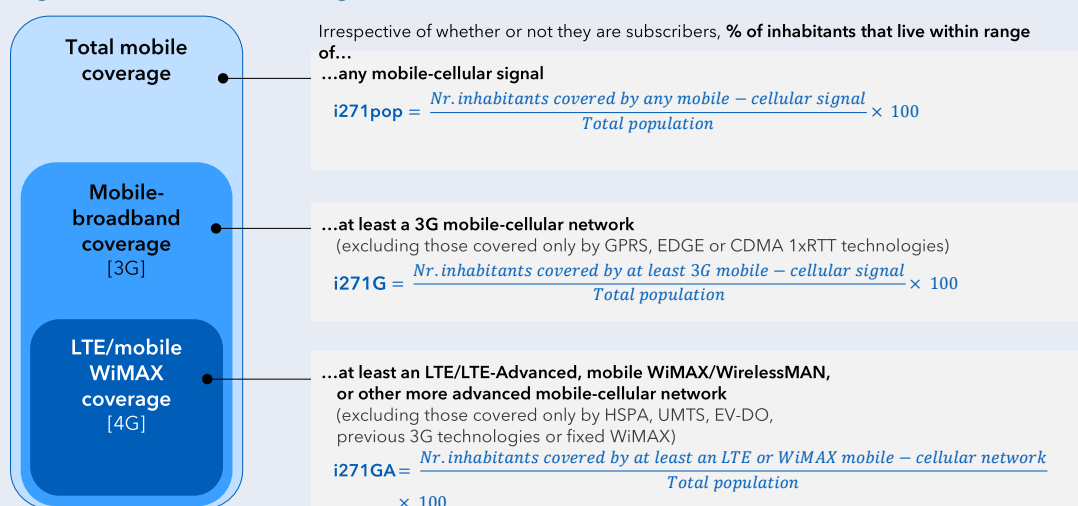
Method of collection:

The data can be collected from licensed mobile-cellular operators. However, they are likely to have different levels and locations of coverage. Another method would be to request operator coverage maps, which can be overlaid with maps showing the population of the country.

Relationship with other indicators:

This indicator (i271pop) includes the value of Indicator 2.7: Percentage of the population covered by at least a 3G mobile network (i271G), which in turn includes Indicator 2.8: Percentage of the population covered by at least a 4G/LTE mobile network (i271GA). Indicator i271pop complements Indicator 2.5: Percentage of the land area covered by mobile-cellular network (i271Land).

Figure 19: Mobile coverage indicators



Source: ITU

(continued)

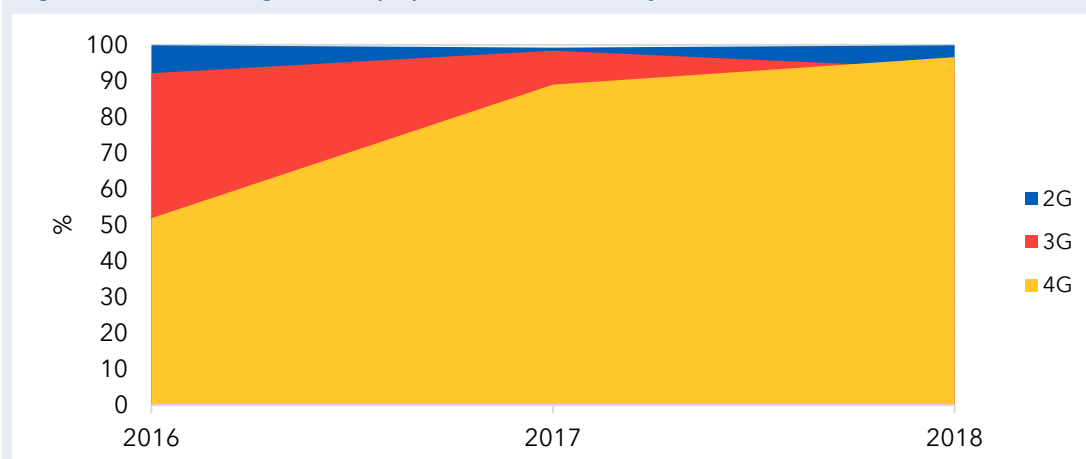
Methodological issues:

Some countries have difficulty calculating overall mobile-cellular population coverage. In many cases, data refer only to the operator with the largest coverage, and this may understate the true coverage. If the coverage only refers to one operator, this should be specified in a note. The percentage of the population covered by a mobile-cellular network is Partnership on Measuring ICT for Development core ICT indicator A7 (Fixed broadband Internet prices per month).

Example:

The Rwanda Utilities Regulatory Authority (RURA) collects quarterly data on mobile geographical and population coverage from each operator and for each technology. As per the guidelines for this indicator, in the absence of a country total, the figure for the largest operator should be used. 2G has the highest population coverage and therefore is the figure to use for this indicator.

Figure 20: Percentage of the population covered by a mobile cellular network, Rwanda



Note: 2G and 3G refer to MTN Rwanda (MNT) and 4G to KT Rwanda Networks (KTRN). MTN is the largest operator by subscriptions for 2G and 3G while KTRN is the sole 4G wholesale provider.

Source: Rwanda Utilities Regulatory Authority. "Statistics and Tariff Information in Telecom, Media and Postal Service."

Relevance:

Mobile networks advance a new standard for communications recurrently. Each new standard brings about higher speeds and communications possibilities. While 2G/GPRS networks allowed for voice and narrowband data transmissions, 3G and 4G allow for broadband speeds and a wealth of new applications and uses of the connection. By measuring the coverage of any mobile network or standard deployed, a minimal measure of the capacity of individuals to communicate while on mobility is being achieved.

Indicator 2.7: Percentage of the population covered by at least a 3G mobile network (i271G)

Definition:

Percentage of the population covered by at least a 3G mobile network refers to the percentage of inhabitants that are within range of at least a 3G mobile-cellular signal, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by at least a 3G mobile-cellular signal by the total population and multiplying by 100.

Clarifications and scope:

This indicator captures mobile-broadband coverage and refers to the proportion of the population that lives within range of at least a 3G mobile-cellular network signal, regardless of whether they actually subscribe to the service or use it. It is based on where the population lives, and not where they work or go to school. It includes the percentage of the population covered by mobile-cellular technologies such as WCDMA (UMTS) and associated technologies such as HSPA, CDMA2000 and related technologies such as EV-DO and mobile WiMAX 802.16e. Note that when 4G/ LTE or 5G have higher population coverage than 3G, then they should be used instead. It excludes the percentage of the population covered by a 2G mobile-cellular network, and by GPRS and EDGE technologies. Coverage should refer to all broadband mobile-cellular technologies. If this is not the case, it should be specified in a note.

Method of collection:

The data can be collected from licensed 3G mobile-cellular operators in the country. However, they are likely to have different levels and locations of coverage. Another method would be to request 3G operator coverage maps, which can then be overlaid with maps showing the population of the country.

Relationship with other indicators:

This indicator (i271G) is a component of Indicator 2.6: Percentage of the population covered by a mobile-cellular network (i271pop). This indicator (i271G) includes Indicator 2.8: Percentage of the population covered by at least a 4G/LTE mobile network (i271GA) (See Figure 19).

(continued)

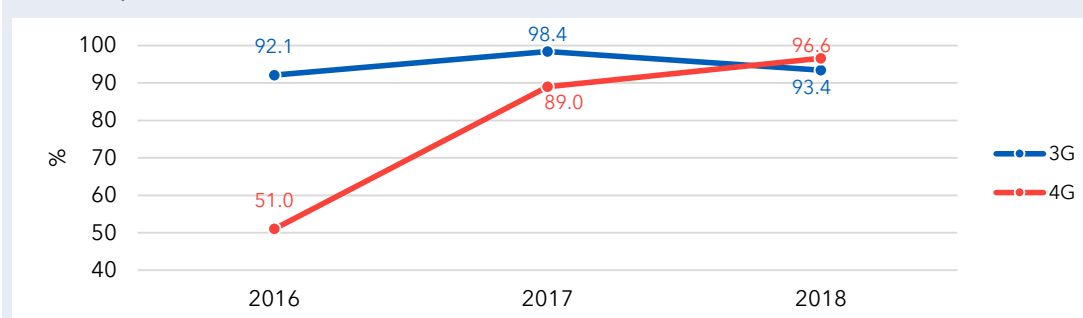
Methodological issues:

Some countries have difficulty calculating overall broadband mobile-cellular population coverage. In many cases, data refer only to the operator with the largest coverage, and this may understate the true coverage since other operators may have coverage where the largest operator does not. If the coverage only refers to one operator, this should be specified in a note.

Example:

The Rwanda Utilities Regulatory Authority (RURA) collects quarterly data on mobile geographical and population coverage from each operator and for each technology. As per the guidelines for this indicator, in the absence of a country total, the figure for the largest operator should be used. 4G has the highest population coverage in Rwanda and therefore is the figure to use for this indicator for that country.

Figure 21: Percentage of the population covered by at least a 3G mobile network, Rwanda



Note: 3G refers to MTN and 4G to KTRN. MTN is the largest operator by subscriptions for 3G while KTRN is the sole 4G wholesale provider.

Source: Rwanda Utilities Regulatory Authority. "Statistics and Tariff Information in Telecom, Media and Postal Service." <https://www.rura.rw/index.php?id=194>

Relevance:

Mobile broadband population coverage is both a Partnership on Measuring ICT for Development core indicator (A6 Percentage of the population covered by a at least a 3G mobile network) and an SDG tracking indicator (9.c.1). Mobile broadband coverage is a critical indicator of the potential of the population to access high-speed Internet. In some countries it is used as a licence condition with operators obligated to reach a specific level of mobile broadband coverage within a certain period of time.

Indicator 2.8: Percentage of the population covered by at least a 4G/LTE mobile network (i271GA)

Definition:

Percentage of the population covered by at least a 4G/LTE mobile network refers to the percentage of inhabitants that are within range of at least a 4G/LTE mobile-cellular signal, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by at least a 4G/LTE mobile-cellular signal by the total population and multiplying by 100.

Clarifications and scope:

This indicator captures mobile-broadband coverage and refers to the proportion of the population that lives within range of at least a 4G/LTE mobile-cellular network signal, regardless of whether they subscribe to the service or use it. It is based on where the population lives, and not where they work or go to school. It excludes the percentage of the population covered by mobile-cellular technologies such as WCDMA (UMTS) and associated technologies such as HSPA, CDMA2000 and related technologies such as EV-DO, mobile WiMAX 802.16e and LTE. It excludes the percentage of the population covered by a 2G mobile-cellular network, by GPRS and EDGE and by WCDMA (UMTS) and associated technologies such as HSPA, CDMA2000 and related technologies such as EV-DO, mobile WiMAX 802.16e. Coverage should refer to all broadband mobile-cellular technologies. If this is not the case, it should be specified in a note.

Method of collection:

The data can be collected from licensed 3G mobile-cellular operators in the country. However, they are likely to have different levels and locations of coverage. Another method would be to request 4G/LTE operator coverage maps, which can then be overlaid with maps showing the population of the country.

Relationship with other indicators:

This indicator (i271GA) is a component of Indicator 2.6: Percentage of the population covered by a mobile-cellular network (i271pop) as well as of Indicator 2.7: Percentage of the population covered by at least a 3G mobile network (i271G) (See Figure 19).

(continued)

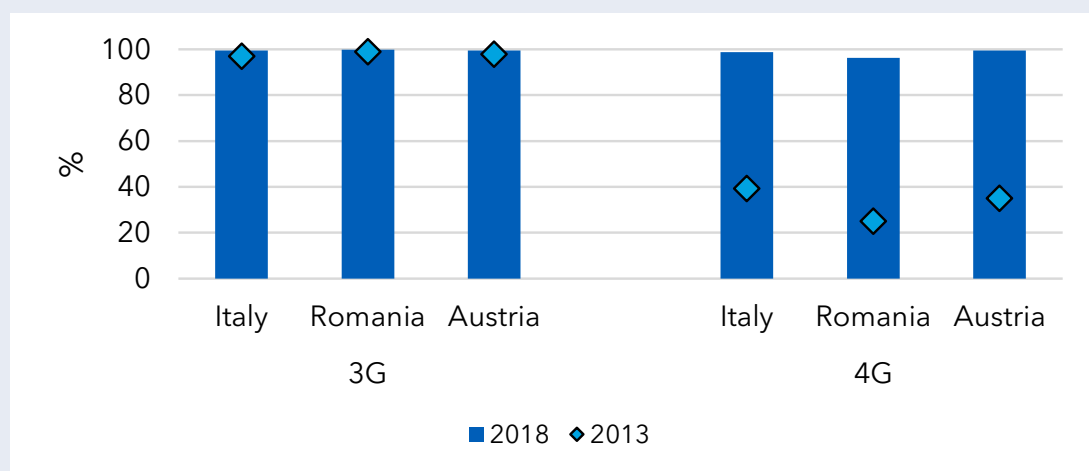
Methodological issues:

Some countries have difficulty calculating overall broadband mobile-cellular population coverage. In many cases, data refer only to the operator with the largest coverage, and this may understate the true coverage. If the coverage only refers to one operator, this should be specified in a note.

Example:

Coverage of population with a new technology involves substantial investment. Coverage of cities and densely populated areas is achieved first while rural coverage usually lags behind. The example below shows that in 2013 Romania, Austria and Italy had less than 40 per cent of the population covered with 4G/LTE networks. Five years later their coverage was practically complete at the national level.

Figure 22: Percentage of the population covered by at least a 4G/LTE mobile network



Source: European Commission Digital Scorecard. <https://ec.europa.eu/digital-single-market/en/digital-scoreboard>

Relevance:

As of 2019, 5G networks were commercially deployed in only a handful of countries. Hence 4G/LTE was the mobile broadband technology with the fastest speeds and compatibility for the largest number of devices in use. Thus, its coverage is important to understand the extent to which the population has theoretical access to significantly faster speeds and lower latency compared to 3G networks.

2.3 Portability

87. Mobile number portability (MNP) allows a subscriber to retain their telephone number when changing providers. This benefits subscribers by making it easier to switch providers while keeping the same number and not having to notify contacts and change things like business cards or stationery. Ease of switching contributes to making mobile markets more competitive.

Indicator 2.9: Mobile-cellular numbers ported (i271pt)

Definition:

Mobile-cellular numbers ported refers to the number of mobile porting transactions that have been carried out during the reference year.

Clarifications and scope:

This indicator refers to the number of transactions whereby mobile-cellular numbers have been transferred from one mobile-cellular operator to another operator for users who change operators and have requested to keep the same telephone number. The data should refer to actual porting transactions that have been completed, and not pending transactions. The data refer to the number of mobile-cellular telephone numbers that have been ported over the year, and not the cumulative number of porting transactions. The indicator covers porting within the mobile-cellular network. It excludes fixed-telephone number porting, fixed-telephone line to mobile-cellular network porting and mobile-cellular telephone number to fixed-telephone network porting.

Method of collection:

The data can be collected from all licensed mobile-cellular operators in the country. Alternatively, where the operators or regulator have established a centralized number portability system, it should be possible to obtain the data from the portability administrator. Data should refer to the sum of the incoming numbers ported to each operator or, alternatively, to the sum of the outgoing numbers ported from each operator. The total obtained should be the same as long as all operators report the same portability figures (either incoming or outgoing). Data should not refer to the sum of the net portability of each operator.

Relationship with other indicators:

This indicator is not directly related to other indicators in the Handbook. However, it is analytically useful to compare the volume of porting numbers to the number of mobile cellular subscriptions.

(continued)

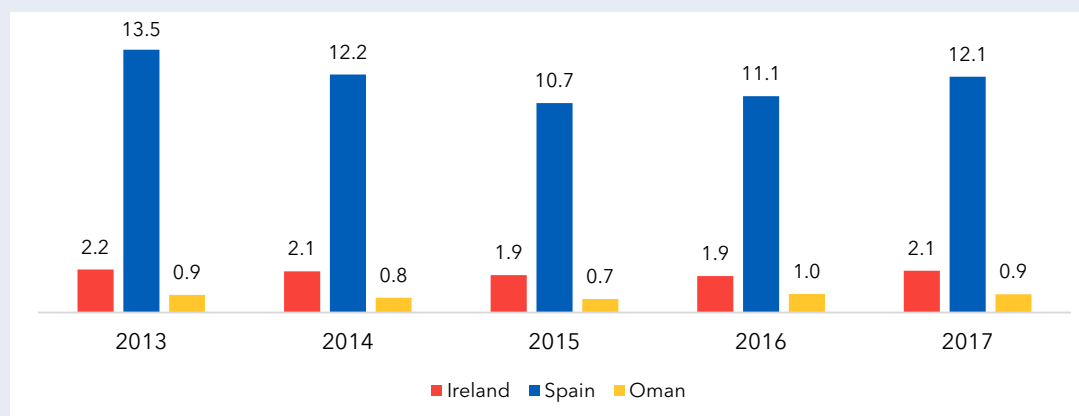
Methodological issues:

Mobile number portability needs to be available in the country for this indicator to be relevant. The indicator is also only relevant for countries with more than one operator providing mobile-cellular telephone services. If operators or the regulator have established a centralized number portability system, it should be possible to query how many numbers have been ported or request this from the portability administrator.

Example:

The volumes of ported numbers vary greatly from country to country. In Ireland, for example, the volume has been quite constant over the years, at approximately 2 per cent of all mobile subscriptions that switch service provider every year. About 1 per cent of portability rate has been registered in Oman. In Spain, by contrast, on average 12 per cent of all mobile subscriptions change service provider every year.

Figure 23: Mobile-cellular numbers ported (% of total subscriptions), Ireland, Spain, and Oman



Source: ComReg (Ireland), CNMC (Spain) and TRA (Oman)

Relevance:

Portability facilitates the switching of service provider by the customer. In many countries specific norms for the portability process have been issued (longest duration, cost for subscribers). Data on portability helps in evaluating the functioning of the market.

2.4 Data services

Indicator 2.10: Machine-to-Machine (M2M) mobile-network subscriptions (i271m2m)

Definition:

M2M mobile-network subscriptions refers to the number of mobile-cellular machine to-machine subscriptions that are assigned for use in machines and devices (cars, smart meters, consumer electronics) for the exchange of data between networked devices, and are not part of a consumer subscription.

Clarifications and scope:

This indicator refers to mobile data machine-to-machine subscriptions to networks using a mobile-cellular technology, specifically 2G/GSM, 3G/UMTS and 4G/LTE and 5G networks. It collects all subscriptions of connected devices using a cellular technology that are not part of a consumer subscription. Data-only subscriptions contracted by individual consumers for personal use, as dongle-USB or subscriptions for tablets are to be excluded since they are contracted and to be used by individual consumers.

M2M subscriptions are usually contracted by firms or institutions. In any case, subscriptions for connected devices using any cellular technology may be contracted as well by individuals, households or firms and institutions alike.

Method of collection:

Data for machine-to-machine subscriptions (M2M) can be collected from all licensed mobile-cellular operators in the country, and then aggregated at the country level. If retail mobile-cellular services connecting machines are also provided by non-facilities-based operators (i.e., mobile virtual network operators or other agents offering M2M final services), these subscriptions should also be counted.

Relationship with other indicators:

No other indicator captures non-personal subscriptions or activity. No direct relationship with any other indicator.

(continued)

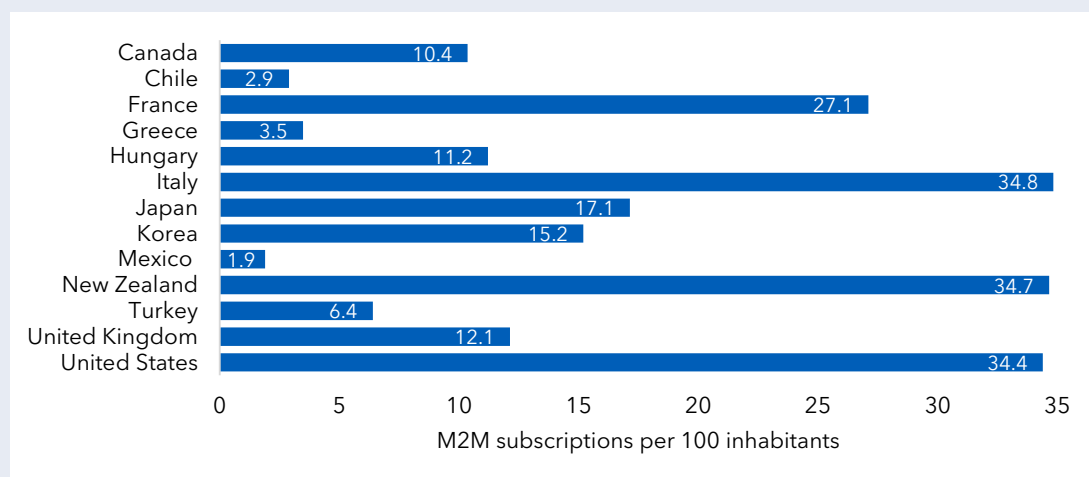
Methodological issues:

M2M subscriptions are an important subset of all mobile connected devices active in the market. With the deployment of 5G networks, an explosion of devices, users and things connected to a densely deployed network of cells, base stations and sites is expected. It is likely that more detail in this M2M indicator will be needed in order to capture market trends and penetration of mobile machine connectivity with more precision.

Example:

M2M connections have been growing at significant rates in recent years. To obtain a measure of their relevance in the market, it is convenient to compare penetration as part of a total, for example over 100 inhabitants in the country. The comparison of penetration with respect to that of mobile broadband, shows the importance of only-machine connection cards active.

Figure 24: Penetration of M2M subscriptions (per 100 inhabitants) in selected OECD countries, 2018



Source: OECD Broadband statistics <http://www.oecd.org/sti/broadband/broadband-statistics>

Relevance:

In addition to people, machines such as utility meters and Automatic Teller Machines (ATMs) can also be connected to mobile networks. M2M is a measure of machine-type communications. With the deployment of 5G networks and the support for the Internet of Things (IoT), it is expected that the number of devices and machines wirelessly connected will grow significantly.

2.5 Spectrum

88. Mobile communications use the spectrum available, which is a public and scarce resource. Spectrum is divided into frequency bands and they define the capacity to transmit signals over airwaves.

89. At the Extraordinary EGTI meeting on March 2017, a proposal to measure spectrum availability was made since there was interest to know how much spectrum was available for wireless broadband in each country. Spectrum is a vital resource that governments allocate to operators to advance providing connectivity for all. The innovations and technological improvements that have taken place in wireless networks allows mobile connectivity, increasing capacity and speed rates, low latency, and very high quality communications.

90. A subgroup proposal discussed at the EGTI meeting in 2018 resulted in the approval of two new indicators to measure spectrum availability: one indicator measures the amount (in MHz) of a spectrum specific band that the governmental agency decides to put for use for any commercial purpose (spectrum allocated); the other indicator measures the amount of spectrum (in MHz) given to a particular operator or agent to provide final services (spectrum assigned). This second indicator captures the granting to a commercial operator, public or private, via any of the main mechanisms used for this: auctions, public contest, lotteries or any other, of a specific capacity, i.e., frequency band (in MHz), for its use.

91. In order to obtain from these measures a comparable and interesting indicator, it was proposed to measure both new indicators with respect to the total amount of spectrum that ITU recommends to make available for each relevant frequency band.

Indicator 2.11: Amount of spectrum allocated for IMT systems, in MHz (i271_spec_a)

Definition:

Amount of spectrum allocated for IMT systems refers to the total spectrum, in MHz, *made available* (i.e., allocated) through any formal national publication, such as a national frequency plan, for IMT systems, including any of the air interfaces in accordance with ITU-R Recommendations concerning these standards for mobile communications. This process, known as allocation of spectrum, is decided by the governmental agency responsible for spectrum management and defines a band and a specific capacity (in MHz) to be put for a specific commercial use. This stage does not assign the spectrum yet to any particular operator.

This indicator is broken down by the following bands (indicated in GHz):

- **Indicator 2.11a: Block < 1 GHz (i271_spec_a1)**
- **Indicator 2.11b: Block 1 GHz- 6 GHz (i271_spec_a1to6)**
- **Indicator 2.11c: Block > 6 GHz (i271_spec_aG6)**

(See Table 5 below for the identification of frequency bands within each block)

Clarifications and scope:

This indicator refers to spectrum allocated as identified in national frequency plans and other documents that can be considered formal announcements of allocation. By this allocation process, the governmental agency decides that a specific frequency band is to be assigned to individual entities and defines the purposes band for which the use of the band is authorized.

The IMT definition encompasses all IMT versions (IMT-2000, IMT-Advanced, IMT-2020). Official documents may use the term IMT or other commercial names, such as 3G, 4G or 5G. All these different denominations should be considered when collecting the data for this indicator.

It should be noted that for all bands listed, countries may allocate and license the full band, or parts thereof depending on the Radio Regulations, regional and national allocations.

In order to compare the data submitted for this indicator across countries, the “Amount of spectrum offered for IMT systems, in MHz” will be divided by the spectrum identified for IMT systems in the Radio Regulations on a per Region basis.

$$\text{Indicator } I_i = \frac{\text{amount spectrum allocated in band}_i}{\text{identified spectrum by ITU in band}_i}$$

Method of collection:

Data can be collected from the national administration responsible for allocating spectrum, such as the telecommunication regulator, the ministry or other public agency in charge of spectrum management. Information on spectrum allocation are found in national frequency plans, spectrum outlook documents, strategy plans and other formal documents.

Relationship with other indicators:

This indicator (i271_spec_a) is related to Indicator 2.12: Amount of spectrum licensed for IMT systems, in MHz (i271_spec_li). Spectrum is first allocated to a given service and, in a subsequent phase, it may be assigned to a licensee. As a result, “Amount of spectrum allocated for IMT systems, in MHz” should be greater than or equal to “Amount of spectrum licensed for IMT systems, in MHz”.

(continued)

Methodological issues:

In order to compare the data submitted for this indicator across countries, the "Amount of spectrum offered for IMT systems, in MHz" will be divided by the spectrum identified for IMT systems in the Radio Regulations on a per Region basis. In the calculation of the spectrum identified for each Region, each band will be considered as identified for IMT systems for the Region based on the percentage of countries in the Region having identified a band for IMT systems in the Radio Regulations footnotes.

This indicator is broken down by the following bands:

Table 5: Breakdown of spectrum bands identified for IMT* (in MHz)

1. Block < 1 GHz		2. Block from 1 GHz to 6 GHz		3. Block > 6 GHz	
a. 450 MHz	(450 - 470)	a. L- band	(1427 - 1518)	a. 26 GHz	(24 250 - 27 500)
b. UHF band	(470 - 608)	b. 1.7 / 1.8 GHz	(1710 - 1885)	b. 40 GHz	(37 000 - 43 500)
c. 600 MHz	(610 - 694/698)	c. 1.9 GHz	(1885 - 2025)	c.	(45 500 - 47 000)
d. 700 MHz	(694/698 - 790/806)	d. 2.1 GHz	(2110 - 2200)	d.	(47 200 - 48 200)
e. 800 MHz	(790/806 - 902)	e. 2.3 GHz	(2300 - 2400)	e.	(66 000 - 71 000)
f. 900 MHz	(902 - 960)	f. 2.5 GHz	(2500 - 2690)		
		g. C band	(3300 - 3400)		
		h. C band	(3400 - 3500)		
		i. C band	(3500 - 3600)		
		j. C band	(3600 - 3700)		
		k. 4.8 GHz	(4800 - 4900)		
		l. 4.9 GHz	(4900 - 4990)		

* Please consult the Radio Regulations footnotes listed in the table below for guidance on the harmonization of specific frequencies for IMT. While some bands have been harmonized globally, others were harmonized on a regional basis or were identified for specific countries only.

(continued)

Band	Footnotes identifying the band for IMT		
	Region 1	Region 2	Region 3
450-470 MHz		5.286AA	
470-698 MHz	-	5.295, 5.308A	5.296A
694/698-960 MHz	5.317A	5.317A	5.313A, 5.317A
1 427-1 518 MHz	5.341A, 5.346	5.341B	5.341C, 5.346A
1 710-2 025 MHz		5.384A, 5.388	
2 110-2 200 MHz		5.388	
2 300-2 400 MHz		5.384A	
2 500-2 690 MHz		5.384A	
3 300-3 400 MHz	5.429B	5.429D	5.429F
3 400-3 600 MHz	5.430A	5.431B	5.432A, 5.432B, 5.433A
3 600-3 700 MHz	-	5.434	-
4 800-4 990 MHz	5.441B	5.441A, 5.441B	5.441B
24.25-27.5 GHz		5.532AB	
37-43.5 GHz		5.550B	
45.5-47 GHz	5.553A	5.553A	5.553A
47.2-48.2 GHz	5.553B	5.553B	5.553B
66-71 GHz		5.559AA	

(continued)

Example:

5G Americas collects data on mobile spectrum allocations in Latin America based on information from regulatory authorities. In the next graph a blue cell indicates that spectrum was allocated by the government or the responsible agency in that specific frequency band.

Figure 25: Mobile spectrum allocations in Latin America, September 2018

	450 MHz	700 MHz	800 MHz	850 MHz	900 MHz	1.7/2.1 GHz (AWS)	AWS-3	1.8 GHz	1.9 GHz	2.1 GHz	2.5 GHz
Argentina		•	•	•	•	•			•		•
Bolivia		•		•		•			•		
Brasil	•	•	•	•	•			•	•	•	•
Chile		•	•	•	•	•			•		•
Colombia			•	•		•			•		•
Costa Rica				•				•	•	•	•
Ecuador		•		•		•			•		
El Salvador			•	•	•				•		•
Guatemala			•	•	•				•		
Honduras				•		•	•		•		
Mexico		•	•	•		•	•		•		•
Nicaragua		•		•		•		•	•		
Panama		•		•					•		
Paraguay		•		•	•	•			•		
Peru		•	•	•	•	•			•		•
Domenican Rep.				•	•	•			•		
Uruguay		•		•	•	•	•	•	•	•	
Venezuela				•	•	•		•	•		•

Source: 5G Americas. 2018. Analysis of ITU Spectrum Recommendations in Latin America. https://www.5gamericas.org/wp-content/uploads/2019/07/EN_Analisis_de_las_Recomendaciones_de_Espectro_de_la_UIT_en_America_Latina_Sept_2018.pdf

Relevance:

Most of the world population depends on mobile networks to access telecommunication services. The amount of spectrum available for commercial purposes reflects potential capacity that can be allocated. This aids planning of spectrum bands to be made available later by the government agency in charge of spectrum.

Indicator 2.12: Amount of spectrum licensed for IMT systems, in MHz (i271_spec_li)

Definition:

Amount of spectrum licensed for IMT systems refers to the total spectrum, in MHz, assigned nationally, including any of the air interfaces in accordance with ITU-R Recommendations concerning these standards for mobile communications. Assignment implies granting a specific block in a specific frequency band to a firm or institution (a licensee).

This indicator is broken down by the following bands (indicated in MHz):

- **Indicator 2.12a: Block < 1 GHz (i271_spec_li1)**
- **Indicator 2.12b: Block 1 GHz- 6 GHz (i271_spec_li1to6)**
- **Indicator 2.12c: Block > 6 GHz (i271_spec_liG6)**

(See Table 5 above for the definition of the blocs)

Clarifications and scope:

This indicator refers to spectrum that has been assigned to a given operator as a result of an assignment process (e.g., auction, beauty contest, etc.). The IMT definition encompasses *all IMT versions* (IMT-2000, IMT-Advanced, IMT-2020). Official documents may use the term IMT or other commercial names, such as 3G, 4G or 5G. All these different denominations should be considered. For all bands listed, *countries may allocate and license the full band, or parts thereof* depending on the Radio Regulations, regional and national allocations.

Method of collection:

Data can be collected from the national administration responsible for licensing spectrum, such as the telecommunication regulator, the ministry or another agency in charge of spectrum management. In addition, data are often publicly available through press releases informing the outcomes of spectrum assignment processes.

Relationship with other indicators:

This indicator (i271_spec_li) is related to Indicator 2.11: Amount of spectrum allocated for IMT systems, in MHz (i271_spec_a). Spectrum is first allocated to a given service and, in a subsequent phase, it may be assigned to a licensee. As a result, "Amount of spectrum licensed for IMT systems, in MHz" should be lower than or equal to "Amount of spectrum offered for IMT systems, in MHz".

Methodological issues:

This indicator is a relative measure, in that it reflects a ratio between the amount of spectrum licensed in a specific band divided by the amount of spectrum identified by ITU for that band. **In order to compare the data submitted for this indicator across countries, the "Amount of spectrum licensed for IMT systems, in MHz" will be divided by the spectrum identified for IMT systems in the Radio Regulations on a per Region basis.** In the calculation of the spectrum identified for each Region, each band will be considered as identified for IMT systems for the Region based on the percentage of countries in the Region having identified a band for IMT systems in the Radio Regulations footnotes.

$$\text{Indicator } I_i = \frac{\text{amount spectrum allocated in band}_i}{\text{identified spectrum by ITU in band}_i}$$

Total spectrum, in MHz, assigned nationally for use for IMT systems, including any of the air interfaces in accordance with ITU-R Recommendations concerning these standards for mobile communications.

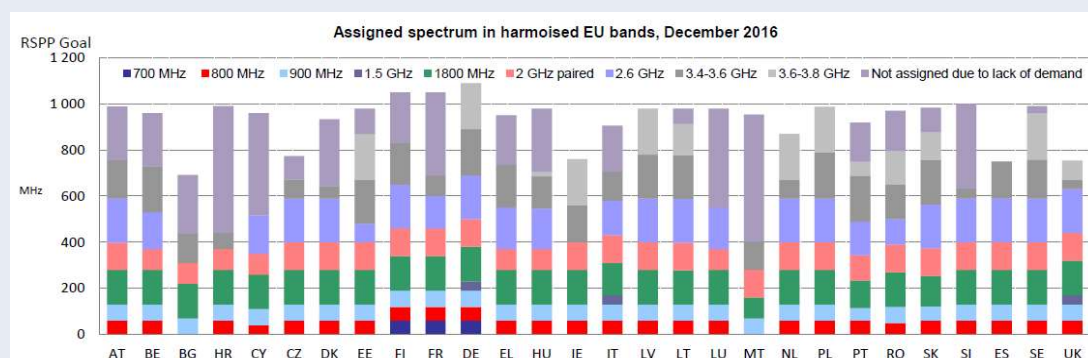
The indicator is broken down in three blocks as per the definition above.

(continued)

Example:

The European Commission collects data on *assigned spectrum* for wireless-broadband services in harmonized European Union (EU) bands. These data are regularly collected and published in order to monitor the progress towards the target of 1200 MHz for wireless-broadband services set by the EU Radio Spectrum Policy Programme (RSPP). The data collection is carried out separately by band, which allows tracking for example the progress achieved by EU Member States in assigning the 800 MHz band (the 'digital dividend') for wireless-broadband services. By May 2016 in the EU 71 per cent of the harmonized spectrum had been assigned on average across the Member States for wireless broadband use.

Figure 26: Percentage of harmonized spectrum assigned for wireless broadband in the EU, 2016



Source: Digital Agenda Scoreboard key indicators. http://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/indicators

Relevance:

The amount of spectrum assigned accounts for the effective capacity made available for telecommunication operators for commercial services. Spectrum capacity is usually granted in the form of a license contract between the governmental authority in charge of spectrum and the operator and usually has conditions regarding territorial and population coverage and quality of service.

3 Internet

92. This section identifies indicators related to bandwidth and Internet subscriptions. One common product demanded by firms or institutions is leased lines, which is presented at the end of this section.

93. This group of indicators is based on annual (calendar year) data with respect to the year ending 31 December. Where data are not available for the year ending 31 December, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as data from the previous year). Where countries report data on the basis of a year not ending on 31 December, this should be specified in a note.

3.1 International bandwidth

94. Domestic and international backbones are important building blocks of Internet infrastructure. Backbone transmission networks typically revolve around satellite, optical fibre, and microwave infrastructure. Backbone transmission bandwidth affects the speed at which information is delivered to, and sent from, Internet users. It is measured in the number of bits that can be transferred per second. A common benchmark is bits per second per capita, obtained by dividing the Internet bandwidth by the population.

95. Over the last few years international bandwidth capacity around the globe has increased significantly. Growth has been driven by the need to support ever growing data traffic much of it exchanged between data centres and end users from across the globe. The vast majority of international Internet traffic flows over optical fibre submarine cables that were historically deployed by consortiums of telecommunication operators. Recently large content providers such as Amazon, Facebook, and Google have been investing in undersea cables, either as part of consortiums or on their own.

96. Data can be collected for both international and domestic Internet backbone connectivity. The data are obtained from Internet service providers (ISPs) with domestic and international connectivity infrastructure.

97. Indicators on bandwidth have been collected by ITU for a number of years. In 2016, a revision of the scope and clarifications of the indicators was approved. The revised indicators are presented here.

Indicator 3.1: Lit/equipped international bandwidth capacity, in Mbit/s (i4214I)

Definition:

Total *Lit/equipped international bandwidth capacity* refers to the total lit capacity of international links, namely fibre-optic cables, international radio links and satellite uplinks to orbital satellites in the end of the reference year (expressed in Mbit/s). If the traffic is asymmetric (i.e., different incoming and outgoing traffic), then the highest value out of the two should be provided.

Clarifications and scope:

- 1) Out of the initial design capacity of any link, understood as the maximum potential bandwidth if the links were equipped with existing technologies, only a share of it will be equipped or lit to allow the transfer of data. Some of that lit cross border capacity will be leased to third parties. This is known as contracted capacity. This indicator measures lit or equipped capacity. It excludes unused, reserve or 'design' capacity.
- 2) Lit/equipped international bandwidth of operators owning and operating international links (self-supply) should be included as well as international bandwidth capacity of leased or contracted international links by service providers.

Method of collection:

Data can be collected from facilities-based carriers that provide wholesale international connectivity. An alternative would be to collect the data from all operators in the country that contract or self-supply international bandwidth, namely fixed, mobile and satellite operators. There are other entities that may have direct connections to international carriers, namely over-the-top providers and content-providers. For the sake of completeness, national authorities should strive to take these operators into account. Care should be taken to avoid double counting when collecting data both from service providers and facilities-based carriers.

Relationship with other indicators:

This indicator (i4212I) concerns the actual usage of the 'lit/equipped bandwidth measured in Indicator 3.2: International bandwidth usage, in Mbit/s (i4214u).

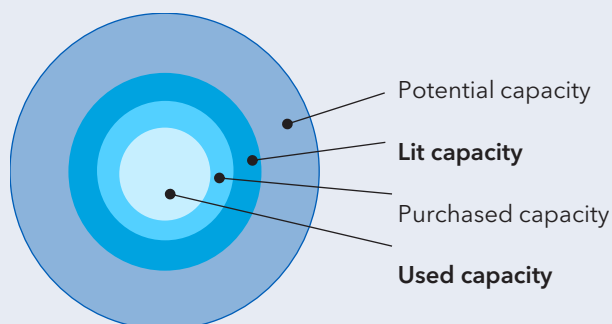
Methodological issues:

The reference date for measuring this indicator is the end of the calendar year.

Example:

This example illustrates the differences between *potential*, *lit*, *purchased* (or *contracted*) and *used* capacity in international optical fibre networks in the case where operators lease or use third-party facilities. This example does not apply to self-supply. *Potential* capacity refers to the total theoretical bandwidth that is available. In the case of fibre systems, this includes *lit* (turned on) and *unlit* (*dark fibre* not available for use) capacity. *Lit* capacity thus refers to the bandwidth in optical fibre networks where it has been turned on and is ready for use. "Purchased" (i.e., *contracted*) capacity covers bandwidth put into service but not all of which is used; some is held in reserve for restoration or redundancy. *Used* capacity covers bandwidth which is available to carry traffic (that is Indicator "International bandwidth usage, in Mbit/s" (i4214u)).

Figure 27: Capacity in international optical fibre networks



Source: ITU, adapted from EQUINIX

Indicator 3.2: International bandwidth usage, in Mbit/s (i4214u)

Definition:

Average usage of all international links, including optical fibre cables, radio links and traffic processed by satellite ground stations and teleports to orbital satellites (expressed in Mbit/s). The average should be calculated over the twelve-month period of the reference year. If the traffic is asymmetric (i.e., different incoming and outgoing traffic), then the highest value out of the two should be provided.

All international links used by all types of operators, namely fixed, mobile and satellite operators should be taken into account. The combined average usage of all international links can be reported as the sum of the average usage of each link.

Clarifications and scope:

- 1) This indicator refers to the *used* capacity of international connections between countries (i.e., actual traffic carried over international links).
- 2) If the traffic is asymmetric (i.e., different incoming and outgoing traffic), then the highest value out of the two should be provided.
- 3) Traffic carried by operators owning and operating international links (self-supply) should be considered, as well as traffic carried over leased or contracted international links by service providers.
- 4) In the case of traffic processed by satellite uplinks to orbital satellites broadcast/multicast and data/unicast can be taken into account.
- 5) The reported data should account for all types of traffic including traffic associated with but NOT limited to:
 - a. All IP based services (IPLC, IPVPN, VoIP, ...).
 - b. Clients of the service provider, subsidiaries and own usage.
 - c. Links to international subsidiaries.
 - d. Providers with which the service provider established transit agreements.
 - e. Providers with which the service provider established peering agreements.
 - f. Content providers or OTT providers.

Method of collection:

Data can be collected from facilities-based carriers that provide wholesale international connectivity. An alternative method would be to collect the data from all operators in the country that contract or self-supply international bandwidth, namely fixed, mobile, and satellite operators.

There are other entities that may have direct connections to international carriers, namely OTT and content providers. For the sake of completeness, national authorities should strive to take these operators into account. Care should be taken to avoid double counting when collecting data both from service providers and facilities-based carriers.

Relationship with other indicators:

This indicator (i4214u) concerns the actual average usage of the 'lit' bandwidth capacity measured by Indicator 3.1: Lit/equipped international bandwidth capacity, in Mbit/s (i4214l). Some traffic monitoring tools present results in terms of percentage of capacity. This data can be used to report indicator i4214u as long as the calculation method follows the guidelines presented in the methodological issues section and the reporting unit is Mbit/s.

(continued)

Methodological issues:

1. Some operators will be able to report international bandwidth data provided by widely available network monitoring systems and tools (i.e., MRTG-Multi Router Traffic Grapher, PRTG, Cacti, OpenNMS, etc.). In general, these network monitoring tools compute average traffic usage in the following way:
 - The basic unit or data point used to compute this indicator is the number of bits (or octets) transferred during the sampling interval divided by the duration of the sampling interval in seconds:
The sampling interval is the period of time over which the measurement is taken. The more usual sampling interval is five minutes.
 - These data points are then averaged over the reporting period (the calendar year, in this case) and converted to Mbit/s, which is the reporting unit.

For data collection, processing and storage purposes, some operators produce weekly or monthly averages that will then be used to compute the twelve-month average. In this specific case, the figure reported to ITU would be the sum of these yearly averages for all international links.

2. Some network monitoring systems produce figures for the 95th percentile because some tariffing models (i.e., "95% percentile burstable billing model") are based on this metric. If the reported figures are based in the 95th percentile, a note should be inserted in the comment section.
3. In some cases, countries may not have access to network monitoring systems or equivalent data. If this is the case, contracted international bandwidth can be reported. A note should be inserted in the comments section indicating that the reported figure refers to contracted international bandwidth.

98. At the domestic level "Internet bandwidth", either in terms of capacity available or in terms of its usage, is changing rapidly. Trunk lines and transit services are relatively less demanded over time. The emergence of content delivery networks and Internet exchange points (IXPs) have changed the way IP content is transported domestically, the way it is charged, and the way it is measured.

Indicator 3.3: Domestic Internet bandwidth, in Mbit/s (i4214d)

Definition:

Domestic Internet bandwidth refers to the total used capacity of domestic Internet bandwidth, in megabits per second (Mbit/s).

Clarifications and scope:

This indicator refers to the *used* capacity for exchanging domestic Internet traffic. Out of the *total* domestic bandwidth available in the country (i.e., the *potential* capacity of the connections), there is a part that corresponds to the *contracted* or purchased capacity. This *contracted* capacity refers to bandwidth put into service, but not all of which is used; some is held in reserve for restoration or redundancy. This indicator thus refers to the portion of the *contracted* capacity that is *used* to carry traffic. It refers to the capacity ISPs use to connect to Internet exchanges.

Method of collection:

Data can be collected from public Internet exchanges in the country, which should be able to supply the aggregated total for an exchange. If there is more than one exchange, the data can be aggregated to obtain country level data.

Relationship with other indicators:

This indicator (i4214d) is not related to other indicators in the Handbook but complements Indicator 3.2: International bandwidth usage, in Mbit/s (i4214u).

Methodological issues:

This indicator refers to the total domestic Internet bandwidth for exchanging national traffic. ISPs can have different bandwidth capacities depending on the route and topology of their backbone networks. Therefore, the methodology to use is to add up the bandwidth that is available to each ISP at locations where Internet traffic is exchanged, such as Internet exchanges or network access points.

Examples:

The Internet Information Research Network Technology Lab of the National Electronics and Computer Technology Center (NECTEC) compiles monthly data on domestic and international Internet bandwidth in Thailand (Table 6). The data are compiled by adding the bandwidth available to each ISP.

(continued)

Table 6: Total international and domestic Internet bandwidth, Thailand

Y-M-D	Total international bandwidth (Mbit/s)	Total domestic bandwidth (Mbit/s)
2010-08-18	158 680	721 217
2010-01-01	110 243	641 317
2009-08-07	70 561	272 427
2009-01-09	56 385	251 091
2008-08-05	30 071	226 060
2008-01-07	23 272	157 910

Source: Adapted from NECTEC, available at <http://internet.nectec.or.th/webstats/bandwidth.iir?Sec=bandwidth>.**Relevance:**

Domestic Internet capacity used at the national level is collected for a limited number of countries. Internet traffic carried through fixed and mobile networks are better measures of the activity and volume of internet traffic over the year. This indicator "Domestic Internet bandwidth, in Mbit/s" (i4214d) is replaced by indicators 5.17: Fixed broadband Internet traffic, in exabytes (i35tfb) and Indicator 5.18: Mobile broadband Internet traffic - within the country (i136mwi) and is not to be collected anymore.

3.2 Fixed Internet subscriptions

99. Indicators in this group deal with all fixed Internet subscriptions, whether broadband or narrowband. The next section (fixed broadband subscriptions) deals with broadband connections. The distinction between narrowband and broadband is the download speed of the fixed connection: in order to be categorized as broadband it must offer a speed of at least 256 kbit/s. This threshold of speed can be reached with different fixed or wireless 'fixed' technologies: digital subscriber line (DSL), coaxial cable, optical fibre cable (fibre to the home/premise, FTTx), in-building Ethernet Local Area Networks (LANs) and fixed wireless such as WiMAX and other technologies and satellite.

100. Note that in the category of fixed broadband all wireless connections not offered for users while in mobility are to be considered 'fixed' broadband connections and are classified in the sub-indicator "Fixed wireless broadband", which in turn is part of the scope of the "Fixed broadband subscriptions" indicator. Both residential and business subscriptions should be included.

Indicator 3.4: Fixed Internet subscriptions (i4213)

Definition:

Fixed Internet subscriptions refers to the number of active fixed Internet subscriptions at speeds less than 256 kbit/s (such as dial-up and other fixed non-broadband subscriptions) and total fixed (wired)-broadband subscriptions that allow for a speed of at least 256 kbit/s. This indicator includes (but is not necessarily the sum of):

Indicator 3.4a: Dial-up Internet subscriptions (i4213d)

Dial-up Internet subscriptions refers to all active Internet subscriptions that use a modem and fixed-telephone line to connect to the Internet, and which require that the modem dial a phone number when Internet access is needed. If subscriptions for dial-up access are not required, then the indicator refers to the number of active users (those connecting to the Internet at least once in the last three months). It excludes users of Internet cafes or Wi-Fi hotspots.

Indicator 3.4b: Fixed-broadband subscriptions (i4213tffb)

Fixed-broadband subscriptions refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This includes cable modem, DSL, fibre-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations.

Clarifications and scope:

This indicator refers to the total number of active Internet subscriptions using fixed networks. This includes dial-up access over the PSTN, other fixed (wired) subscriptions at speeds less than 256 kbit/s, and fixed-broadband networks such as DSL, cable modem, fibre, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. It excludes Internet subscriptions using mobile-cellular networks. The scope of the indicator is active subscriptions, i.e., if they do not include a recurring monthly payment, only those used to connect to the Internet at least once in the last three months should be counted. On the other hand, all subscriptions including a recurring monthly fee should be counted as active. Both residential and business subscriptions should be included.

Any deviations from the definitions above (such as the treatment of mobile broadband using data cards) should be specified in a note.

If countries use a different definition of broadband, this should be indicated in a note.

Method of collection:

Data for these indicators should be collected from ISPs in the country. The data from each ISP should be aggregated to obtain a country total. In some countries, the Internet market is outside the scope of regulatory treatment, and therefore it may be difficult to collect the statistics. There may also be duplication if facilities-based operators include their wholesale subscriptions. Countries can overcome this by asking facilities-based operators only for their subscriptions, including wholesale, and not requesting non-facilities-based ISPs to provide data. Alternatively, countries can ask for retail subscriptions only from all ISPs.

This indicator can be divided by the population and multiplied by 100 to derive fixed Internet subscriptions per 100 inhabitants, Partnership on Measuring ICT for Development core ICT indicator A3 (Fixed broadband Internet subscriptions per 100 inhabitants, broken down by speed).

(continued)

Relationship with other indicators:

This indicator (i4213) includes the values of Indicator 3.4a: Dial-up Internet subscriptions (i4213d) and Indicator 3.4b (= Indicator 3.5) Fixed-broadband subscriptions (i4213tfbb), but may not equal the sum of the two indicators. This is due to other fixed Internet subscriptions that are considered to be narrowband but are not dial-up. Indicator i4213d is not related to other indicators in the Handbook.

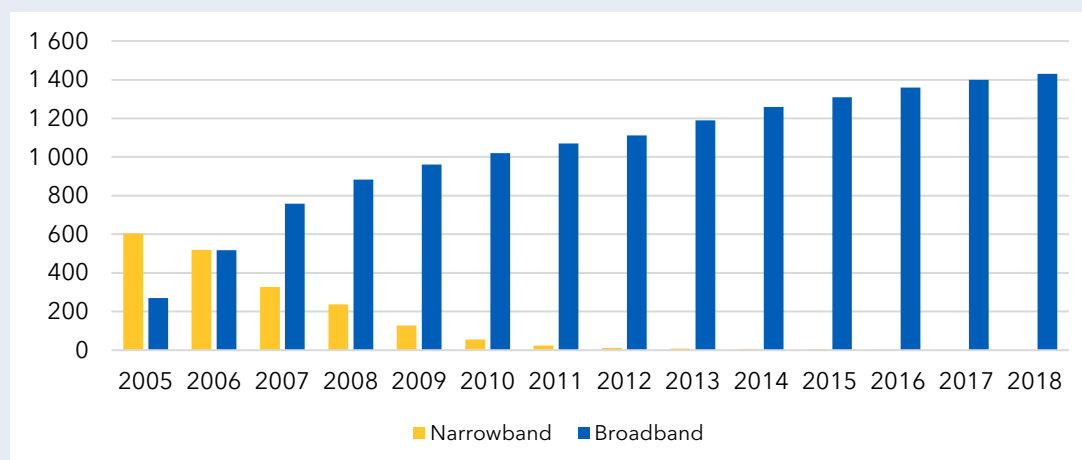
Indicator i4213tfbb (Fixed-broadband subscriptions) can be decomposed into indicators by technology (Indicator 3.5: Fixed broadband subscriptions, by technology (i4213tfbb)) and speed (Indicator 3.6: Fixed broadband subscriptions, by speed (i4213sp)).

Methodological issues:

Subscriptions to fixed internet are to be collected from Internet Service Providers (ISPs), regardless of whether they provide access to narrowband – a service little used nowadays – or to broadband Internet, and regardless of the technology underlying the service, as long as it is provided to a household, firm or institution at a fixed location. All subscriptions that provide access to the open internet, at any download/ upload speeds, are to be accounted for in this indicator.

Example:

Broadband was commercialised in the early 2000s, first with ADSL based on the legacy copper-wire network of incumbent operators and with cable television operators based on coaxial cable. Previously only low connection speeds were available, less than 256 kbit/s (i.e., narrowband). The growth of broadband has been rapid. For example, in Ireland around 600 000 narrowband subscriptions were active in 2005 almost three times more than fixed broadband. A little more than a decade later all fixed Internet was broadband.

Figure 28: Fixed Internet subscriptions (000s), Ireland

Source: ComReg, Ireland.

Relevance:

Access to the Internet by any fixed network measures any form of accessing the Internet. Even if the vast majority of Internet connections nowadays are of high speed (e.g., broadband), it is still relevant to capture in one indicator the total amount of narrowband and broadband connections.

Fixed-broadband subscriptions

101. Fixed broadband is an important part of Internet infrastructure. It is essential for supporting the increasing speeds required by bandwidth-intensive applications. *Broadband* is defined as a service providing download speeds of at least 256 kbit/s. Fixed broadband consists of technologies providing Internet access over wireline networks such as copper wire telephone lines, coaxial cable television, optical fibre cable, in-building ethernet cable and electrical power lines. Wireless broadband (Indicator 22) is not included in this category and is treated separately with a different set of indicators.

102. Both residential and business subscriptions should be included.

103. Broadband subscriptions can be split by speed or based on the underlying technology that supports the connection. Each dimension is captured by two indicators.

Indicator 3.5: Fixed-broadband subscriptions, by technology (i4213tfbb)

Definition:

Fixed-broadband subscriptions refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This includes cable modem, DSL, fibre-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations. The indicator can be broken down as follows:

Indicator 3.5a: Cable modem Internet subscriptions (i4213cab)

Cable modem Internet subscriptions refers to the number of Internet subscriptions using a cable modem service to access the Internet, at downstream speeds greater than, or equal to, 256 kbit/s. Cable modem is a modem attached to a cable television network.

Indicator 3.5b: DSL Internet subscriptions (i4213dsl)

DSL Internet subscriptions refers to the number of Internet subscriptions using digital subscriber line (DSL) services to access the Internet, at downstream speeds greater than or equal to 256 kbit/s. DSL is a technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines. It should exclude very high-speed digital subscriber line (VDSL) subscriptions if these are provided using fibre directly to the premises.

Indicator 3.5c: Fibre-to-the-home/building Internet subscriptions (i4213ftth/b)

Fibre-to-the-home/building Internet subscriptions refers to the number of Internet subscriptions using fibre-to-the-home or fibre-to-the-building, at downstream speeds equal to, or greater than 256 kbit/s. This should include subscriptions where fibre goes directly to the subscriber's premises or fibre-to-the-building subscriptions that terminate no more than 2 metres from an external wall of the building. Fibre-to-the-cabinet and fibre-to-the-node are excluded.

(continued)

Indicator 3.5d: Other fixed-broadband subscriptions (i4213ob)

Other fixed-broadband subscriptions refers to Internet subscriptions using other fixed-broadband technologies to access the Internet (other than DSL, cable modem, and fibre), at downstream speeds equal to, or greater than, 256 kbit/s. This includes technologies such as ethernet LAN, and broadband-over-powerline (BPL) communications. Ethernet LAN subscriptions refer to subscriptions using IEEE 802.3 technology. BPL subscriptions refer to subscriptions using broadband-over-powerline services. Users of temporary broadband access (e.g., roaming between PWLAN hotspots), users of WiMAX and those with Internet access via mobile-cellular networks are excluded.

Indicator 3.5e: Satellite broadband subscriptions (i271s)

Satellite broadband subscriptions refers to the number of satellite Internet subscriptions with an advertised download speed of at least 256 kbit/s. It refers to the retail subscription technology and not to the backbone technology.

Indicator 3.5f: Terrestrial fixed wireless broadband subscriptions (i271fw)

Terrestrial fixed wireless broadband subscriptions refers to the number of terrestrial fixed wireless Internet subscriptions with an advertised download speed of at least 256 kbit/s. This includes fixed WiMAX and fixed wireless subscriptions but excludes occasional users at hotspots and Wi-Fi hotspot subscribers. It also excludes mobile-broadband subscriptions where users can access a service throughout the country wherever coverage is available.

Clarifications and scope:

This indicator refers to the total number of subscriptions to fixed-broadband access to the public Internet. It excludes fixed Internet access at speeds less than 256 kbit/s. If subscriptions to lower-speed services cannot be excluded, this should be indicated in a note. Both residential and business subscriptions should be included.

Any deviations from the definitions above (such as the treatment of mobile broadband using data cards) should be specified in a note.

Method of collection:

The data can be collected by asking all ISPs in the country to provide the number of their fixed-broadband subscriptions (by type – cable, DSL, optical fibre, other, satellite, and terrestrial fixed wireless broadband).

This indicator can be divided by the population and multiplied by 100 to obtain fixed-broadband subscriptions per 100 inhabitants.

Relationship with other indicators:

This indicator (i4213tfbb) is equal to the sum of the values of sub-indicators mentioned above. *Fixed-broadband subscriptions* can be split into by technology and speed. Indicator i4213tfbb complements Indicator 2.2: Active mobile-broadband subscriptions (i271mw).

(continued)

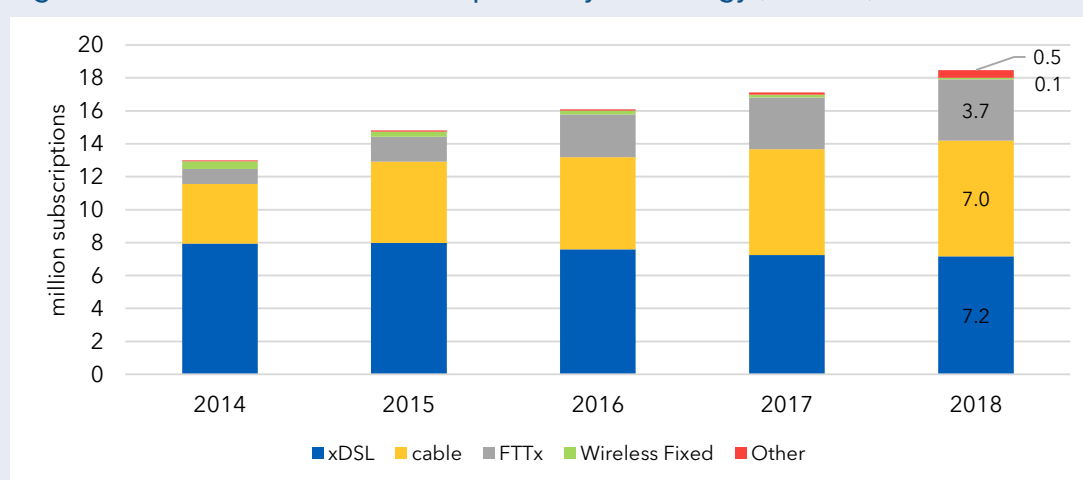
Methodological issues:

Some countries may use a different definition of broadband. For example, some countries define broadband as less than 256 kbit/s or substantially more than 256 kbit/s. The other issue is the treatment of fixed wireless broadband – some countries include this under fixed broadband or total broadband.

Example:

Traditional copper based wired network using DSL have traditionally been the leading source of fixed broadband in many countries. In Mexico, fixed broadband based on coaxial cable television networks have extended their reach and new fibre-to-the-home networks are being deployed in cities and densely populated areas, bringing about much higher connection speeds and data consumption by consumers. As a result, the share of DSL in total fixed (wired) broadband subscriptions has declined from 61 per cent in 2014 to 39 per cent in 2018.

Figure 29: Fixed-broadband subscriptions, by technology (millions), Mexico



Source: Instituto Federal de Telecomunicaciones, Banco de Información de Telecomunicaciones [<https://bit.ift.org.mx/BitWebApp/>]

Relevance:

Each technology provides a specific quality for the connection (e.g., speed, latency, etc.) whether optical fibre, coaxial cable or copper wire). The improvement possibilities of each existing technology may hinge upon the type of cable deployed initially, among other factors. To better appraise the quality of the disposable connections it is necessary to know about the underlying technology or standard supporting it. Fixed broadband technology also provides information about the degree of intermodal competition.

Indicator 3.6: Fixed-broadband subscriptions, by speed (i4213sp)

Definition:

Fixed-broadband subscriptions, by speed refers to the number of fixed broadband subscriptions to the public Internet (i4213tfbb), split by advertised download speed. The indicator can be broken down as follows:

Indicator 3.6a: 256 kbit/s to less than 2 Mbit/s subscriptions (i4213_256to2)

256 kbit/s to less than 2 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 256 kbit/s and less than 2 Mbit/s.

Indicator 3.6b: 2 Mbit/s to less than 10 Mbit/s subscriptions (i4213_2to10)

2 Mbit/s to less than 10 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 2 Mbit/s and less than 10 Mbit/s.

Indicator 3.6c: Equal to or above 10 Mbit/s subscriptions (i4213_G10)

Equal to or above 10 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 10 Mbit/s.

Indicator 3.6d: 10 Mbit/s to less than 100 Mbit/s subscriptions (i4213_10to100)

10 Mbit/s to less than 100 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 10 Mbit/s and less than 100 Mbit/s.

Indicator 3.6e: 100 Mbit/s to less than 1 Gbit/s subscriptions (i4213_100to1G)

100 Mbit/s to less than 1 Gbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 100 Mbit/s and less than 1 Gbit/s.

Indicator 3.6f: Above 1 Gbit/s subscriptions (i4213_G1Gb)

Above 1 Gbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 1 Gbit/s.

Indicator 3.6g: 10 Mbit/s to less than 30 Mbit/s subscriptions (i4213_10to30)

10 Mbit/s to less than 30 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 10 Mbit/s and less than 30 Mbit/s.

Indicator 3.6h: 30 Mbit/s to less than 100 Mbit/s subscriptions (i4213_30to100)

30 Mbit/s to less than 100 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 30 Mbit/s and less than 100 Mbit/s.

Indicator 3.6i: Equal to or above 100 Mbit/s subscriptions (i4213_G100)

Equal to or above 100 Mbit/s subscriptions refers to all fixed broadband subscriptions with advertised downstream speeds equal to, or greater than, 100 Mbit/s.

Clarifications and scope:

This group of indicators classifies fixed broadband subscriptions by advertised speed. Advertised speed refers to the speed at which the ISP markets the subscription, rather than the actual speed the user may experience. Speed is measured in megabits per second (Mbits/s). This indicator refers to fixed-broadband technologies. Both residential and business subscriptions should be included.

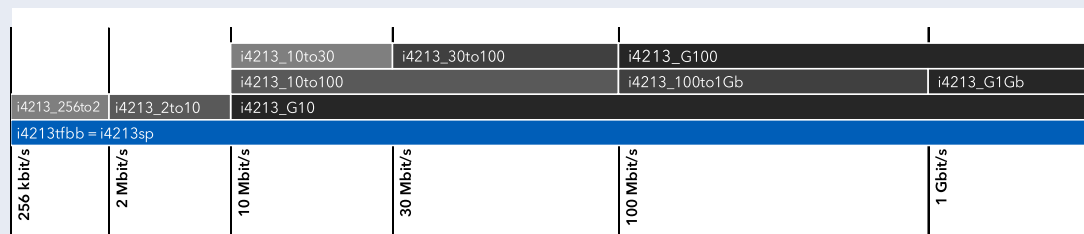
Method of collection:

The data can be collected by asking each ISP in the country to provide the number of their fixed broadband subscriptions by the speeds indicated for this group of indicators. The data can then be added up to obtain the country totals.

(continued)

Relationship with other indicators:

Indicator 3.6 (i4213sp) is equal to the sum of the values of Indicators 3.6a to 3.6c, and Indicator 3.6c (i4213_G10) is the sum of the values of Indicators 3.6d to 3.6f. *Fixed-broadband subscriptions* is Indicator 3.4b, which is split into Indicators 3.5 and 3.6. Indicator 3.6 complements Indicator 3.4.

Figure 30: Fixed broadband subscription indicators by speed breakdown

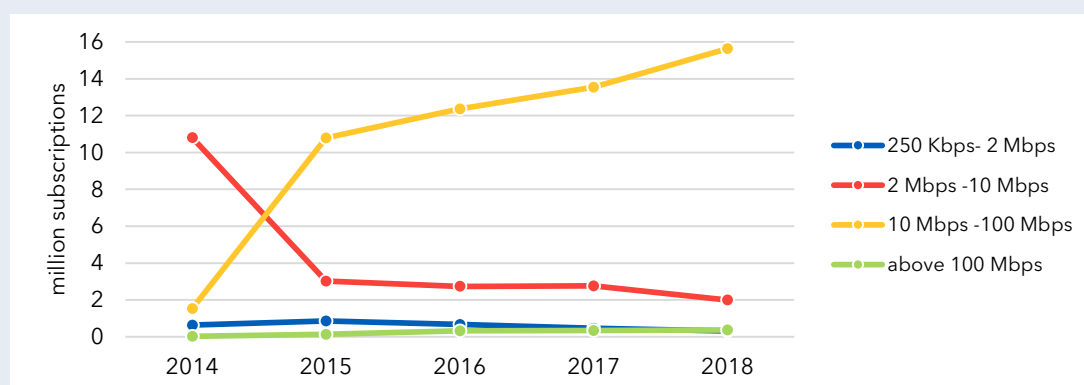
Source: ITU

Methodological issues:

Fixed-broadband subscriptions can vary tremendously by speed, thus affecting the quality and functionality of Internet access. Since most ISPs offer plans linked to download speed, these indicators should be relatively straightforward to collect. Countries may use packages that do not align with the speeds used for this group of indicators. Countries are encouraged to collect the data in more speed categories to allow aggregation of the data according to the split shown above.

Example:

As new broadband technologies are deployed higher speeds are made available. The extension of cable networks and its upgrading to faster standards together with the introduction of new DSL standards in the legacy copper-wired network in Mexico induced a sudden jump in average speeds. While before 2015 more than three quarters of subscriptions had speeds below 10 Mbit/s, within a few months 80 per cent enjoyed download speeds higher than 10 Mbit/s.

Figure 31: Fixed-broadband subscriptions, by speed (millions), Mexico

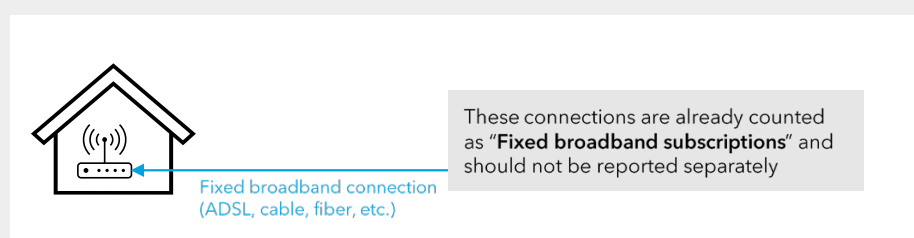
Source: Instituto Federal de Telecomunicaciones, Banco de Información de Telecomunicaciones [<https://bit.ift.org.mx/BitWebApp/>]

Box 6: When to count Wi-Fi connections as fixed broadband subscriptions

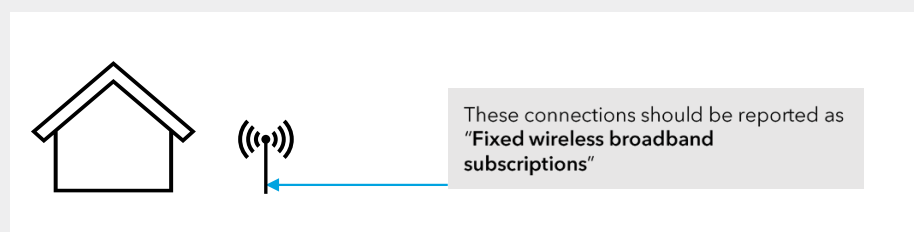
Wi-Fi is a solution to provide users with an Internet connection, be it for voice or broadband services. A modem is needed to extend the received signal--usually by a fixed wired connection--to the rest of the area to be covered, which may range from a few square kilometres, inside a building, or inside the home premises.

Different cases are considered in order to clarify when a Wi-Fi connection to access the Internet is to be counted as "Fixed broadband" and when not.

Case 1: Wi-Fi is used **on top of a fixed broadband subscription** to distribute the signal at home or inside a premise or building. In this case the premise has a fixed broadband connection contracted already (e.g., DSL, coaxial cable, fibre, etc.), and Wi-Fi is used in order to distribute the signal. Since the fixed connection is already counted as a "Fixed broadband subscription", the Wi-Fi itself is not to be counted as a broadband subscription.



Case 2: Wi-Fi is **used as a "last mile" technology** and associated with a specific monthly billed broadband contract. An outside Wi-Fi signal is available within the premises. This solution is implemented by some operators in small villages, where reaching them with a wired cable would be too costly and the few premises can be covered with Wi-Fi. In this case, the Wi-Fi connection is the broadband connection and it is to be considered a "Fixed broadband subscription". Even though the last mile connection is wireless, since the user is situated at a fixed location, this is considered a "Fixed (wireless) broadband subscription".



Case 3: Wi-Fi hot spots (public, private, free or paid). Private institutions (coffee shop, airport, shopping mall, etc.) or public ones (libraries, universities, municipalities) establish a Wi-Fi network where users can connect to the Internet. The institution offering the Wi-Fi service may charge visitors for the use of the connection or may provide it for free. In any case, in most cases these Wi-Fi connections are typically not collected by telecommunication regulatory agencies and, hence, are usually not recorded connection possibilities. Further, usage is often ad-hoc.

Case 4: Wi-Fi as a subscription service. Some ISPs offer commercial Wi-Fi service with nodes typically spread throughout large urban areas. The service can be contracted with different time frequencies (e.g., hourly, daily, weekly, monthly). One challenge is that users could be contracting the service in either a mobility mode (i.e., moving around while they are using it) or at a fixed location. Second, the frequency of use presents a challenge as to whether it is ad-hoc or a subscription. There is an argument to consider this as a fixed broadband connection if it is contracted on a regular monthly basis and only used from a fixed location.

Indicator 3.7: Fixed-broadband subscriptions for organizations (i4213tfb_o)

Definition:

Fixed-broadband subscriptions for organizations refers to the total subscriptions contracted by public and private organizations, institutions or businesses (i.e., non-residential customers) to access the public Internet at a fixed location at downstream speeds greater than, or equal to 256 kbit/s. This includes cable, DSL, fibre-to-the-home/building and fixed wireless broadband and satellite technologies. It excludes residential subscriptions and subscriptions that have access to data communications (including the Internet) via mobile networks.

Clarifications and scope:

The indicator refers to the total number of subscriptions to fixed broadband contracted by businesses, institutions, firms, organizations and any other entity not considered residential. Since it refers to broadband business subscriptions it excludes fixed Internet access at speeds less than 256 kbit/s. Note that some businesses and institutions do not contract retail broadband subscriptions but require specific quality of service conditions obtained via leased lines or dedicated circuits, which are connections out of the scope of this indicator.

As with the indicator "Fixed broadband subscriptions" all connections that use wireless technology for the last mile offered to fixed located consumers (i.e., not available for users while in mobility) are to be considered 'fixed' broadband connections classified in the sub-indicator "Fixed wireless broadband". In this case only those fixed broadband subscriptions contracted by institutions or business will be counted.

Any deviations from the definitions above (such as dedicated lines or line rentals contracted by businesses or institutions or the treatment of mobile broadband using data cards) should be specified in a note.

Method of collection:

The data can be collected by asking all ISPs in the country to provide the number of their fixed broadband subscriptions contracted by firms, institutions and/or organizations (i.e., non-residential subscriptions).

(continued)

Relationship with other indicators:

This indicator is part of Indicator 3.4b: Fixed-broadband subscriptions (i4213tfbb), which includes not only subscriptions to the business/organization market but as well those subscribed by households (the residential market).

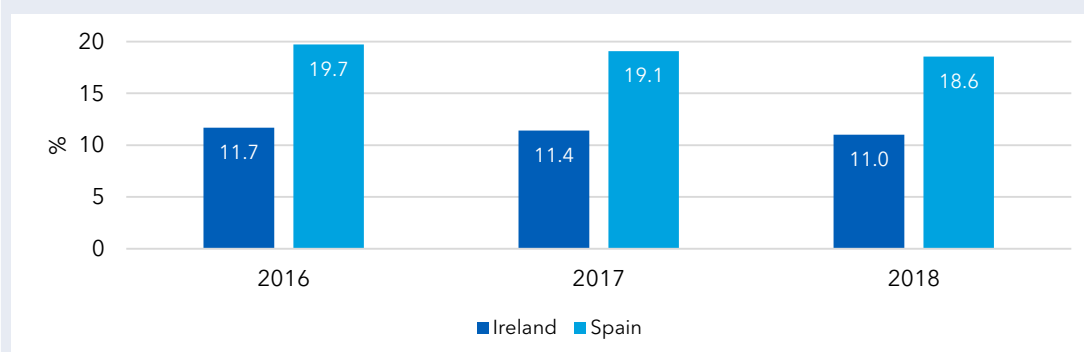
Methodological issues:

The criteria used to distinguish between residential and non-residential (e.g., business/institutions) subscriptions may vary from country to country. Two criteria are frequently used when the source of information is the operator who supplies the service to the end user: (1) when contracting any telecommunication service, the contracting party supplies a fiscal identification code. Residential subscribers have a different code or fiscal identity than the identification used by enterprises, business or institutions. Based on the different fiscal identification operators are able to distinguish subscriptions to the business/institutions market. Another method to distinguish is based on (2) operator practice: often when selling a service, operators offer specific service characteristics (volume of service to be consumed, price segmentation, quality of service, complementary services, etc.) to a specific market (i.e., residential/non-residential), with clear differences attached to each offer.

Example:

Businesses and institutions contract broadband subscriptions, as do households (residential segment) often with different quality of service or pricing conditions. The proportion of fixed broadband lines contracted by the business segment in Ireland (11%) and Spain (18.6% in 2018) has been stable over time in each country for the few last years.

Figure 32: Proportion of business fixed-broadband subscriptions, Ireland and Spain



Source: ComReg (Ireland) [www.comreg.ie/industry/electronic-communications/market-information/quarterly-key-data-report/] and CNMC (Spain) [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp].

3.3 Leased lines

Indicator 3.8: Leased-line subscriptions (i4213I)

Definition:

Leased-line subscriptions refers to the number of dedicated private connections. A leased line connects two locations for the provision of a private voice and/or data telecommunication service. The leased line could either be a dedicated physical cable or a virtual connection that reserves a circuit between two points. It maintains a single open circuit at all times, as opposed to traditional telephone services that re-use the same lines for many different conversations. Leased lines most commonly are rented by businesses to connect branch offices, because the lines guarantee bandwidth for network traffic.

Clarifications and scope:

This indicator refers to private telecommunication connections for the exclusive use of the subscriber. The line connects two of the subscriber locations via a continuously available connection. The leased line or circuit rental provides specific quality of service guarantees (uploading/downloading speeds, jitter, latency parameters, redundancy....) as specified in the leased line contract or in the specific offer made by the telecommunication operator.

The data refer to the number of leased lines provided to retail customers, i.e., to institutions, business, public sector institutions and agencies. This indicator should exclude all wholesale leased lines, i.e., those rented to other telecommunication service providers. The indicator does not refer to the number of fixed-telephone lines, nor fixed-broadband subscriptions. The data refer to national, regional, or local leased lines and not to international private leased circuits.

The distinction between "broadband subscription" and "leased-line subscription" rests in the quality parameters agreed upon in the contract and in the connectivity characteristics offered. While broadband subscriptions performance is usually based on the best effort principle, leased lines are based on specific values for the quality parameters specified in the contract ex ante. Leased lines are usually demanded by firms and institutions to connect critical locations, data centres or cloud services where guarantees on quality of the connection are critical.

Method of collection:

The data can be collected from telecommunication operators that provide leased-line services in the country, and then aggregated at the country level.

(continued)

Relationship with other indicators:

This indicator is not related to other indicators in the Handbook.

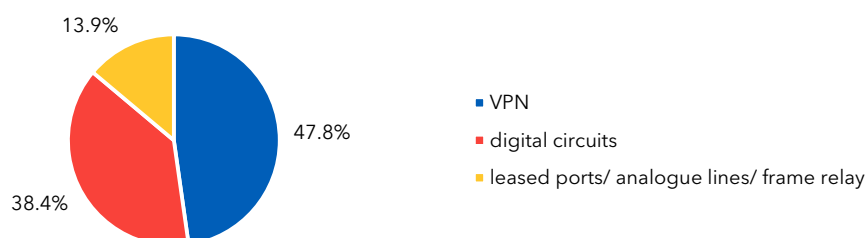
Methodological issues:

Operators may use different methods for counting or measuring the number of leased lines over data communication networks, typically based on how they charge for the service. Some operators may report the number of leased lines as speed equivalents (e.g., 64 kbit/s, 10 Mbit/s, 100 Mbit/s equivalent leased lines), while others report only the total number of physical lines. Some countries may report only retail leased lines. Others may report both domestic and international leased lines, in which case the figures should be provided separately.

Example:

The distribution of leased lines and circuits installed by technology shows a clear predominance of virtual private networks (VPN) and digital circuits in Costa Rica, both of them accounting in total for more than 86 per cent of all the leased lines market.

Figure 33: Distribution of leased lines by type (% of total), 2018, Costa Rica



Source: SUTEL.2019. Estadísticas del sector de telecomunicaciones, Costa Rica 2018. https://sutel.go.cr/sites/default/files/informe_estadisticas_del_sector_de_telecomunicaciones_2018_vf.pdf

4 Bundles

104. One growing practice is selling several services in one offer, as for example, fixed telephone and fixed broadband in one single bill, one single contract, and provided by one single operator.

105. A bundle is a prepaid or postpaid subscription that meets the following criteria:

- A commercial offer that includes two or more of the following services: fixed telephone, mobile voice, fixed broadband, mobile broadband, pay TV.
- Marketed as a single offer, with a single bill and with a single price for the set of services included in the bundle.
- Subscribed under conditions that cannot be obtained by adding single play offers together.

Hence, bundling is the combination of two or more of the following five services:

- (1) fixed telephony,
- (2) fixed broadband,
- (3) mobile voice,
- (4) mobile broadband, and
- (5) pay TV.

106. The total bundled price features a better value than the sum of the individual services if bought separately. The bundle generally offers a discount compared to subscribing to each individual service separately. However, it may also be the case that additional features are offered with the bundle (e.g., free or discounted voice calling minutes, extra data, faster speeds, etc.) that could not be obtained if the services were contracted individually.

107. Bundles are also commonly referred to as double play (two services), triple play (three services) and quadruple play (four services) and theoretically quintuple play (all five services). The following two bundles defined in this Handbook and are collected by ITU: 1. Subscriptions to fixed broadband and fixed telephone bundles (double play); 2. Subscriptions to fixed broadband, fixed telephone and pay TV bundles (triple play).

Indicator 4.1: Subscriptions to fixed-broadband and fixed-telephone bundles (i4213_2x)

Definition:

Subscriptions to fixed-broadband and fixed-telephone bundles refers to the number of bundled telecommunication subscriptions including fixed-broadband and fixed-telephone services. Only those subscriptions that meet the criteria established in the definition of bundled telecommunication services should be included. Subscriptions that include additional telecommunication services – such as triple play subscriptions including fixed telephony, fixed broadband and pay TV – should be excluded.

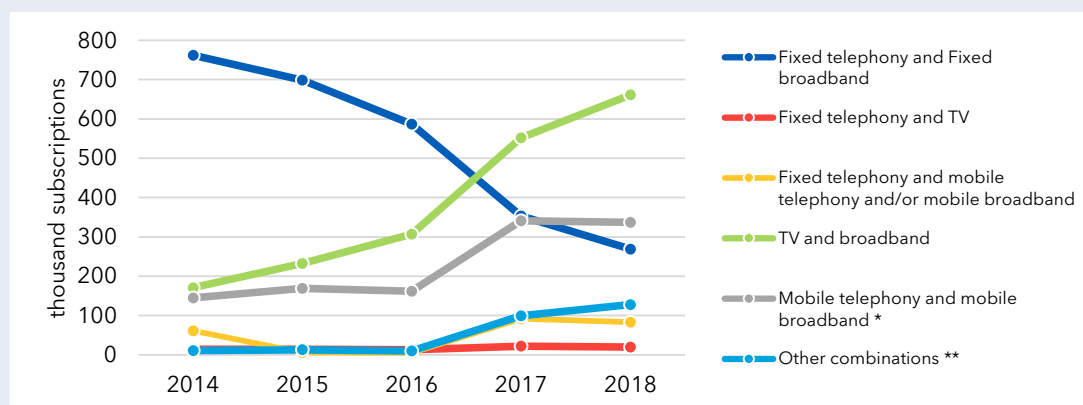
Clarifications and scope:

This indicator is considered a "double play" bundle. Double play bundles can consist of other combinations (i.e., a different bundle may consist of pay TV service together with fixed broadband). This indicator consists of only one combination: those that combine only fixed telephony and fixed broadband (at download speeds above 256 kbit/s). The bundle may offer additional features such as special international call rates. As long as the additional features are not an additional bundled component (i.e., multichannel television or mobile voice or data) then it is considered a fixed broadband and fixed telephone bundle and subscriptions should be included in this indicator.

Example:

The Swedish Post and Telecom Authority collects data on double play bundle subscriptions. While the fixed telephony and fixed broadband bundle was the most popular in 2016, accounting for over half of all double play subscriptions, its share has dropped as people switch to television and broadband or mobile telephony and mobile broadband double play bundles.

Figure 34: Double play subscriptions (000s), Sweden



Note: *Business subscriptions only. ** Included in "Other combinations" are for example "Mobile telephony and mobile broadband" and "Mobile telephony and television".

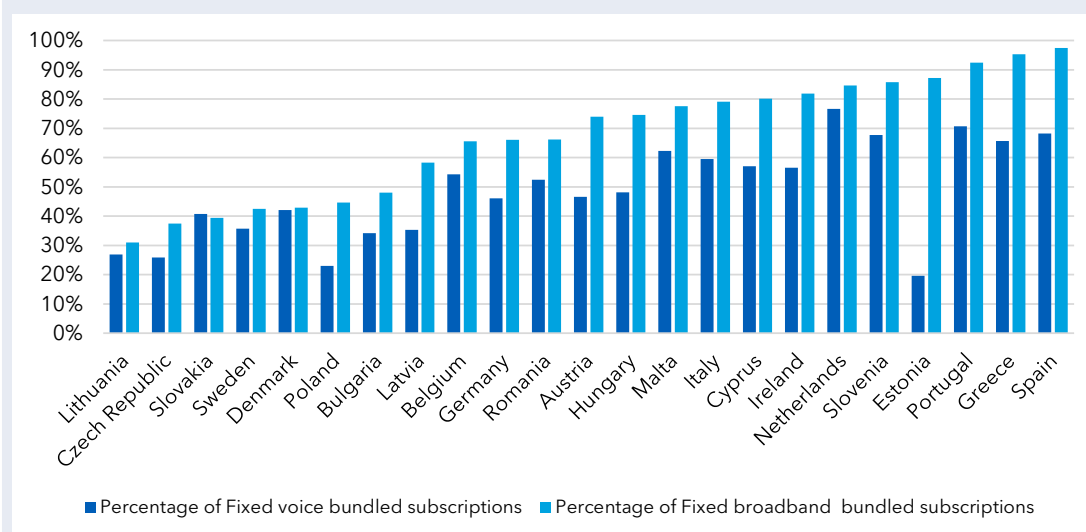
Source: The Swedish Post and Telecom Authority, The Swedish Telecommunications Market, <https://statistik.pts.se/en/the-swedish-telecommunications-market/tables/>

(continued)

Example 2:

Two of the most bundled services are fixed telephony and fixed broadband. Usually both services are offered in the same commercial offer (bundle) and, as well, are offered in isolation each (as stand-alone). In the European Union the degree of bundling of each of these two services varies across countries, but on average more than half of total fixed telephony and more than 60 per cent of all broadband subscriptions have been contracted together with at least one additional service in the commercial offer.

Figure 35: Bundling intensity in fixed voice and fixed broadband in the EU as % of total subscriptions to each service, 2016



Source: European Commission, Digital Scoreboard 2017 [<https://ec.europa.eu/digital-single-market/en/news/telecommunications-data-files-digital-scoreboard-2017>]

Relevance:

By measuring the amount of bundling it is possible to better capture the penetration rate of some services offered in this way, as well as the convergence of services (and networks). Additionally, bundling can represent a welfare improvement in terms of total expenditure on a subset of services, since the bundled offer may provide a discount or at least a single bill in contrast to contracting these two services on a stand-alone basis.

Indicator 4.2: Subscriptions to fixed-broadband, fixed-telephone and pay TV bundles (i4213_3x)

Definition:

Subscriptions to fixed-broadband, fixed-telephone and pay-TV bundles refers to the number of bundled telecommunication subscriptions including fixed-broadband, fixed-telephone and pay-TV services. Only those subscriptions that meet the criteria established in the definition of bundled telecommunication services should be included. Subscriptions that include additional telecommunication services – such as quadruple play subscriptions including fixed telephony, fixed broadband, pay TV and mobile voice/data – should not be counted under this indicator.

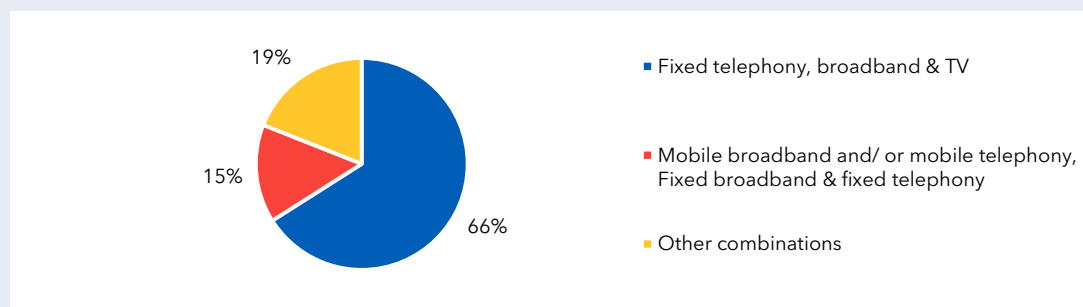
Clarifications and scope:

This indicator is considered a "triple play" bundle. Note that a triple play bundle may be formed with a combination of other services, i.e., mobile voice and broadband and fixed voice, but this or other combination of three services is not to be considered under this indicator. Pay TV services relates to multichannel services offered via cable, fibre or satellite. If digital terrestrial television (DTT) is part of the bundle, it should include channels that are not free-to-air. Mobile pay TV, i.e., pay TV offered only for mobile subscriptions and via mobile networks will not be considered for this indicator nor will Internet streaming services unless it is included as part of a multichannel package.

Example:

The Swedish Post and Telecom Authority collects data on triple play bundle subscriptions. Fixed telephony and broadband and television bundle was the most popular accounting for two thirds of all triple play bundles in 2018.

Figure 36: Triple play subscriptions (% of total), Sweden, 2018



Source: The Swedish Post and Telecom Authority, The Swedish Telecommunications Market, <https://statistik.pts.se/en/the-swedish-telecommunications-market/tables/>

Relevance:

As operators deploy next generation access (NGA) networks and acquire content for distribution on their networks they offer increasingly bundled offers that contain pay TV (content services). This type of bundling can be beneficial to consumers, since they usually offer better prices if compared with the individual offers for each service. This type of bundling approximates convergence on the operator side as well as the impact of this convergence on the marketplace.

Box 7: The convergent bundle

During the 8th EGTI meeting held in Geneva from 12 to 13 September 2017, the 'convergent' bundle was discussed due to its growing presence in the market, i.e., the bundling of fixed services (broadband and telephony) and mobile services (voice and data broadband) in the same commercial offer.

Definition:

Subscriptions to convergent bundle refers to the number of bundled telecommunication subscriptions including fixed telephony, fixed broadband, and mobile services (voice and mobile broadband data). Only those subscriptions that meet the criteria established in the definition of converged telecommunication services should be included. Subscriptions that include additional telecommunication services such as pay TV or content services should be excluded.

Mobile data service has to offer a broadband speed, which is defined as a connection providing at least 256 kbit/s. This speed is available by 3G/UMTS systems or higher (4G/LTE). In considering the (download) speed of a mobile connection, the advertised or nominal speed should be considered (not real or effective speed).

Clarification:

This indicator is also known as "quadruple play". Note that in some countries mobile voice and mobile data (broadband) are not considered a bundle, but a single offer service. In this bundle, both voice and broadband are required to be included in the final offer, both supplied via fixed and mobile networks. Voice and broadband in one single contract with a mobile service provider may lead to confusion regarding the components of a quadruple and a quintuple play offer. The quadruple play offer is defined here as including both fixed and mobile supported voice and broadband services.

Many operators offer zero-rating services, i.e., access to specific additional services (for example music or use of social media apps) that are not restricted by the data cap, if any, included in the price selected. These special, on-top-services, are not to be considered even if offered as a compulsory additional service.

Example:

In the European Union, by 2015 more than 20 per cent of all mobile cellular (voice) subscriptions had been contracted together with at least one additional final service (usually mobile broadband)¹. In Denmark, Germany, Lithuania, and Slovakia, this proportion was more than 40 per cent. The intensity of bundling with regards to mobile broadband services is even higher: on average in the European Union, more than 40 per cent of all mobile data subscriptions were bundled subscriptions. In countries such as Hungary, Lithuania, Portugal, and Slovakia, this proportion amounted to more than 80 per cent of all active data subscriptions.

Relevance:

In many parts of the world operators have both fixed and mobile networks at their disposal. Furthermore, it has been observed in many markets during recent years a trend towards "convergent operators" and many mergers and acquisitions between mobile network operators buying fixed network operators have taken place as a result. Operators increasingly offer sets of services to the user, irrespective of the network that provisions these. The collection of mobile + fixed network services, as this quadruple play proposes, provides an idea of the rate of convergence of these services.

¹ See Indicators on Bundles, Board of European Regulators for Electronic Communications, BEREC, BoR (15) 77, July 2015.

5 Traffic

108. Measuring traffic reflects trends in the usage of telecommunication networks. This is becoming more critical as networks, particularly mobile networks, reach saturation and usage becomes more analytically interesting than subscriptions. Indicators in this category include voice traffic from fixed-telephone and mobile-cellular networks and domestic Internet traffic. They can be used to derive indicators such as minutes of use per subscription and average number of SMS sent per subscription. This section also covers text messaging. One trend observed in many markets is a substitution pattern in voice traffic: it is increasingly being driven by mobile networks to the detriment of fixed line traffic, which is decreasing in absolute terms. Over the top (OTT) services used over the Internet (e.g., WhatsApp, Facetime, Facebook Messenger, etc.) are increasingly substituting traditional voice and text messages.

109. Data traffic is growing in importance both in fixed and in mobile networks. Data traffic is recording growth at double digit rates in most markets, and more so as new networks or technological standards are being deployed, for example, the deployment of 4G/LTE networks has brought significant increases in data consumption per subscriber. The same evolution takes place in fixed networks with the extension of optical fibre-based networks that has driven up the average data consumed.

110. Voice traffic that originates in a fixed network may have a fixed or mobile domestic network destination or an international destination.

111. Voice traffic that originates in a mobile network may have the following destinations: another domestic mobile network (off-net), the same network as the originating call (on-net) or international (fixed network).

112. This group of indicators is based on annual (reference year) data in respect of the year ending 31 December. Where data are not available for the year ending 31 December, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data). Where countries report data on the basis of a year not ending on 31 December, this should be specified in a note.

113. Traffic flows are to be measured based on the network of origination, on the destination network and on the type of service provided (voice, data, and messaging). Main destinations of each service, when relevant, are also to be measured independently (domestic/ international, off-net/ on- net). Table 7 provides the main dimensions used for measuring traffic flows.

114. Note that this classification implies, on the one hand, a simplification in the number of indicators related to traffic to be collected. For example, inside the fixed-to-fixed telephone calls category both local calls and long-distance (national) calls are to be included. The technology underlying the voice provision does not matter anymore. Analogue based, digital and (managed) VoIP voice calls are to be included in each indicator that distinguishes traffic by destination: domestic, international, and to mobile networks.

115. The technology underlying the provision of voice services is no longer relevant. The indicator "VoIP traffic" is no longer relevant as an independent sub-indicator, but it is included in "Fixed voice traffic", in any of its relevant disaggregation: domestic, international, or to a mobile network.

Table 7: Voice, messaging and Internet traffic by origin and destination network

	Indicator	Clarification / scope
Fixed originated traffic	Fixed-to-Fixed (domestic)	includes local and long-distance, as well as VoIP
	Fixed-to-Mobile (outgoing)	includes VoIP
	Fixed-to-international	includes VoIP
	International incoming to-Fixed (wholesale)	
Mobile originated traffic	Domestic (voice)	
	on-net	
	off-net	
	Mobile-to-Fixed	
	International (voice)	
	incoming	
	outgoing	
	SMS	
	SMS domestic	includes SMS and MMS
	SMS international	outgoing messages, includes SMS and MMS
	Roaming	
	Voice (roaming)	
	roaming- out	retail, includes received calls
	roaming- in (wholesale)	wholesale, includes outgoing and incoming minutes
	Data roaming	
	data roaming- out	retail traffic
	data roaming- in (wholesale)	wholesale traffic
Domestic internet traffic	Fixed broadband traffic	
	Mobile broadband traffic	

116. Mobile traffic is also simplified in its collection. Messaging services were differentiated based on SMS and MMS (multimedia), but due to the significant reduction in the demand for these services, these two modalities, for domestic messaging as well as for international messaging, are to be integrated into one single indicator.

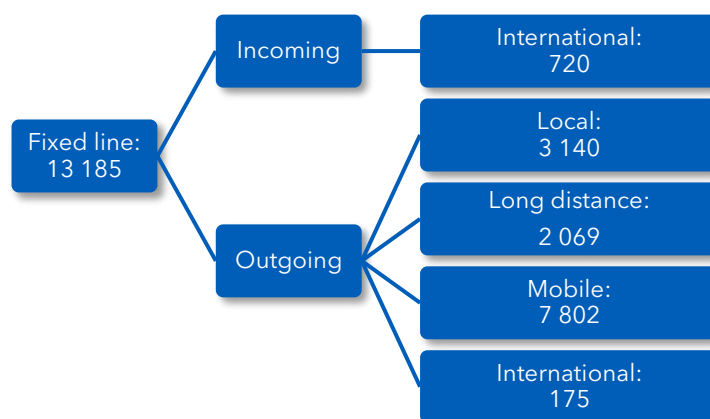
117. Internet traffic is to be reported based on total domestic traffic. Due to the special interest that Internet traffic has, a further disaggregation is needed: (1) fixed network Internet traffic and (2) mobile network Internet traffic.

118. Roaming services have been collected by ITU for a number of years. Due to the growth in the demand for roaming and changes in the regulatory rules that govern this service, growth in the volumes demanded are being observed. Data (Internet) roaming is increasing all over the world. Data roaming services are classified in the same way as voice services, based on the retail level collection (roaming-out), and on the wholesale level (roaming-in).

5.1 Fixed-telephone traffic

119. The indicators in this section refer to domestic and international voice traffic originated in fixed telephone line networks as well as incoming international traffic. Figure 37 shows 2018 data from South Africa illustrating the different types of fixed telephone line traffic. More than half of fixed telephone line traffic in South Africa was to mobile telephones. International incoming traffic is more than four times higher than outgoing international traffic. There is also a distinction between local and domestic long-distance fixed line calls in South Africa, though this separation is disappearing in many tariffs and commercial practices in a significant number of countries.

Figure 37: Fixed telephone line traffic (millions of minutes), South Africa, 2018



Note: Refers to fiscal year for twelve months ending 30 September 2018.

Source: Independent Communications Authority of South Africa. 2019. The state of the ICT sector report in South Africa. <https://www.icasa.org.za/legislation-and-regulations/state-of-ict-sector-in-south-africa-2019-report>

Indicator 5.1: Domestic fixed-to-fixed telephone traffic, in minutes (i131m)

Definition:

Domestic fixed-to-fixed telephone traffic refers to completed local and domestic long-distance fixed telephone voice traffic. The indicator should be reported as the number of minutes of traffic during the reference year. This should exclude minutes used for dial-up Internet access.

The main data to collect is the *total* of domestic voice traffic, in minutes, originated in any fixed network and with any other fixed (domestic) network destination.

Additional detail can be collected through the local and long-distance (domestic) voice traffic:

Indicator 5.1a: Local fixed-to-fixed telephone traffic, in minutes (i1311m)

Refers to effective (completed) fixed-telephone line voice traffic exchanged within the local charging area in which the calling station is situated. This is the area within which one subscriber can call another on payment of the local charge (if applicable). This indicator should be reported in the number of minutes, which should exclude minutes used for dial-up Internet access.

Indicator 5.1b: Long-distance fixed-to-fixed telephone traffic, in minutes (i1312m)

Refers to effective (completed) fixed national long-distance telephone voice traffic exchanged with a station outside the local charging area in which the calling station is situated. The indicator should be reported as the number of minutes of traffic. It excludes local calls, calls to mobile networks, calls abroad, and calls to special service numbers such as ISPs for Internet dial-up.

Clarifications and scope:

This indicator refers to all fixed-to-fixed telephone traffic within the country. It excludes fixed-to-mobile traffic, fixed traffic to abroad and fixed traffic to special numbers.

Where some or all operators include unlimited (or a certain number of) calls or minutes in the monthly telephone subscription and do not account for this traffic, this should be specified in a note.

Method of collection:

The data can be collected from all licensed fixed-telephone operators in the country, and then aggregated at the country level.

(continued)

Relationship with other indicators:

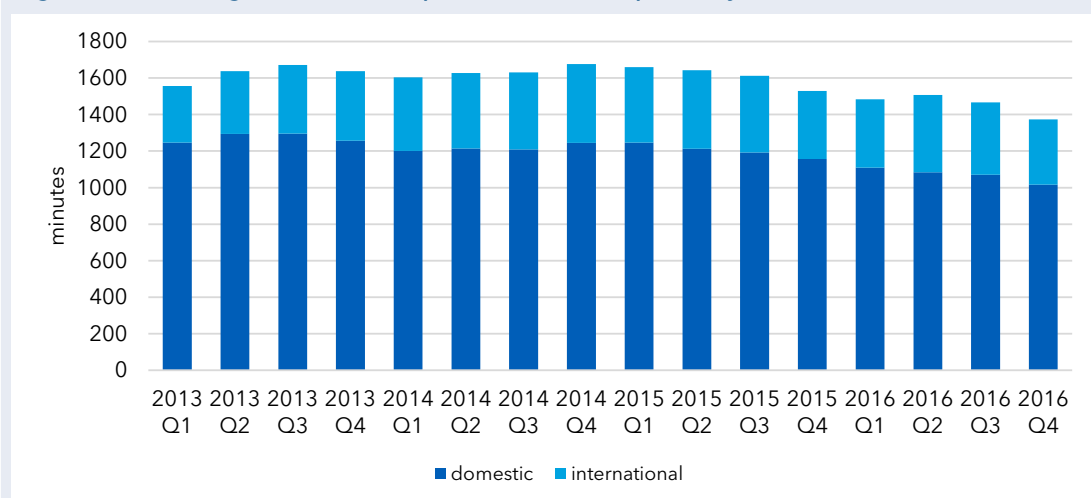
This indicator (i131m) is equal to the sum of the values of Indicator 5.1a: Local fixed-to-fixed telephone traffic, in minutes (i1311m), and Indicator 5.1b: Long-distance fixed-to-fixed telephone traffic, in minutes (i1312m). Indicator i131m and its sub-indicators are not related to other indicators in the Handbook.

Methodological issues:

In some countries all domestic fixed-to-fixed telephone traffic is within one zone and priced at the same tariff. In this case, there is no distinction between local and domestic long-distance traffic. When this is the case data should be reported as total domestic voice traffic only.

Example:

Fixed-to-fixed voice traffic is decreasing in many countries. Since the Constitutional Reform in 2013, the regulatory authority for telecommunications in Mexico (Instituto Federal de Telecomunicaciones (IFT)) collects voice traffic data on a quarterly basis by origin and by destination of call in order to monitor the evolution of the market and the effects of the regulatory decisions adopted. IFT called for the elimination of the distinction between local calls (metropolitan) and long-distance domestic calls, and established the same interconnection rates. Additionally, and due to competitive pressures, the majority of operators started offering international calls to many destinations, particularly Canada and the United States of America, at the same rates as domestic calls. This significantly reduced rates from Mexico to any destination and the volume of international calls increased. However, fixed domestic traffic decreased while in parallel mobile networks absorbed higher volumes of voice calls.

Figure 38: Average voice traffic per fixed subscription by destination, Mexico

Source: Banco de Datos, IFT [<https://bit.ift.org.mx/BitWebApp/>]

Relevance:

The volume of fixed-to-fixed voice traffic is needed in order to identify important trends in market behaviour, substitution patterns between fixed and mobile networks, and to evaluate the effects of specific regulations such as interconnection rates, retail prices, or the degree of bundling.

Note that the split between local calls and long-distance calls (minutes) is not needed for this indicator. The split may be provided if collected but will not be used by ITU.

Indicator 5.2: Fixed-to-mobile telephone traffic, in minutes (i1313wm)

Definition:

Fixed-to-mobile telephone traffic refers to total traffic from all fixed-telephone networks to all mobile-cellular networks within the country. The indicator should be reported as the number of minutes of traffic during the reference year.

Clarifications and scope:

This indicator refers to the effective (completed) volume of traffic in minutes sent from fixed-telephone lines to mobile networks within the country. The treatment of public payphone-to-mobile network traffic should be clarified in a note if it is not covered here.

Method of collection:

The data can be collected from licensed fixed-telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

This indicator (i1313wm) is not related to other indicators in the Handbook.

Methodological issues:

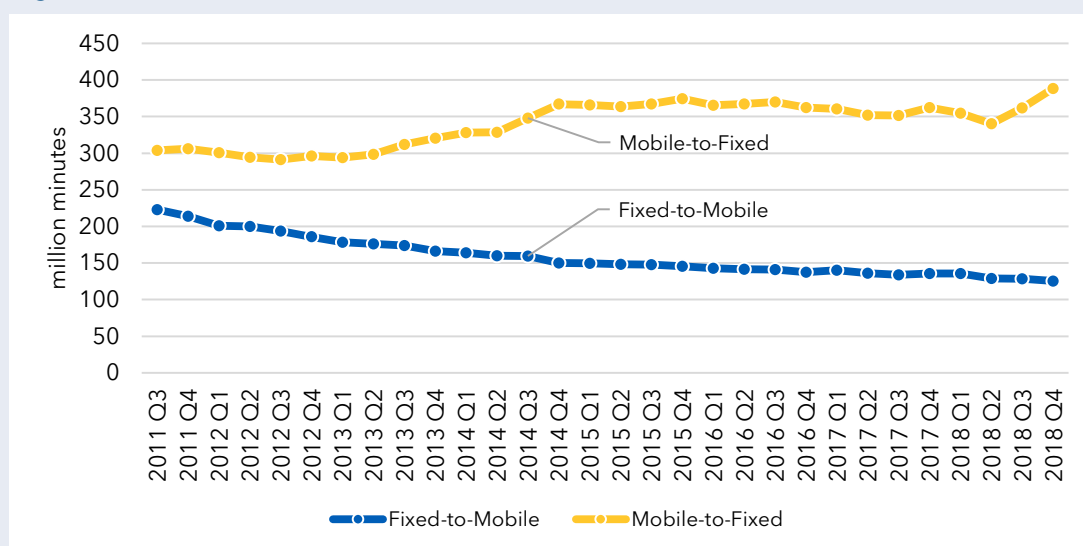
Data should refer to fixed telephone line voice traffic to all domestic mobile networks, in minutes. Some operators may report minutes that are included in monthly plans or may use different approaches for rounding traffic billed in seconds.

Example:

The substitution effect from fixed to mobile networks is reflected in the amount of originated and terminated traffic on both fixed and mobile networks, whereby fixed networks show decreasing demand for voice, mobile networks show positive growth rates.

The regulatory authority for telecommunications in Ireland, ComReg, measures quarterly the traffic flows between fixed and mobile networks. In 2011, the majority (57%) of all voice traffic in Ireland, both fixed and mobile, was handled by mobile networks. Seven years later this had risen to 76 per cent.

Figure 39: Fixed to mobile and mobile to fixed voice traffic (million minutes) in Ireland



Source: ComReg, Ireland

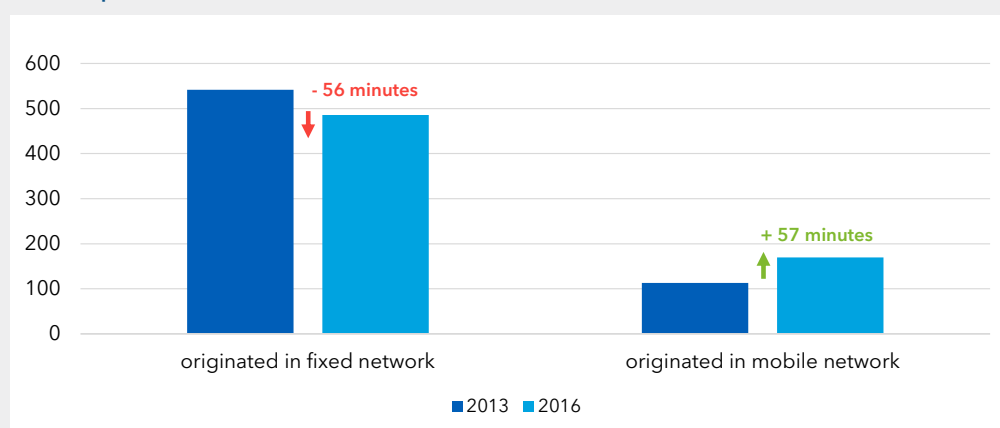
Relevance:

The volume of fixed-to-mobile voice traffic is relevant when analysing trends such as the degree of substitution between fixed and mobile networks as well as when analysing effects of regulating interconnection in fixed and mobile networks.

Box 8: Substitution of mobile and fixed voice calls

The substitution pattern in voice calls, from fixed to mobile networks, can also be seen when analysing traffic per line, be it from fixed or mobile active subscription. In Mexico, the regulatory authority, IFT, collects data quarterly on the consumption of voice in each type of network. By taking the average of total traffic by active subscription of each network, it is possible to compare average traffic originated in fixed and in mobile networks. Figure 40 shows that, from 2013 to 2016, voice traffic originated in fixed networks decreased in absolute terms by 56 minutes per line (per month), which is almost exactly the gain achieved by mobile networks in terms of voice traffic managed.

Figure 40: Average consumption of voice (minutes) per fixed or mobile subscription, Mexico, 2013-2016



Source: Banco de Datos, Instituto Federal de Telecomunicaciones (IFT) <https://bit.ift.org.mx/BitWebApp/>

120. The indicator on international outgoing and incoming traffic collects information from two different levels of activity. Fixed international outgoing traffic represents the volume of calls (measured in total minutes) from a fixed network to an international destination, no matter if the destination is a fixed or mobile network. This traffic is charged to subscribers (retail level traffic) by the domestic operator.

121. The total incoming traffic is the volume of calls that have originated in a foreign country (fixed or mobile network) and have an active domestic fixed network destination. This incoming traffic is measured at the wholesale level by the domestic operator, which receives termination revenues for providing this service. Note that the volume of voice traffic coming from a foreign country and the volume of traffic going to a foreign destination need not be balanced.

Indicator 5.3: International incoming and outgoing fixed-telephone traffic, in minutes (i132mb)

Definition:

International incoming and outgoing fixed-telephone traffic refers to the sum of international incoming and outgoing fixed-telephone voice traffic. The indicator should be reported as the number of minutes of traffic during the reference year. It can be broken down as follows:

Indicator 5.3a: International outgoing fixed-telephone traffic, in minutes (i132m)

International outgoing fixed-telephone traffic refers to effective (completed) fixed telephone voice traffic originating in a given country to destinations outside that country. This should include traffic to mobile phones outside the country. The indicator should be reported in number of minutes of traffic. It excludes calls originating in other countries. It should include managed VoIP traffic, that is, voice traffic handled by a registered operator that complies with the quality of service conditions attached in licence conditions or by domestic regulation.

Indicator 5.3b: International incoming fixed-telephone traffic, in minutes (i132mi)

International incoming fixed-telephone traffic refers to effective (completed) fixed telephone voice traffic originating outside the country with a destination inside the country, irrespective of whether the call was from a fixed or mobile subscriber. It excludes minutes of calls terminating in other countries (when the country serves as a transit country to carry the traffic) but it should include VoIP traffic.

This incoming international traffic may be more complex to collect by national authorities since it is not a retail traffic but charged only at the wholesale level (among operators). In order to account for this volume of traffic, the authority needs to collect traffic volumes for international calls (incoming), or international termination in fixed networks. If this traffic cannot be collected it should be clearly specified.

Clarifications and scope:

Indicator 5.3b: International incoming fixed-telephone traffic, in minutes (i132mi) may not reflect all incoming international traffic, particularly calls made using IP telephony that are re-routed to appear as local calls (see Methodological issues below).

Any such deviations from the definitions should be indicated in a note.

Method of collection:

The data can be collected from fixed-telephone operators in the country offering international telephone call services and then aggregated at the country level.

Relationship with other indicators:

This indicator (i132mb) is equal to the sum of the values of Indicator 5.3a: International outgoing fixed-telephone traffic, in minutes (i132m) and Indicator 5.3b: International incoming fixed-telephone traffic, in minutes (i132mi).

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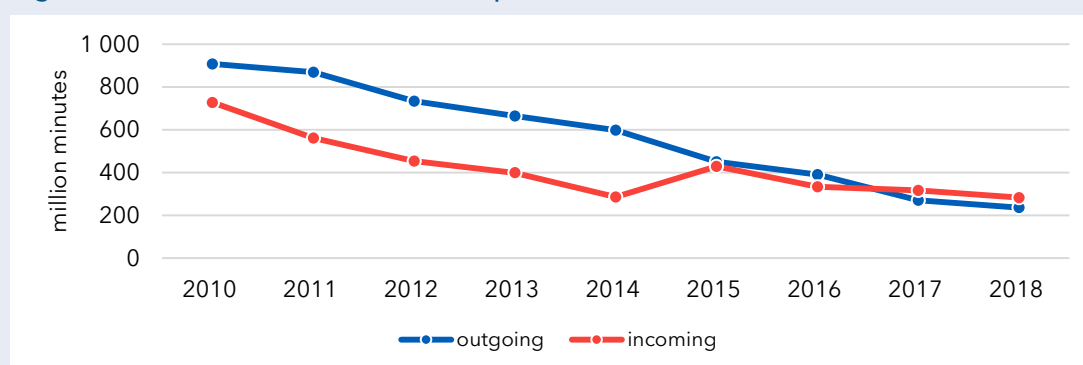
Methodological issues:

Indicator 5.3a: International outgoing fixed-telephone traffic, in minutes (i132m) may not reflect all outgoing international traffic, particularly if calls made using IP telephony are not included. The treatment of call-back services may also affect how a call is accounted for. Call-back involves making an international call via a third country to take advantage of lower prices. For example, assume a user in Country A wants to call someone in Country B but finds that call-back is cheaper than directly calling Country B. Call-back works by the user in Country A calling a number in Country C, hanging up before the call is answered, waiting for the call-back and then dialling Country B. Even though the subscriber places the call to Country B, the traffic is liable to be recorded as incoming traffic from Country C to Country A.

Indicator 5.3b: International incoming fixed-telephone traffic, in minutes (i132mi) may not reflect all incoming international traffic, particularly calls made using IP telephony that are re-routed to appear as local calls. This happens when the IP call enters the network of an ISP in the country, which then routes it over the local network. The treatment of call-back services may also affect how the call is accounted for (e.g., call-back may be considered outgoing).

Example:

International incoming traffic is generally handled differently in national regulatory agency reports. The Swedish Post and Telecom Authority reports international fixed line traffic on a semi-annual basis. Incoming traffic is classified as an interconnection service. Fixed line international traffic in Sweden has been declining as users switch to Internet-based applications for international calling.

Figure 41: International fixed line telephone traffic (million minutes), Sweden

Note: Outgoing traffic excluding calls from pre-paid telephone cards.

Source: Swedish Post and Telecom Authority, The Swedish Telecommunications Market, available at: <https://statistik.pts.se/en/the-swedish-telecommunications-market/>

Relevance:

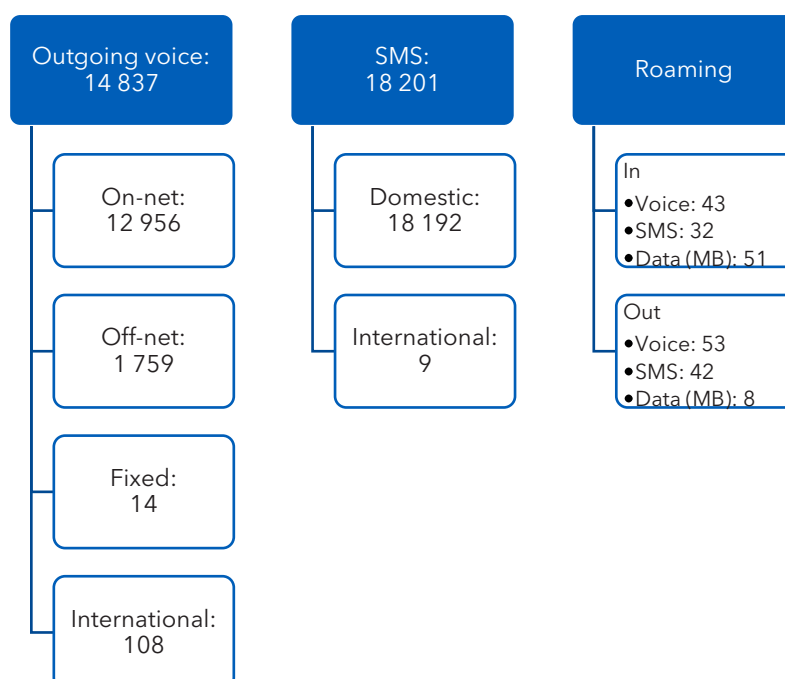
A general trend observed in many parts of the world is the gradual decline in volumes of international calls, whether outgoing or incoming. Users place international calls more often via Internet apps, or OTT service providers, and make use less and less of the traditional operator services. Given the difficulties existing in measuring OTT services (or un-managed VoIP traffic), the measuring of traditional voice services with international destination provides evidence of this trend.

5.2 Mobile telephone traffic

122. Traffic from mobile-telephone networks accounts for the majority of usage in most countries. The volume of mobile traffic is critical for monitoring usage and for deriving key performance indicators such as minutes of use, average revenue per minute, average number of SMS per user, and average number of gigabytes (GB) of data per user.

123. Mobile traffic also includes services not included with fixed telephone line traffic such as texting. Most owners of mobile telephones take them when they travel. Hence roaming indicators are also relevant for mobile traffic. Figure 42 shows data from the Communications Authority of Kenya to illustrate the various traffic indicators of mobile networks.

Figure 42: Mobile traffic (million minutes, MB), fourth quarter 2018, Kenya



Source: Communications Authority of Kenya. Second Quarter Sector Statistics Report for the Financial Year 2018/2019.
https://ca.go.ke/document_category/statistics/

Indicator 5.4: Domestic mobile-telephone traffic, in minutes (i133wm)

Definition:

Domestic mobile-telephone traffic refers to the total number of minutes of calls made by mobile subscribers within a country (including minutes to fixed telephone and minutes to mobile telephone subscribers). The indicator can be broken down as follows:

Indicator 5.4a: Outgoing mobile traffic to same mobile network, in minutes (i1331wm)

Outgoing mobile traffic to same mobile network refers to the number of minutes of calls made by mobile subscribers to the same mobile network (within the country). The indicator refers to the number of minutes originating on mobile networks and terminating on the same mobile network (on-net). It does not cover minutes of calls from mobile to fixed or mobile to other mobile networks.

Indicator 5.4b: Outgoing mobile traffic to other mobile networks, in minutes (i1332wm)

Outgoing mobile traffic to other mobile networks refers to the number of minutes of calls made by mobile subscribers to other mobile networks (within the country). The indicator refers to the number of minutes originating on mobile networks and terminating on different domestic mobile networks (off-net). It does not cover minutes of calls from mobile to fixed or mobile to the same mobile networks.

Indicator 5.4c: Outgoing mobile traffic to fixed networks, in minutes (i1332wmf)

Outgoing mobile traffic to fixed networks refers to the number of minutes of calls made from mobile-cellular networks to fixed-line telephone networks within the country. The indicator refers to the number of minutes originating on mobile networks and terminating on fixed-line telephone networks within the country.

Clarifications and scope:

This indicator refers to the total amount of traffic (in minutes) originating on mobile telephones with a destination to either fixed- or mobile-telephone subscriptions in the country.

Method of collection:

Data can be collected from mobile-telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

This indicator (i133wm) is equal to the sum of the values of the sub-indicators mentioned above (5.4a, b, and c). Indicator i133wm and its sub-indicators are not related to other indicators in the Handbook.

(continued)

Methodological issues:

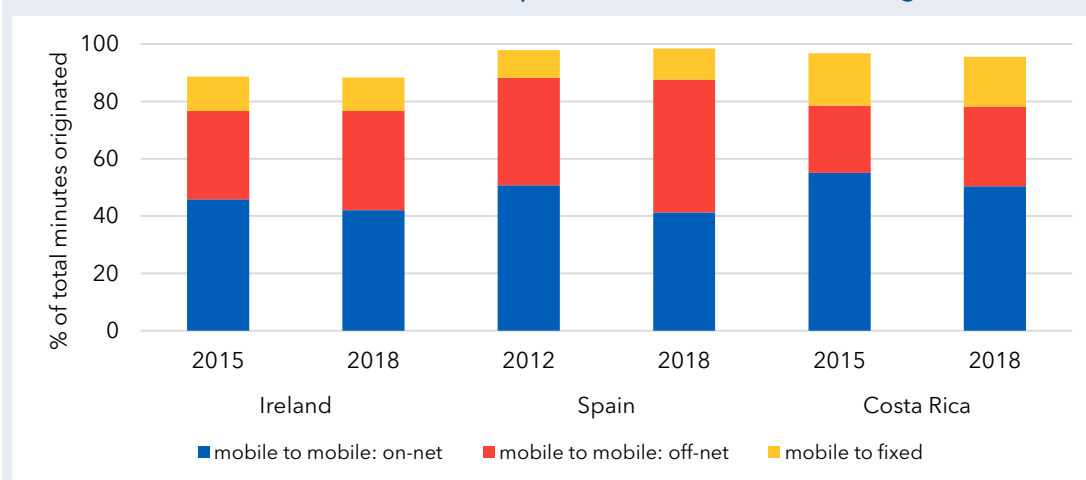
Countries may deal with the rounding of seconds to minutes or the inclusion of minutes in subscriptions differently.

Example:

Mobile networks have been very successful in that the adoption of voice and data services keeps increasing, as does user demand for voice and access to Internet. A substitution effect of fixed to mobile usage has been observed in many countries.

As new operators come to market, and more intense use of mobile networks is made for placing calls, the proportion of off-net calls (those starting and ending in a different mobile network provider) has risen, while the share of calls that started and ended in the same network have diminished in similar magnitudes. In Costa Rica and Ireland, the proportion of machine-to-machine off-net calls increased by 5 percentage points from 2015 to 2018, the same magnitude as the decrease experienced by on-net calls in the same period. In Spain, the proportion of switching has reached 10 percentage points.

Figure 43: Voice traffic volumes evolution of calls originated in mobile networks by destination in Costa Rica, Ireland, and Spain (as % of total minutes originated)



Source: ComReg (Ireland) [<https://www.comreg.ie/industry/electronic-communications/market-information/quarterly-key-data-report/>], SUTEL (Costa Rica) [https://sutel.go.cr/sites/default/files/informe_estadisticas_del_sector_de_telecomunicaciones_2018_vf.pdf] and CNMC (Spain) [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp].
 Note: Totals may not add up to 100 per cent due to some traffic not being included (e.g., to international, roaming).

Relevance:

The most widely used telecommunication service is mobile telephony. The destination of voice traffic originated in a mobile network, whether it is another fixed or mobile network, is important evidence when analysing changing patterns of use and the emergence of rival services (such as OTT provided video calls), and when detecting trends that may have important consequences for regulation.

Indicator 5.5: Outgoing mobile traffic to international, in minutes (i1333wm)

Definition:

Outgoing mobile traffic to international refers to the number of mobile traffic minutes originating in a country to any fixed network destination outside that country.

Clarifications and scope:

Outgoing mobile traffic to international refers only to minutes of calls made from a domestic (home) mobile network (country A) to an international destination fixed network (country B).

It excludes minutes of calls made by domestic (home) mobile network subscribers while visiting other countries (roaming-out minutes). It excludes minutes of calls originating in other countries. It excludes minutes of calls made from a domestic (home) mobile network (country A) to an international destination mobile network (country B).

Calls originating in a domestic mobile network terminated on an international mobile network fall under the roaming category and have a separate set of indicators. Hence, this indicator should exclude roaming-out minutes (calls made by home subscribers while abroad), and focus only on calls made from a domestic mobile network to "fixed international networks".

Method of collection:

The data can be collected from mobile operators in the country offering international telephone call services, and then aggregated at the country level.

Relationship with other indicators:

Indicator i1333wm is a component of Indicator 5.15a: Total international outgoing telephone traffic, in minutes (i132t).

Methodological issues:

The treatment of call-back services may affect how a call is counted. Call-back involves making an international call via a third country to take advantage of lower prices. For example, assume a user in Country A wants to call someone in Country B but finds that call-back is cheaper than directly calling Country B. Call-back works by the user in Country A calling a number in Country C, hanging up before the call is answered, waiting for the call-back and then dialling Country B. Even though the subscriber places the call to Country B, the traffic is liable to be recorded as incoming traffic from Country C to Country A.

As for any other voice service, be it provided with a fixed or a mobile network provider, VoIP calls that are offered by registered operators and abide to quality of service parameters established by regulation (managed VoIP), are to be included in the volumes of calls (minutes) described in the indicator.

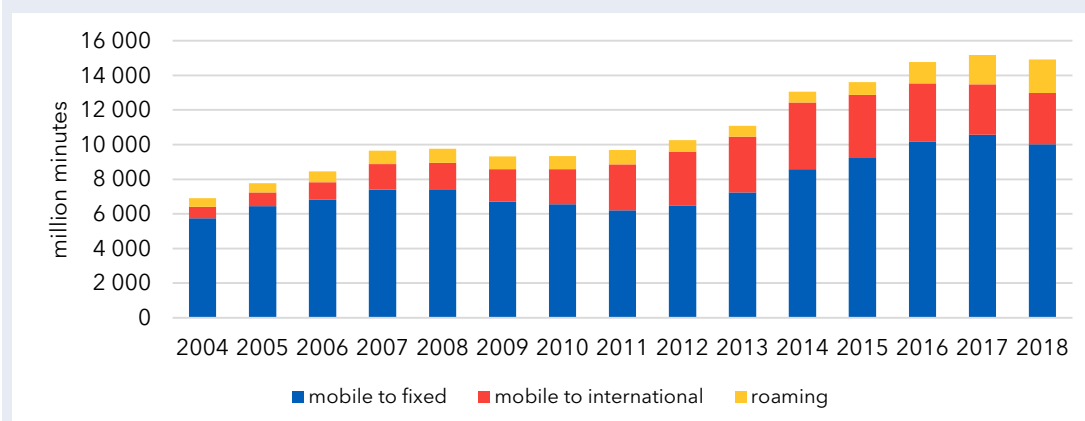
By contrast, voice over broadband, or voice or video calls offered by over-the-top (OTT) service providers that are not registered as telecommunication operators and do not abide to any quality of service regulation (i.e., voice or video calls transmitted over the open Internet) are not to be counted in this indicator. Note that OTT audio or video calls provided over the open Internet are increasingly being used by individuals when placing international calls.

(continued)

Example:

Voice traffic with international destination originated in a mobile network domestically has a small share of the total mobile generated traffic, but it is relevant if compared with the volume of roaming or mobile-to-fixed traffic. In Spain, traffic from mobile to international destinations accounts only for 3 per cent of all minutes originated in a mobile network, but this volume is higher than the one for roaming.

Figure 44: Selected traffic destinations from mobile originated calls, Spain (million minutes)



Source: CNMC (Spain) [http://data.cnm.es/datagraph/jsp/inf_anual.jsp]

Relevance:

International traffic flows change over time. New communications possibilities and services, such as OTT services, new networks and tariffs, affect the demand for voice calls over mobile and fixed networks. The evaluation of trends, regulatory policies implemented, and other social objectives, require knowledge of traffic flows and how they evolve.

Indicator 5.6: Incoming international traffic to mobile network, in minutes (i1335wm)

Definition:

Incoming international traffic to mobile network refers to the number of incoming minutes (fixed and mobile) received by mobile networks originating in another country.

Clarifications and scope:

This indicator refers to minutes of calls terminating on mobile-cellular networks with an origination abroad, irrespective of whether the call is from a fixed or mobile subscriber. This should exclude roaming traffic.

Any limitations with the indicator (e.g., if calls made using IP telephony appear as local calls) should be specified in a note.

Method of collection:

The data can be collected from mobile operators in the country offering international telephone call services, and then aggregated at the country level.

Relationship with other indicators:

This Indicator (i1335wm) is a component of Indicator 5.15b Total international incoming telephone traffic, in minutes (i132ti).

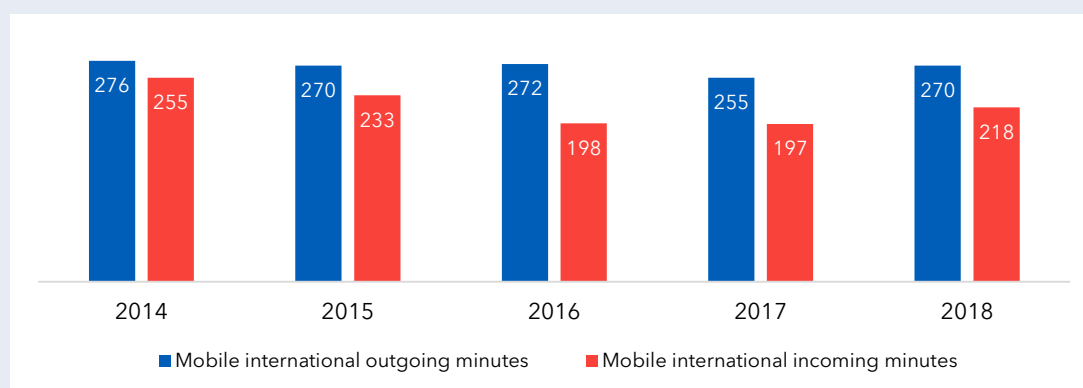
Methodological issues:

The indicator may not reflect all incoming international traffic, particularly calls made using IP telephony that are re-routed to appear as local calls. This happens when the IP call enters the network of an ISP in the country, which then routes it over the local network. The treatment of call-back services may also affect how the call is accounted for (e.g., call-back may be considered outgoing).

Example:

The telecommunication regulatory authority in Costa Rica, SUTEL, collects data on mobile international incoming and outgoing minutes of voice calls. The volume of mobile originated minutes that have an international destination is higher than the volume of incoming minutes coming from any foreign network.

Figure 45: Minutes of voice international outgoing (from mobile) and incoming (to mobile), Costa Rica (million minutes)



Source: SUTEL, Costa Rica, [https://sutel.go.cr/sites/default/files/sutel_informe-estadisticas_2017_esp_0.pdf]

Relevance:

The composition of incoming and outgoing volumes of calls with a mobile destination or origination network varies from country to country. One useful indicator to know the balance of traffic flows with international origin or destination is the volume of voice calls placed from any international network (fixed or mobile) and having a mobile network destination in the domestic country.

Indicator 5.7: Roaming by home subscribers abroad (outbound roaming), in minutes (i1334wm)

Definition:

Roaming by home subscribers abroad (outbound roaming) refers to the total call minutes made and received by own customers in foreign networks (outbound roaming), i.e., retail international roaming minutes from own network subscribers roaming on foreign networks abroad. The indicator excludes minutes from users who are not subscribers to domestic mobile networks and are temporarily roaming on domestic mobile networks.

Clarifications and scope:

This indicator refers to retail international roaming minutes on foreign networks. It refers to domestic mobile subscriber traffic that is generated when mobile telephones are used on foreign networks (abroad).

It excludes minutes from subscribers who are not subscribers to domestic mobile networks and are temporarily roaming on domestic mobile networks. It does not refer to international traffic originating on mobile networks in the country (domestic (home) mobile network).

Any deviations from the definition (e.g., a different treatment of roaming traffic) should be specified in a note.

Method of collection:

The data can be obtained from mobile-telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

Indicator i1334wm is not related to other indicators in the Handbook.

Methodological issues:

Some countries may only report roaming traffic that is returned to the country, or calls placed within the country to mobile subscribers who are roaming abroad, or some other variation.

Example:

Outbound roaming services usually only account for a small proportion of the total mobile traffic, but when roaming charges are higher than domestic rates, revenues are much greater for this service.

In some areas of the world free roaming zones are being introduced where roaming rates are greatly reduced or eliminated (outbound roaming to domestic rate parity), as in the European Union, with the 2017 roam-like-at-home regulation.

For example, Table 8 shows that, in Spain, outbound roaming minutes represented only 2 per cent of the total minutes managed by mobile networks in 2018.

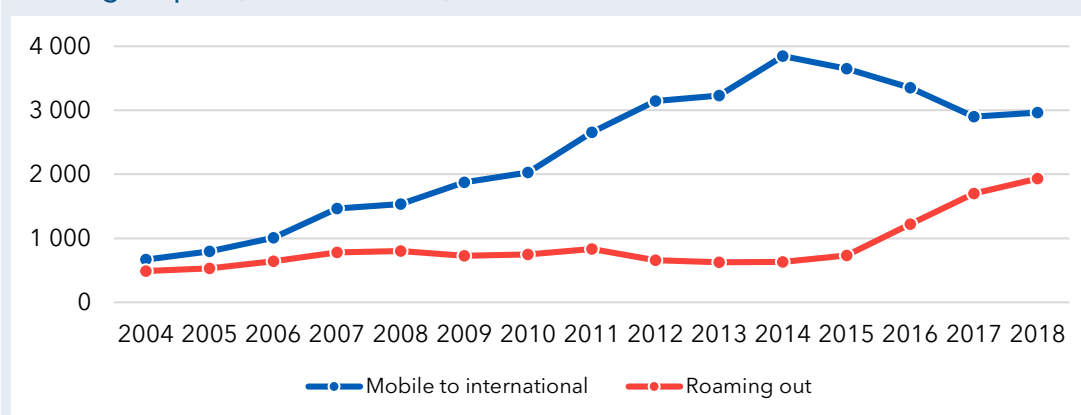
(continued)

Table 8: Outbound roaming minutes managed by mobile networks in Spain, 2018

	Proportion of total traffic (%)
Mobile to fixed (domestic)	10.3
Mobile to mobile (domestic)	83.2
on- net	39.2
off- net	44.0
Mobile to international	3.0
Roaming out	2.0
Other	1.6
Total	100.0

Source: CNMC, [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

A significant increase in voice minutes has been observed in Spain since July 2017 when the European Union roaming regulation (roam-like-at-home) started charging roaming as a domestic call.

Figure 46: Traffic originated in mobile networks, international destination, and roaming in Spain (million minutes)Source: CNMC [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]**Relevance:**

Mobile networks are absorbing increasing voice traffic volumes due to both higher penetration rates of cellular telephony, and to a substitution effect from fixed to mobile consumption. International roaming has received specific regulatory treatment in many areas of the world where specific free roaming area regulations have been implemented, reducing the rates paid for the roaming service and increasing considerably the volume of service demanded by users.

Indicator 5.8: Roaming by foreign subscribers (inbound roaming), in minutes (i1336wm)

Definition:

Roaming by foreign subscribers (inbound roaming) refers to the total call minutes of visiting (foreign) subscribers making and receiving calls within a country (inbound roaming).

Clarifications and scope:

This indicator refers to the roaming traffic of foreign mobile subscribers, in minutes. It refers to the traffic that foreign mobile subscribers generate when they are roaming. It does not refer to international traffic originating on mobile networks in the country, nor to domestic mobile subscribers generating roaming traffic abroad.

Any deviations from the definition (e.g., a different treatment of roaming traffic) should be specified in a note.

Method of collection:

The data can be obtained from mobile-telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

Indicator i1336wm is not related to other indicators in the Handbook.

Methodological issues:

Some countries may only report incoming or outgoing roaming traffic that is generated by foreign subscribers.

Example:

Total volume of roaming traffic (as measured in minutes) accounts for a small part of the total mobile originated traffic. In Spain for example, it was 2.9 per cent of the total in 2018, which stands out in terms of revenue, since roaming rates are substantially higher than domestic rates. Roaming regulation in the form of caps on retail (and wholesale) prices for voice and SMS in the European Union has been in place since 2007. In 2017, the roam-like-at-home regulation in the European Union came into force, which applied domestic rates to the previous roaming rates for making calls. The result has been clear: much higher volumes of voice calls being made by subscribers while travelling (roaming) in the European Union.

Figure 47: Volume of roaming-in (wholesale traffic) and roaming-out (retail) for voice calls, Spain (million minutes)



Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

Relevance:

Roaming-in volumes for voice service helps identify specific problems with high rated services, which is essential for any regulatory policy that aims to reduce those rates. Free roaming areas are being introduced in different forms in many parts of the world.

Indicator 5.9: SMS/MMS roaming by domestic subscribers (outbound SMS roaming) (i1334sms)

Definition:

This indicator refers to the total number of SMS and MMS messages (short-message service (SMS), multimedia-messaging service (MMS)) sent by domestic subscribers while visiting a foreign country and using the network of a foreign service provider (outbound SMS/MMS roaming).

Clarifications and scope:

This indicator refers to the total volume of SMS/MMS messages that subscribers send while abroad and managed by foreign network providers. It is a retail level traffic.

It does not include SMS/MMS sent by domestic subscribers managed by domestic network providers.

Method of collection:

The data can be obtained from mobile-telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

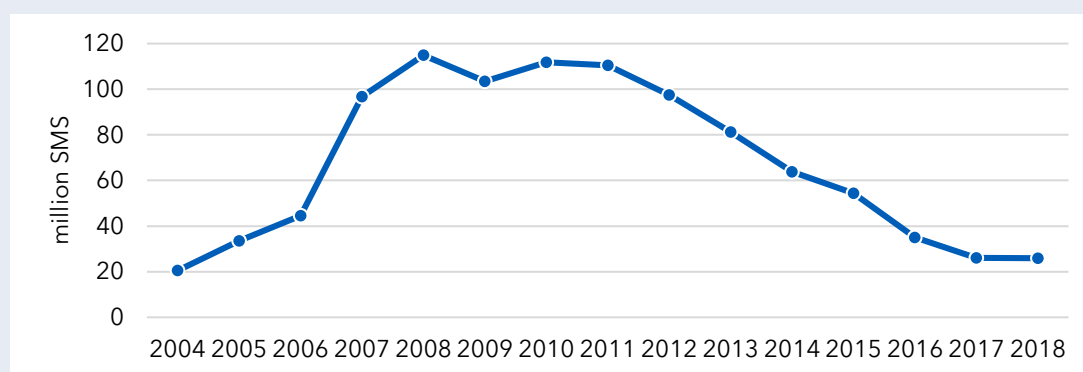
Methodological issues:

See note for Indicator 5.19: Mobile broadband Internet traffic outside the country - data roaming out (136mwo).

Example:

Adoption of over-the-top (OTT) messaging apps has been widespread in many countries and has led to reduced demand for traditional SMS (and MMS). For example, since 2007, the volume of SMS managed by operators has been declining in Spain.

Figure 48: SMS roaming-out, Spain (million)



Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

Relevance:

In many areas in the world countries are reaching agreements to establish free roaming areas, where roaming traffic is either charged at domestic country rates or charges are substantially lower than previous roaming tariffs. It is important to know the consumption patterns, be it for data, voice or messages used, of foreign subscribers while at home in order to analyse the effects and consequences of establishing a free roaming area, or when this is not the case, to analyse the evolution, unit prices, traffic flows and capacity requirements of roaming users in order to design an appropriate regulatory environment.

Indicator 5.10: SMS/MMS roaming by foreign subscribers (inbound SMS roaming) (i1336sms)

Definition:

SMS/MMS roaming by foreign subscribers (inbound SMS roaming) refers to the total number of messages (SMS and MMS) sent by visiting (foreign) subscribers while in the domestic country (inbound SMS and MMS roaming). It includes simple messages, SMS, as well as multimedia messaging, MMS.

Clarifications and scope:

This indicator refers to the number of SMS and MMS messages sent by non-domestic (foreign) subscribers while abroad (roaming). It does not include any data consumption by domestic consumers who subscribe to a domestic operator. Nor does it include any Internet traffic generated outside the country. This indicator is a wholesale level indicator in that it affects domestic operators that manage SMS/MMS messages in origination and bill the foreign operator (to which the subscriber belongs) for this service.

Method of collection:

The data can be obtained from mobile-telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

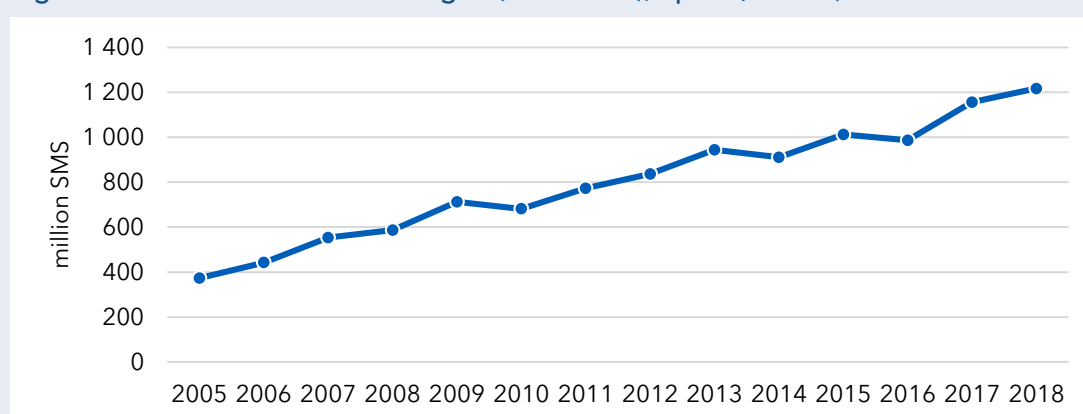
Methodological issues:

The inbound SMS/MMS message roaming volume is a wholesale traffic and transaction, i.e., it affects the domestic operator in that it provides a service to a foreign subscriber, and hence, to a foreign operator. Operators around the world have roaming agreements by which they set specific rates at which they exchange traffic that they manage for another service provider while their customers are located in the domestic country. This inbound data traffic is not caused by domestic subscribers and is not charged at retail by domestic operators.

Example:

The amount of SMS/MMS messages sent by foreign subscribers while visiting Spain has been decreasing in contrast to the domestic SMS volume in recent years.

Figure 49: SMS volume of roaming-in (wholesale), Spain (million)



Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp].

Relevance:

See note on indicator "Data roaming by foreign subscribers (data inbound roaming)".

Indicator 5.11: SMS sent (i133sms)

Definition:

SMS sent refers to the total number of mobile short-message service (SMS) messages sent, both to domestic and international destinations. This should exclude messages sent from computers to mobile handsets or to other computers. It shall include as well MMS messaging sent.

Clarifications and scope:

This indicator refers to text or multi-media messages composed on, and sent from, a mobile handset to another mobile handsets (peer-to-peer), both to domestic and international destinations, and includes all MMS messaging sent.

Where the indicator includes both SMS sent and received, this should be indicated in a note.

Method of collection:

The indicator can be collected from all licensed mobile telephone operators in the country, and then aggregated at the country level. Some operators may only be able to report chargeable SMS messages, since they may not account for SMS messages sent as part of special add-on packages to mobile subscriptions.

Relationship with other indicators:

Indicator i133sms includes the value for Indicator i133smsi (SMS international).

Methodological issues:

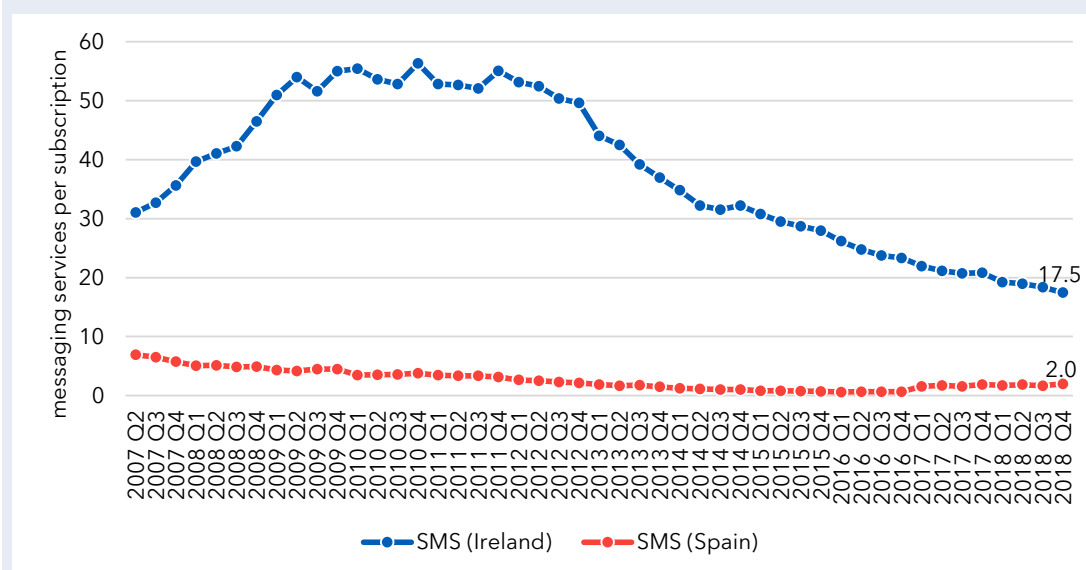
This indicator refers only to SMS messages sent from one mobile user, using their handset, to another mobile handset. Some operators may only be able to report chargeable SMS messages. Despite the definition, some countries, particularly those employing receiving party pays (RPP), report both SMS messages sent and received. In some countries, operators may only be able to report all SMS messages that pass through the SMS centre, thus including also machine-to-machine, machine-to-human, and human-to-machine messages. If this is the case, it should be indicated in a note.

(continued)

Example:

In order to compare the evolution across countries with different size of customer bases, a comparison of the number of SMS messages per active cellular subscriber line and per month is presented in Figure 50 for Ireland and Spain. For both countries, a clear reduction in the demand for SMS/MMS messages is present, being on average in 2018 less than one SMS/MMS sent by a representative Spanish mobile line and less than 18 SMS/MMS messages sent in Ireland per month.

Figure 50: Evolution of messaging services per cellular subscription and per month in Ireland and Spain



Source: ITU based on ComReg (Ireland) [<https://www.comreg.ie/industry/electronic-communications/market-information/quarterly-key-data-report/>] and CNMC (Spain) [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp] data.

Relevance:

The demand for messaging via the traditional networks has reduced substantially during the last decade following the introduction of over-the-top (OTT) messaging services and social media, which run via the open Internet and offer services in general free of charge. The reduction in the demand of SMS is also observed with multi-media messaging (MMS). It is convenient due to the low volumes of messaging traffic to incorporate both types of messaging (SMS and MMS) into one single indicator. Note that this indicator includes SMS/MMS messages sent to international destinations.

Indicator 5.12: SMS international (i133msi)

Definition:

SMS international refers to the total number of mobile short-message service (SMS) messages sent to international destinations. This should exclude messages sent from computers to mobile handsets or to other computers. The volume of SMS sent to international mobile subscribers does not include SMS sent by subscribers while in a foreign country (roaming -out SMS).

Clarifications and scope:

This indicator refers to SMS sent outside the country. It covers SMS composed on a mobile handset and sent to a mobile handset abroad. It excludes SMS received, SMS sent to users within the country, value-added SMS, premium SMS, SMS sent while visiting a foreign country and SMS sent from web-based services.

Method of collection:

The indicator can be collected from all licensed mobile telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

Indicator i133msi is a component of Indicator i133sms (SMS sent).

Methodological issues:

In some cases, it may be difficult to differentiate between value-added SMS, premium SMS and regular SMS, especially when definitions of SMS differ among countries. In some countries, operators may only be able to report all SMS that pass through the SMS centre, thus including also machine-to-machine, machine-to-human, and human-to-machine messages. If this is the case, it should be indicated in a note.

Relevance:

SMS messages show a clearly decreasing trend in usage. A substitution effect has taken place since the emergence of Internet-based apps that allow for messaging, video-calling and video sharing among users. The reduction in SMS demand takes place in those sent to international networks. This indicator is no longer collected by ITU, and the volume of *SMS international* will be incorporated in the indicator *SMS sent* (i133sms).

Indicator 5.13: MMS sent (i133mms)

Definition:

MMS sent refers to the total number of mobile multimedia-messaging service (MMS) messages sent, both to national and international destinations. This should exclude messages sent from computers to mobile handsets or to other computers.

Clarifications and scope:

This indicator covers the number of MMS sent from mobile handsets to all destinations. An MMS is a message that can contain pictures or sound. It excludes SMS sent. Only sent MMS should be recorded. If this is not possible, then it should be explained in a note.

Method of collection:

The indicator can be collected from all licensed mobile telephone operators in the country, and then aggregated at the country level.

Relationship with other indicators:

Indicator i133mms is not related to other indicators in the Handbook.

(continued)

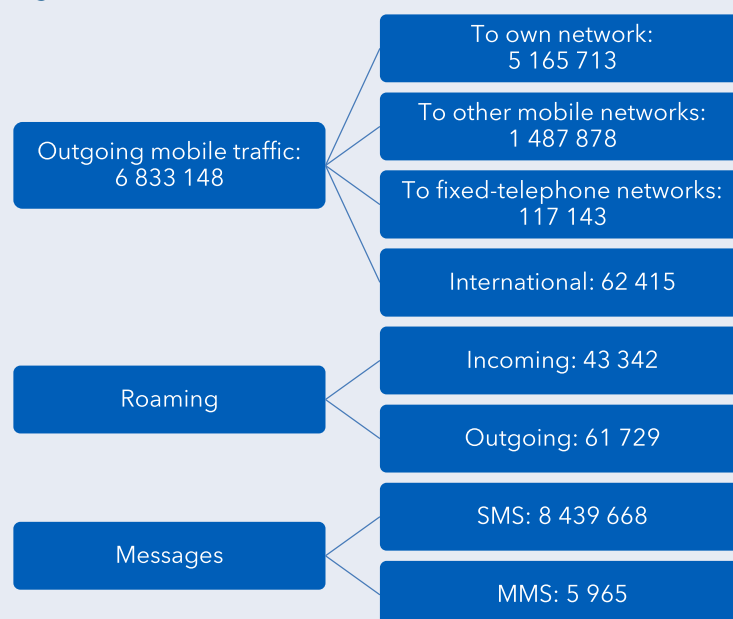
Methodological issues:

Some countries may report both MMS sent and received (despite the definition). Some countries may report only chargeable MMS, on account of tariff options that include free MMS, which operators do not record. In some countries, operators may only be able to report all MMS that pass through the MMS centre, thus including machine-to-machine, machine-to-human and human-to-machine messages. If this is the case, it should be indicated in a note.

Example:

The Lithuanian Communications Regulatory Authority (RRT) publishes quarterly reports on the electronic communications sector, including mobile-traffic statistics.

Figure 51: Outgoing mobile traffic (thousands of minutes), Lithuania, 2010



Source: Adapted from RRT (2010), Report on the electronic communications sector Quarter IV, 2010, available at: [http://www.rtt.lt/en/reviews-and-reports/reports-on-the-urpp/2010_617.html]

Relevance:

Multi-media messaging (MMS) have traditionally amounted to much lower volumes of traffic than SMS. Since the emergence of OTT services that make it possible to send messaging, pictures and short videos via the Internet, the volume of MMS, and that of SMS, have diminished around the globe. Given this diminishing trend in volumes recorded of MMS, this indicator is no longer collected by ITU and will instead be inserted in indicator 13: *SMS sent (133sms)*.

Indicator 5.14: VoIP traffic, in minutes (i131VoIP)

Definition:

VoIP traffic refers to the number of minutes of traffic using managed fixed voice-over-Internet protocol (VoIP) telephony. A managed VoIP service is a publicly available telephone service provided using VoIP for call origination, where the operator controls the quality of service provided. This variable specifies total VoIP traffic (national and international). It should exclude traffic exchanged using software-based VoIP, where the calls originate using computers that do not have an assigned telephone number.

Clarifications and scope:

This indicator refers to telephone traffic transmitted from broadband subscriptions using a voice-over-IP (VoIP) service, as defined in Indicator i112IP. This is typically part of a bundled service and works over the user's broadband connection with the telephone equipment plugged into the router. The traffic terminates at another telephone subscriber, and is expressed in minutes. It excludes VoIP traffic over applications that require a computer. It measures telephone-to-telephone traffic, and not computer-to-telephone or telephone-to-computer traffic.

Method of collection:

The data can be collected from licensed telephone operators and/or ISPs in the country, and then aggregated at the country level.

Relationship with other indicators:

Indicator i131VoIP is generated by subscribers defined in indicator i112IP.

Methodological issues:

This indicator shows the amount of telephone traffic generated from broadband networks using IP telephony. It reflects the transition from usage over conventional PSTN networks to next-generation networks (NGN). Note that it may not cover all VoIP traffic generated over fixed networks if the service is unlicensed or does not require regulatory reporting. It does not include traffic using VoIP mediated through a computer.

Example:

ARCEP, the electronic communications regulatory authority in France, compiles data on VoB traffic (i.e., managed VoIP traffic) from fixed subscriptions, broken down by domestic, international and to mobile telephones.

(continued)

Table 9: Voice over Broadband (VoB) minutes, France

Volumes of VoB communications (millions of minutes)	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	% change Q2 11/ Q2 10
National communications	13 182	11 518	14 633	14 915	13 193	0.1%
International communications	1 948	1 684	2 141	2 275	2 314	18.8%
Communications to mobile	715	744	811	1 199	2 188	206.1%
Total VoB	15 845	13 945	17 585	18 389	17 695	11.7%

Source: Adapted from ARCEP, available at [<http://www.arcep.fr/index.php?id=11054&L=0#c19655>]**Relevance:**

VoIP is the managed voice service provided using Internet Protocol (IP), hence, it is a technology used for the transmission of voice calls. Voice can be provided by different technologies, but as long as it abides to specific and regulated quality of service provisions stipulated in domestic law, it is to be treated equally, no matter the transmission technology used. Hence, VoIP voice traffic is to be included in other relevant voice traffic sub-indicators that distinguish the origin or destination network but not the technology, e.g., fixed-to-fixed voice traffic, fixed-to-mobile telephone traffic, fixed-to-international, fixed-to-mobile, or mobile-to-mobile, and mobile-to-fixed. The indicator *VoIP traffic (i131voIP)* will no longer be collected in isolation.

Indicator 5.15: Total international incoming and outgoing telephone traffic, in minutes (i132tb)

Definition:

Total international incoming and outgoing telephone traffic refers to the sum of international incoming and outgoing fixed and mobile telephone traffic. The indicator can be broken down as follows:

Indicator 5.15a: Total international outgoing telephone traffic, in minutes (i132t)

Refers to effective (completed) international outgoing minutes of telephone traffic originating from national networks, fixed and mobile, including managed VoIP.

Indicator 5.15b: Total international incoming telephone traffic, in minutes (i132ti)

Refers to effective (completed) international incoming minutes of telephone traffic originating outside the country and terminating in national fixed and mobile networks without transit, including managed VoIP.

Method of collection:

The data can be collected from fixed and mobile operators in the country offering international telephone call services, and then aggregated at the country level.

Relationship with other indicators:

Indicator i132tb is equal to the sum of the values of Indicator 5.15a: Total international outgoing telephone traffic, in minutes (i132t) and Indicator 5.15b: Total international incoming telephone traffic, in minutes (i132ti).

Indicator i132t is the sum of the values of Indicator 5.3a: International outgoing fixed-telephone traffic, in minutes (i132m) and Indicator 5.5: Outgoing mobile traffic to international, in minutes (i1333wm).

Indicator i132ti is the sum of values of Indicator 5.3b: International incoming fixed-telephone traffic, in minutes (i132mi) and Indicator 5.6: Incoming international traffic to mobile network, in minutes (i1335wm).

Methodological issues:

This indicator (i132tb) is the sum of previously defined indicators on international traffic, from/to fixed networks and from/to mobile networks.

Note that this indicator aggregates both fixed and mobile international traffic and it does so at two levels: (a) retail total international traffic (indicators 5.3a and 5.5), and 5.3b) incoming wholesale level international received voice traffic (indicators 5.3b and 5.6).

Relevance:

Given that this indicator is the sum of already existing indicators on traffic, it is no longer to be collected by ITU. Note that this indicator is the sum of:

- (a) international outgoing traffic (retail):
 - (5.3a) international outgoing traffic from fixed networks (i132m)
 - (5.5) international outgoing traffic mobile networks (i1333wm)
- (b) international incoming traffic (wholesale level):
 - (5.3b) international incoming traffic to fixed networks (i132mi)
 - (5.6) international incoming traffic mobile networks (i1335wm)

Since the above indicators are already defined and to be collected, Indicator 5.15: Total international incoming and outgoing telephone traffic, in minutes (i132tb) is not to be collected as an independent indicator.

5.3 Internet traffic

124. Internet traffic is to be reported based on total domestic traffic. Due to the special interest that Internet traffic had during 2011-2013, the Expert Group on Telecommunication/ICT Indicators (EGTI) discussed and approved further Internet traffic indicators that were later endorsed by the World Telecommunication/ICT Indicators Symposium⁶. The indicators approved split total Internet traffic based on the network used: (1) Fixed Internet traffic (i135tfb) and (2) Mobile broadband Internet traffic (i136mwi). Additionally, one specific indicator for data roaming was defined: Mobile broadband Internet traffic outside the country (data roaming-out).

125. Indicator 5.16 is a measure of the volume of daily peak traffic through public Internet exchanges.

⁶ "New telecommunication/ICT indicators from administrative data sources 2011- 2013", Covering Note, Telecommunications Development Bureau, ITU, February 2014.

Indicator 5.16: Domestic Internet traffic (137d)

Definition:

Domestic Internet traffic refers to the average volume of traffic, expressed in gigabits per second (Gbit/s), exchanged over public Internet exchanges in a year.

Clarifications and scope:

Public Internet exchanges typically report average incoming and outgoing traffic, which is generally the same figure. If it is not, then the incoming figure should be used. This indicator does not refer to the capacity of ISPs connected to the exchange.

Method of collection:

The data can be collected from public Internet exchanges operating in the country. If there is more than one public Internet exchange, then the data can be aggregated to obtain a total for the country. Practically all public Internet exchanges compile data on the volume of traffic, and these are often reproduced in so-called multi-router traffic grapher (MRTG) charts from which data can be collected (see Figure 52 below).

Relationship with other indicators:

This indicator is not related to other indicators in the Handbook.

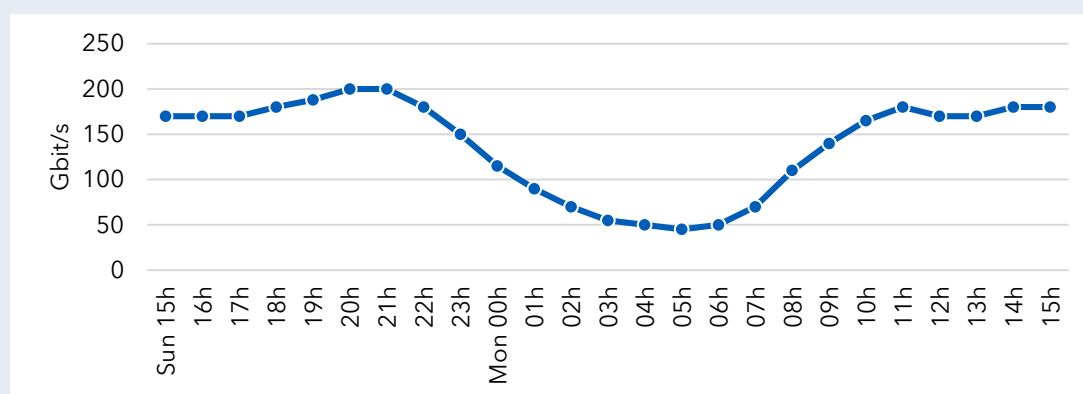
Methodological issues:

If a country does not have a public Internet exchange, then it will not be possible to obtain the data. It should be noted that not all Internet exchanges measure traffic using the same periodic average. If the period for which the data is reported does not correspond to a calendar year, this should be indicated in a note.

Example:

The example below shows hourly incoming traffic statistics from the Budapest Internet Exchange in Hungary. The average traffic on 25 May 2020 was 138 Gbit/s. The average traffic for the whole calendar year would be obtained by requesting the corresponding data covering the whole period.

Figure 52: Daily domestic Internet traffic statistics for Hungary



Note: Budapest Internet Exchange Aggregated incoming traffic for 24-25 May 2020.
Source: BIX Traffic Statistics. [<http://www.bix.hu/en/statistics/aggregated>].

Relevance:

Internet traffic grows at two-digit rates every year but the pattern of growth differs significantly when mobile and fixed network traffic are compared. In 2012, two specific indicators were approved by EGTI: one for fixed network Internet traffic and one for mobile broadband traffic. Hence, it is no longer useful to maintain the indicator that integrates both. The Domestic internet traffic indicator is no longer collected by ITU.

Indicator 5.17: Fixed-broadband Internet traffic, in exabytes (i135tfb)

Definition:

Fixed-broadband Internet traffic (exabytes) refers to traffic generated by fixed-broadband subscribers measured at the end-user access point. It should be measured by adding up download and upload traffic. Internet traffic refers to open Internet traffic generated or consumed by users connected to the Internet.

Wholesale traffic (provided for another operator), walled-garden traffic, and IPTV and cable-TV traffic should be excluded.

Clarifications and scope:

Fixed broadband Internet traffic should include all Internet traffic generated by devices connected through end-user access points to the fixed network (both fixed wired access and fixed wireless access). Mobile network traffic should be excluded.

This indicator refers to fixed broadband traffic, so narrowband fixed traffic should be excluded: if it is not possible, it should be specified in a note.

It should include also unmanaged IP traffic that uses the Internet. For example, it should include web, email, instant messaging, file sharing, gaming, Internet video (inter alia, YouTube, Hulu, Netflix, etc.), OTT services (Facebook, Google, etc.), and any other traffic generated by traffic under the best effort principle (unmanaged services).

Walled garden (including zero-rated), managed IP television (IPTV), managed cable television (CATV), and any other managed IP traffic should be excluded: if it is not possible, it should be specified in a note.

Method of collection:

Data should be collected from fixed operators offering Internet connections or ISPs by national regulatory authorities and ministries. Telecommunication operators represent the most spread and reliable source of data for this indicator, since they can provide direct measurement of fixed broadband traffic. Even if direct measurement were not available, operators should be able to produce an estimate in their networks. Indeed, this information is usually estimated and predicted for network management and dimensioning purposes.

Relationship with other indicators:

Fixed broadband Internet traffic is strictly related to in the indicator fixed broadband subscriptions (i4213tfbb). This indicator can be used as guideline to verify the measurement or the estimation (see Methodological issues and Examples).

Methodological issues:

Operators are asked to report fixed broadband Internet traffic consumed by customers within the given reference year.

Fixed broadband operators should exclude IPTV/CATV traffic, walled-garden (including zero-rated) traffic, and any other traffic from managed services. In order to obtain a precise value of fixed broadband Internet traffic, it is suggested that operators report the traffic as close as possible to the end-user access point.

Direct measurements:

Many operators maintain Internet access log records or IP Detail Records (IPDRs) that can be used as a source to compile the total fixed Internet traffic (see Examples). These records contain a registry of each data access and the amount of data consumed. This information can be aggregated per year to produce the figure to be reported.

If it is not possible to produce a direct measurements of retail Internet traffic, operators can produce estimates based on different parameters, for example the volume of traffic exchanged with wholesale service providers, or the average load of the channels at the wholesale level, or other proxies (see Examples). Data should be reported with a note specifying the method used for the estimation.

(continued)

Unit of measure:

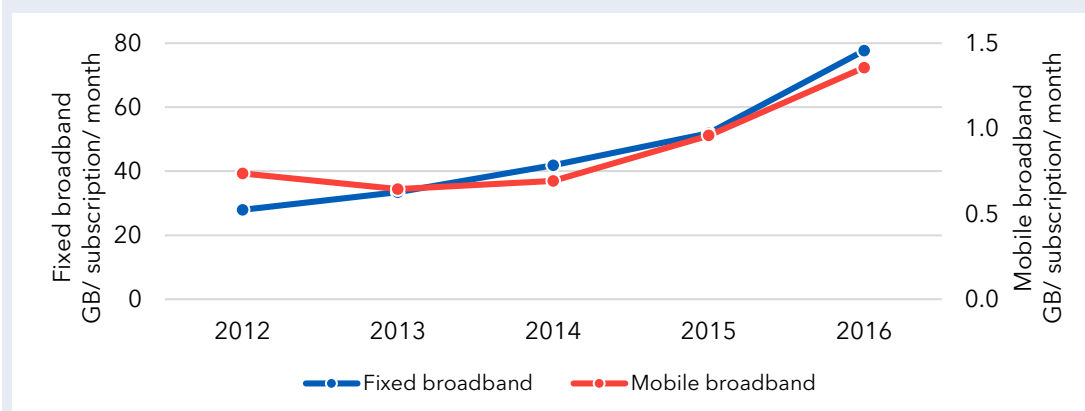
The ITU questionnaire asks every country to report fixed broadband Internet traffic with a predefined unit of measurement, specifically Exabytes (EB). To avoid any confusion, it is worth noting that in the guidelines, the decimal system is adopted. This means that 1 exabyte is equivalent to 1 000 000 000 000 000 bytes. The principal decimal prefixes are listed in Table 10 below.

Table 10: Table of conversion for Internet traffic volumes**Units of measurement**

1 Kilobyte (KB)	=	10 ³ bytes
1 Megabyte (MB)	=	10 ⁶ bytes
1 Gigabyte (GB)	=	10 ⁹ bytes
1 Terabyte (TB)	=	10 ¹² bytes
1 Petabyte (PB)	=	10 ¹⁵ bytes
1 Exabyte (EB)	=	10 ¹⁸ bytes
1 Zettabyte (ZB)	=	10 ²¹ bytes

Example:

Fixed broadband traffic grows when next generation access (NGA) networks become available to end users. Figure 53 shows that in Spain, from 2012 to 2016, where optical fibre-based networks have been deployed, the average Internet consumption from fixed connections doubled, from 40 Gigabytes per month and per subscription to almost 80 Gigabytes.

Figure 53: Trend in fixed (left axis) and mobile broadband traffic (right axis) per subscriber and per month, Spain (GB/month/line)

Source: CNMC Spain, [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

Relevance:

Internet traffic over fixed networks is growing rapidly, and more so when new fixed network technologies or standards that allow for much higher downloading/uploading speeds are deployed and offered to end users. The deployment of FTTX or cable-based networks with new standards allow much higher consumption of Gigabytes per user.

Indicator 5.18: Mobile broadband Internet traffic - within the country (i136mwi)

Definition:

Mobile broadband Internet traffic (within the country) refers to broadband traffic volumes originated within the country from 3G or 4G networks or other more advanced mobile networks, evolutions or equivalent standards in terms of data transmission speeds. Traffic data should be collected and aggregated at the country level for all 3G, 4G or more advanced mobile networks within the country and it is to be measured in Exabytes (EB).

Download and upload traffic should be added and reported together. Traffic should be measured at the end-user access point.

Wholesale and walled-garden traffic should be excluded. The traffic should be reported in Exabytes.

Clarifications and scope:

Mobile broadband Internet traffic should include traffic generated from all devices connected to the end-user access point via the mobile network.

This indicator refers to broadband traffic, so narrowband fixed traffic should be excluded, e.g., traffic of data via 2G/GPRS networks: if it is not possible, it should be specified in a note.

It should account only for Internet traffic, i.e., unmanaged IP traffic that crosses the Internet. For example, it should include web, email, instant messaging, file sharing, gaming, Internet video (inter alia, YouTube, Hulu, Netflix, etc.), OTT services (Facebook, Google, etc.), and any other traffic generated by unmanaged services (i.e., traffic under the best effort principle).

Method of collection:

Mobile network operators measure internet traffic regularly for the management and design of peak capacity in base stations, the management of frequency bands, as well for billing purposes. The majority of mobile tariffs provided have caps or limits in data allowance, i.e., maximum amount of data (GB) to be consumed in the purchased tariff. Traffic is measured at the level of users in order to monitor whether their data consumption is in accordance with the tariff purchased.

Relationship with other indicators:

This indicator (i136mwi) is not directly related to any other indicator collected. Nevertheless, this indicator (i136mwi) in conjunction to Indicator 2.3: Active mobile broadband subscriptions (i271mw) may be useful for obtaining average Internet traffic per subscriber.

Indicator 5.17: Fixed broadband Internet traffic, in exabytes (i135tfb) is also collected regularly. It may be of interest to compare trends and annual growth rates for mobile data traffic (i136mwi) and fixed internet traffic (i135tfb).

Methodological issues:

Mobile broadband Internet traffic refers to traffic (uploaded and downloaded) that occurs in the open Internet. It is traffic managed under the 'best effort' principle and not subject to strict or specific QoS conditions. It refers to Internet traffic not confined to a single ISP network, i.e., traffic that transits different networks or ISPs. It encompasses Internet traffic recorded at the residential as well as in the business segments.

Example:

See above.

Relevance:

Internet traffic over mobile networks grows at two digits rates year after year. The impact of new network technologies, such as 4G/LTE-high speeds and quality of data transmission, enable new apps, services, and uses of the mobile Internet. It has been observed that, as 4G networks grow to cover more of the population in a given country, average data consumption also grows significantly.

Indicator 5.19: Mobile broadband Internet traffic outside the country - data roaming out (136mwo)

Definition:

Mobile broadband Internet traffic (*outside the country, roaming out*) refers to broadband traffic volumes originated outside the country from 3G, 4G/LTE networks, or other more advanced mobile networks, including evolutions or equivalent standards in terms of data transmission speeds. Traffic should be collected and aggregated at the country level for all customers of domestic operators roaming outside the country.

Traffic should be measured at the end-user access point. Wholesale and walled-garden traffic should be excluded. Traffic should be reported in Exabytes.

Clarifications and scope:

Data roaming-out refers to traffic generated by users or subscribers from one country (from country A - home network) while they are abroad (country B - foreign network). When making a telephone call or using the Internet with a smartphone while abroad (country B), the user is generating data roaming-out traffic. This indicator refers only to mobile broadband (data) traffic generated by users while abroad. It is retail level traffic, since it is generated by and billed to the consumer (even if it has a corresponding wholesale transaction occurring among operators).

Download and upload mobile broadband traffic figures should be summed and reported together. Traffic should be measured at the end-user access point. Wholesale and walled-garden traffic should be excluded.

Traffic should be reported in Exabytes, if any other unit of measurement is used, this should be specified in a note.

Method of collection:

Data should be collected from mobile operators that bill the customer and make the corresponding roaming agreements with other operators around the world in order to make the international communication (data use) possible.

Relationship with other indicators:

This indicator is related to the *revenue from international inbound roaming* (i76ri) indicator, which refers to revenue from calls made and received on a foreign network.

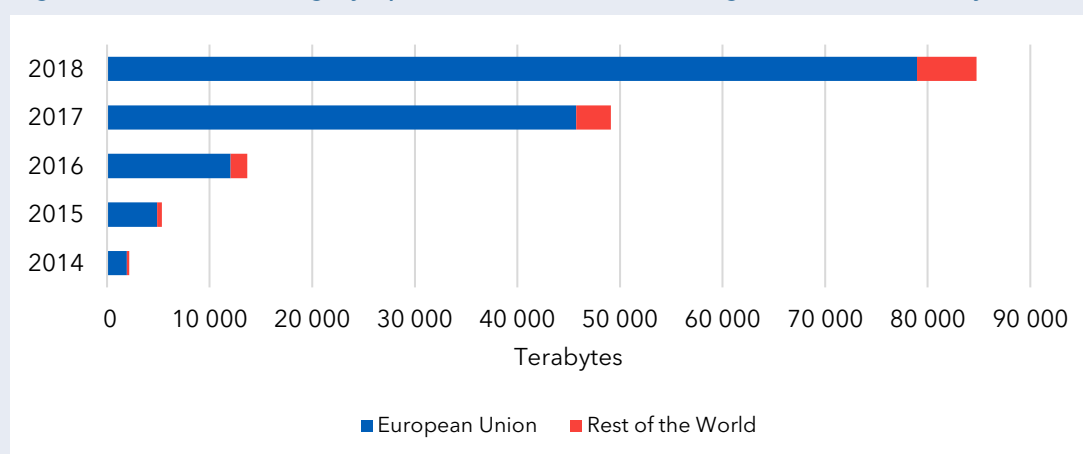
(continued)

Methodological issues:

Outbound data roaming (data roaming out) is a retail level service and transaction. It involves the domestic network subscriber (home network) who accesses the Internet while visiting a network abroad (visiting network). When access to the Internet is provided by a foreign network service provider, the charges are defined by the domestic network service provider.

Example:

Data roaming out traffic has increased significantly in the European Union since 2017 as a result of the 'roam-like-at-home' principle, by which any use of data while abroad is charged at domestic tariffs.

Figure 54: Data roaming by Spanish subscribers in foreign networks (Terabytes)

Source: CNMC Spain [http://data.cnm.es/datagraph/jsp/inf_anual.jsp]

Relevance:

International roaming services are increasingly being used all over the world both for voice calls and to access the Internet via a foreign network. The growth rates of mobile broadband usage (data) is significantly higher than the growth rate of voice calls, and data-roaming has become a very relevant service for users while traveling.

In many parts of the world free-roaming areas are being designed or implemented effectively, by which specific charges while on roaming have been eliminated or greatly reduced, as in the European Union, Gulf States, Mercosur countries, and central Africa.

Box 9: Data roaming by foreign network subscribers (inbound data roaming), in Gigabytes

Definition:

Data roaming by foreign network subscribers (inbound data roaming) refers to the total data used (in Gigabytes) when home network subscribers use a network in another country (foreign network).

Clarifications and scope:

This indicator refers to the mobile network roaming traffic of foreign-network subscribers, in Gigabytes. It refers to the data traffic they generate when they access the Internet while visiting the domestic country, a service provided by domestic operators.

It does not include any data consumption by domestic consumers, those that belong to a domestic country operator. Nor does it include any Internet traffic generated outside the country.

Method of collection:

The data can be obtained from mobile telephone network operators in the country, and then aggregated at the country level.

Methodological issues:

Inbound data roaming volume is a wholesale traffic and transaction, i.e., it affects the domestic operator in that the domestic network provides a service to a subscriber from another country, and hence, to a foreign-network operator. Operators around the world set-out roaming agreements with specific rates at which they exchange the traffic that they manage for other service providers. Inbound data traffic is not caused by domestic (home) subscribers and is not charged at retail level by domestic operators.

Relevance:

In many areas in the world countries are reaching agreements to establish free roaming areas, where roaming traffic is either charged at domestic country rates or charged at substantially lower than previous roaming tariffs. It is important to know the consumption patterns, be it for data, voice or messages used, of foreign subscribers while at home in order to analyse the effects and consequences of establishing a free roaming area, or when this is not the case, to analyse the evolution, unit prices, traffic flows and capacity requirements of roaming users in order to design an appropriate regulatory environment.

6 Employment, Revenue and Investment

6.1 Persons employed

126. The two indicators included in this section refer to persons employed by operating entities in the telecommunication services sector, and exclude persons employed by entities engaged in broadcasting activities only. The businesses covered by these two indicators are entities as defined in ISIC Revision 4, Division 61 (Telecommunications). Division 61 includes wired telecommunication activities, wireless telecommunication activities, satellite telecommunication activities and other telecommunication activities (such as the provision of specialized telecommunication applications, operation of telecommunication facilities, provision of telecommunication access in facilities open to the public and telecommunication resellers, i.e., purchasing and reselling network capacity without providing additional services). The level and structure of employment within the telecommunication sector is important for various analytical purposes. Indicators covered in this area provide information about employment trends and gender distribution. The indicators can also be used to derive productivity ratios, such as the number of fixed-telephone lines per employee and revenue per employee.

127. The data can typically be obtained from telecommunication operators and ISPs. Another option is to use business data from the national statistical agency if it can be disaggregated to show the telecommunication sector.

128. These indicators refer to point-in-time (reference date) data, which should be provided in respect of the end of the calendar year (31 December). Where the calendar year is not the reference year, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data). Where countries report data on the basis of a different date, this should be specified in a note.

Indicator 6.1: Full-time equivalent telecommunication employees (i51), by operator type

Definition:

Full-time equivalent telecommunication employees refers to the total number of persons, in full-time equivalent (FTE) units, employed by telecommunication operators in the country for the provision of telecommunication services, including fixed-telephone, mobile-cellular, Internet and data services. This indicator excludes staff working in broadcasting businesses that offer only traditional broadcasting services. Part-time staff should be expressed in terms of full-time staff equivalents (FTE). The indicator may be broken down as follows:

- **Indicator 6.1a: Persons employed by fixed-telecommunication operators (i51ft)**
- **Indicator 6.1b: Persons employed by mobile-telecommunication operators (i51w)**

Refers to FTE persons employed by mobile-cellular network operators. This includes mobile operator employees only.

Clarifications and scope:

The indicator refers to all FTE telecommunication service staff employed by operators, regardless of occupation, in the telecommunication services (fixed and mobile). Entities covered by the indicator are defined according to ISIC Revision 4, Division 61 (Telecommunications), which excludes broadcasting and ICT equipment manufacturing. Resellers (businesses that purchase and resell network capacity without providing additional services) are included in Division 61, and are therefore within the scope of this indicator. 'Outsource' businesses that specialize in telecommunication services are also included. However, outsource businesses classified in other divisions in ISIC (e.g., Activities of call centres, see Division 8220) are excluded from the scope of this indicator.

Most operators that provide multiple services generally account separately for these activities, through the establishment of subsidiaries or accounting separation, and are therefore able to allocate staff to each service. In situations where operators provide multiple services and do not have an employee breakdown by type of service, they can estimate values for Indicators 6.1a and 6.1b. This should be specified in a note.

The preferred method for converting part-time to full-time employees is to use an eight-hour workday.

Method of collection:

The data can be collected from all licensed telecommunication operators and other telecommunication service entities whose activities are included in ISIC Revision 4, Division 61 (Telecommunications) in the country, and then aggregated at the country level. An alternative source for employment data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

Indicator i51 is equal to the sum of the values of Indicators i51ft and i51w. Indicator i51 complements Indicator 6.2, which is a breakdown of FTE telecommunication employees by gender.

(continued)

Methodological issues:

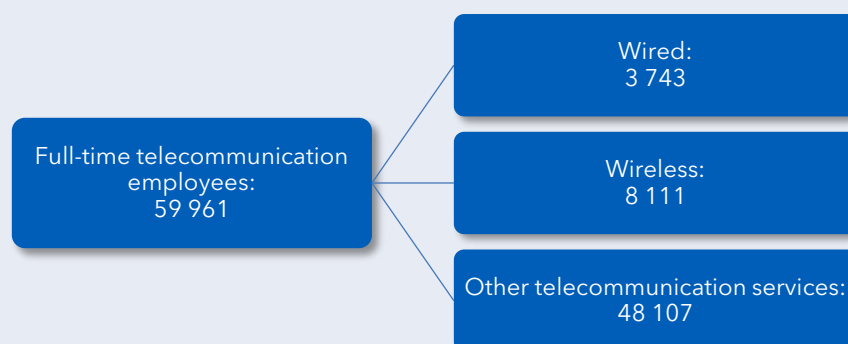
Lack of comparability may arise where the identification of telecommunication employees and the conversion of part-time to full-time equivalent employees differ among countries. For example, some operators may elect to outsource a significant portion of their operations; while the staff working in an outsource business are not included as employees of the 'principal' entity (because they are not directly employed), they may be included in the aggregation as employees of the outsource business if that business specializes in telecommunication services.

Operators in some countries may provide estimates for Indicators i51ft and i51w.

Example:

The Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) carried out an establishment survey in 2017 with results available at ISIC 3-digit codes including data on employment in the telecommunication sector with a breakdown by type of service.

Figure 55: Telecommunication employees by sector in Egypt, 2017



Note: Other telecommunication services include satellite services.

Source: CAPMAS. 2017. Establishment Census, available at: https://www.capmas.gov.eg/Pages/Publications.aspx?page_id=7195&Year=8260

Relevance:

The level and structure of employment within the telecommunication sector is important for various analytical purposes. Indicators covered in this area provide information about employment trends and gender distribution. The indicators can also be used to derive productivity ratios, such as the number of fixed-telephone lines per employee and revenue per employee.

Note that the priority is to collect the total (full time equivalent) employees in the telecommunications industry. Whenever possible the split between employees attached to fixed services provision and to mobile services provision will be useful and collected, but some operators may not disentangle easily people employed in one set of services from the other. In these cases, the total is to be provided.

Indicator 6.2: Full-time equivalent telecommunication employees (i51), by gender

Definition:

Full-time equivalent telecommunication employees refers to the total number of persons, in full-time equivalent (FTE) units, employed by telecommunication operators in the country for the provision of telecommunication services, including fixed, mobile and Internet services. This indicator excludes staff working in broadcasting businesses that offer only traditional broadcasting services. Part-time staff should be expressed in terms of full-time staff equivalents (FTE).

The indicator is broken down as follows:

- **Indicator 6.2a: Persons employed by all telecommunication operators, female (i51f)**
- **Indicator 6.2b: Persons employed by all telecommunication operators, male (i51m)**

Clarifications and scope:

The indicator refers to all FTE telecommunication service staff directly employed by operators, regardless of occupation, in the telecommunication services (fixed and mobile) and Internet service provision industries. Entities covered by the indicator are defined according to ISIC Revision 4, Division 61 (Telecommunications), which excludes broadcasting and ICT equipment manufacturing. Resellers (businesses that purchase and resell network capacity without providing additional services) are included in Division 61 and are therefore within the scope of this indicator. 'Outsource' businesses that specialize in telecommunication services are also included. However, outsource businesses classified in other divisions in ISIC (e.g., activities of call centres) are excluded from the scope of this indicator.

The preferred method for converting part-time to full-time employees is to use an eight-hour workday.

Method of collection:

The data can be collected from all licensed telecommunication operators and other telecommunication service entities whose activities are included in ISIC Revision 4, Division 61 (Telecommunications) in the country, and then aggregated at the country level. An alternative source for employment data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

Indicator i51 is the sum of values of Indicator i51f and Indicator i51m. This Indicator complements Indicator 6.1, which is a breakdown of FTE telecommunication employees by type of operator.

Methodological issues:

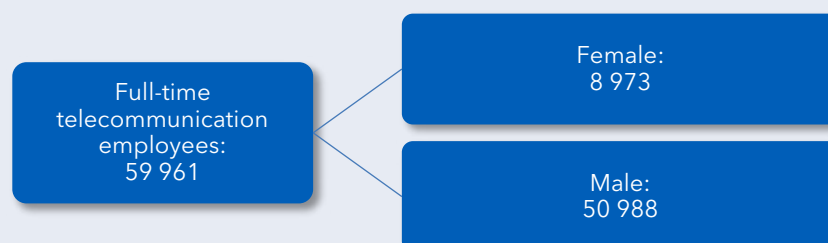
Lack of comparability may arise where the identification of telecommunication employees and the conversion of part-time to full-time equivalent employees differ among countries. For example, some operators may elect to outsource a significant portion of their operations; while the staff working in an outsource business are not included as employees of the 'principal' entity (because they are not directly employed), they may be included in the aggregation as employees of the outsource business if that business specializes in telecommunication services.

(continued)

Example:

The Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) carried out an establishment survey in 2017 with results available at ISIC 3-digit codes including a breakdown by gender.

Figure 56: Telecommunications employees by gender in Egypt, 2017:



Source: Source: CAPMAS. 2017. Establishment Census, available at: https://www.capmas.gov.eg/Pages/Publications.aspx?page_id=7195&Year=8260.

Relevance:

Employment in the telecommunication industry usually has a bias towards employees with a background in engineering, economics, marketing, law, systems and data analysis. It is relevant to know the amount and type of qualifications absorbed by telecommunications operators.

6.2 Revenue from telecommunication services

129. Revenue⁷ is defined as the income received by telecommunication operators from the sale of telecommunication services. This includes revenue from fixed-telephone, mobile-cellular, Internet and data services relating to the subscription and traffic indicators defined in the earlier sections of the Handbook. Revenue should be provided in national currency and in current prices (i.e., not adjusted for inflation). If available, revenue indicators should be provided based on consolidated financial data. Taxes should be excluded.

130. With the exception of Indicator 15 (Revenue from international inbound roaming), the revenue indicators refer only to revenue from retailing activities and should exclude wholesale revenue.

131. The indicators refer to revenue earned during the reference year, which is presumed to be the financial year ending 31 December for the previous year, unless specified otherwise. Where the calendar year is not the reference year, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data).

132. Businesses covered by the revenue indicators are operating entities in the telecommunication services sector as defined by ISIC Revision 4, Division 61 (Telecommunications).

⁷ The income generated from sale of goods or services, or any other use of capital or assets, associated with the main operations of a business before any costs or expenses are deducted. Revenue is shown usually as the top item in an income (profit and loss) statement from which all charges, costs and expenses are subtracted to arrive at net income. Revenue may also be called sales or turnover.

133. Telecommunication services are those offered by entities that are classified within the telecommunication sector, as defined in ISIC Revision 4, Division 61. The sector includes businesses that operate, maintain and provide access to telecommunication networks. Resellers of telecommunication services are also included.

134. Activities related to the creation of content are excluded, since telecommunication activities are restricted to the transmission of the signal. For instance, if a cable operator produces TV content (e.g., news bulletins, series, shows, TV channels, etc.), the revenues generated by the sale of the rights to distribute the content should be excluded. On the other hand, revenues earned by this same operator from its cable-TV subscriptions should be included. This is a major source of discrepancies in data reported by countries and will most probably remain an issue in the future because of convergence, which is blurring the boundaries between content creation and distribution. The following principle should be applied in order to harmonize the data reported⁸:

- If a business engages in both the creation of content and its distribution through telecommunication networks, revenue and investment data should be reported only for those activities that relate to the distribution of content, and exclude those that relate to the creation of content.
- Free-to-air TV should not be included, as it mainly relates to content creation from traditional broadcasters.
- IPTV should be included since it deals mainly with content distribution by telecommunication operators.
- Cable TV should be included if it relates only to Internet/PSTN access and multichannel distribution. In cases where cable-TV operators also produce content, that part should be excluded from total revenue and investment.
- Satellite operators that provide only Internet access and multichannel distribution should be included. In cases where satellite operators also produce TV content, that part should be excluded from total revenue and investment.
- Pay digital terrestrial television channels should be excluded, since they relate mainly to content creation.

⁸ Covering Note "Methodology for the collection of revenue and investment data on telecommunications", Telecommunications Development Bureau, February 2014, ITU.

Table 11: Categories included and excluded from the scope of the telecommunication sector

INCLUDED		EXCLUDED
Free-to-air TV	NO	YES
Pay DTT channels	NO	YES
IPTV	YES	NO
Cable TV	<ul style="list-style-type: none"> - Internet/PSTN access - Multichannel distribution 	PARTIALLY
Satellite	<ul style="list-style-type: none"> - Internet access - Multichannel distribution 	PARTIALLY
		<ul style="list-style-type: none"> - Content creation - Content creation

Revenue from all telecommunication services

135. Table 12 provides the general overview of the main categories of revenues to be collected with the different indicators.

Table 12: Main grouping for revenues categories for the telecommunication industry

Revenues from all telecom services	
<i>Revenues from fixed network services</i>	Revenues from fixed telephone services
	Revenues from fixed internet services
	Revenues from leased lines
	Revenues from other fixed data communication services
<i>Revenues from mobile network services</i>	Revenues from mobile networks (voice, broadband, messaging)
	Revenues from other mobile data communication services
<i>Other telecommunication services</i>	

Indicator 6.3: Revenue from all telecommunication services (i75)

Definition:

Revenue from all telecommunication services refers to revenue earned from retail fixed-telephone, mobile-cellular, Internet and data services offered by telecommunication operators (both network and virtual) providing services within the country during the financial year under review. It includes retail revenues earned from the transmission of TV signals but excludes revenues from TV content creation.

Revenue (turnover) consists of retail telecommunication service earnings (therefore excluding wholesale revenues, such as interconnection revenues) during the financial year under review. Revenues from device sales and rents, VAT and excise taxes should be excluded.

Clarifications and scope:

The indicator should exclude monies received in respect of revenue earned during previous financial years, monies received by way of loans from governments or investors, monies received from repayable subscriber contributions or deposits, revenue from non-telecommunication services, revenue generated from traditional broadcasting and revenue earned from provision of content services. Royalties are also excluded. Taxes should as well be excluded.

Entities covered by this indicator are defined according to ISIC Revision 4, Division 61 (Telecommunications). Resellers (businesses that purchase and resell network capacity without providing additional services) are included in Division 61 and are therefore within the scope of this indicator. Outsource businesses that specialize in telecommunication services are also included. However, outsource businesses classified in other divisions in ISIC (e.g., activities of call centres, see Division 8220) are excluded from the scope of this indicator.

Revenue from distribution, without altering content of complete television programming via telecommunication networks (such as satellite, cable, wireless, optical fibre networks, or broadcasting), is included in this Indicator. In general, any transmission of content that has not involved the agent in its creation, belongs to this category.

The provision of a telecommunication service over an existing telecommunication connection, such as VoIP, is also included.

Method of collection:

The data can be collected from all licensed telecommunication operators and other telecommunication service entities whose activities are included in ISIC Revision 4, Division 61 (Telecommunications) and operating at the retail level in the country, and then aggregated at the country level. An alternative source for revenue data could be generated by industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator is the sum of the values of Indicator 6.4: Revenue from fixed-telephone services (i71), Indicator 6.8: Revenue from mobile networks (i741), Indicator 6.5b: Revenue from fixed broadband services (i7311_fb), Indicator 6.6: Revenue from leased lines (i732), Indicator 6.7: Revenue from fixed value-added telecommunication services (i733), and Indicator 6.10: Other telecommunication revenue (i74).

Methodological issues:

This indicator refers to telecommunication service retail revenue earned by telecommunication service entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it includes neither telecommunication service revenue from businesses that are not classified in ISIC Rev. 4, Division 61, nor wholesale revenues from business classified in ISIC Rev. 4, Division 61. It does not include non-telecommunication service revenue earned by telecommunication operators. Also, as the indicator measures revenue rather than value-added, it is not a national accounts component, even though the indicator is often divided by gross domestic income (GDI) to derive a measure of the intensity of telecommunication services in the economy. The indicator is important as a numerator for various other derivations, such as revenue per employee or revenue per subscription.

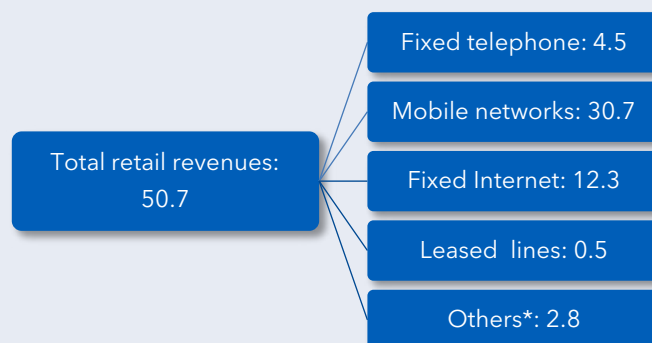
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Table 13: Activities included and excluded from telecommunication revenues

Items included/ excluded under the scope of Telecommunications Revenues	
	included?
Retail revenues from residential customers	YES
Retail revenues from business customers	YES
Wholesale revenues, e.g., interconnection services	NO
Revenues from resellers and Mobile Virtual Operators	YES
Value Added Tax and excise taxes	NO
Corporate taxes and administrative fees, e.g., numbering fees	not to deduce from total revenues
Revenues from device sales and renting (smartphones, final equipment, modems, etc.)	NO
Revenues from value added services, e.g., premium SMS and other data services	YES

Example:

The Swedish Post and Telecom Agency (PTS) compiles detailed semi-annual statistics on the telecommunications sector including revenues for services.

Figure 57: Retail telecommunications service revenues in Sweden, 2018 (million SEK)

Notes: * IP-VPN including the following standards: IPsec VPN, IP MPLS VPN and IP SSL VPN. In the revenues are costs for leased lines included, when used in the IP-VPN service.

Source: The Swedish Post and Telecom Authority, The Swedish Telecommunications Market, available at: <https://statistik.pts.se/en/the-swedish-telecommunications-market/>.

Relevance:

The indicator is important as a numerator for various other derivations, such as revenue per employee or revenue per subscription. Total revenues give a broad measure of the relevance of the industry as a whole and its behaviour over time.

Revenues from fixed network services

136. For almost a century, the voice call service has been the most commonly used of all fixed network telecommunication services, but since the emergence of mobile telephony and the Internet, its importance has been in constant decline both in terms of volume of minutes and in terms of revenue.

137. In Table 14, the fixed-telephone service indicators refer to three main components: the connection charge, the subscription (periodic) charge, and the expense derived from placing calls.

Table 14: Indicators collected on fixed telephone service

Revenues from fixed telephone services	Revenues from fixed telephone connection charges
	Revenues from fixed telephone subscription charges
	Revenues from fixed telephone calls
	Revenues from fixed value-added services

138. Fixed telephone service charges have evolved over the last two decades. Operators today mostly offer a package of services that combine the connection charge, subscription, and other costs, into one bill, and very often irrespective of minutes used or calls made. Quasi-flat rates are very common all over the world, if not for all types of calls, at least for local, domestic long-distance calls, and calls to mobile networks.

139. The traditional billing concepts reflected in the three sub-indicators depicted in Table 14 are blurring and in many cases obsolete, and as few operators continue to collect revenue data based on these billing concepts, it seems convenient to combine them into a single component.

Indicator 6.4: Revenue from fixed-telephone services (i71)

Definition:

Revenue from fixed-telephone services refers to revenue received for the connection (installation) of fixed-telephone services, revenue from recurring charges for subscription to the PSTN and revenue from fixed-telephone calls.

The revenues from fixed telephone service are composed of:

- **Indicator 6.4a. Revenues from fixed connection charges (i711)**
- **Indicator 6.4b. Revenues from telephone subscription charges (i712)**
- **Indicator 6.4c. Revenues from fixed calls (i713)**

For a definition on the sub-indicators i711 to i713 see definitions below.

Clarifications and scope:

Revenue from fixed-telephone services represents retail revenue from the provision of fixed-telephone services. It excludes wholesale revenue and other monies received that are not of a revenue nature.

Method of collection:

The data can be collected from licensed telecommunication operators and other telecommunication service entities providing fixed-telephone services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator is a component of Indicator 6.3: Revenue from all telecommunication services (i75). It is the sum of Indicator 6.4.a: Revenue from fixed-telephone connection charges (i711), Indicator 6.4.b: Revenue from fixed-telephone subscription charges (i712) and Indicator 6.4.c: Revenue from fixed-telephone calls (i713).

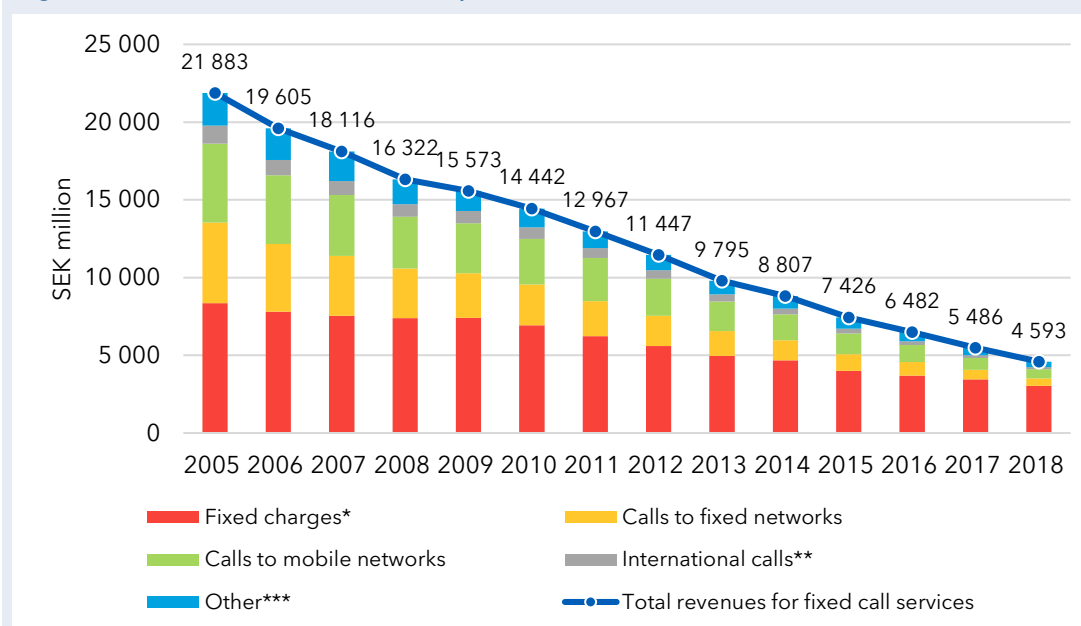
Methodological issues:

This indicator refers to fixed telephone service revenue earned by entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include fixed telephone service revenue from businesses that are not classified in ISIC Rev. 4, Division 61. In those cases where fixed-telephone services are bundled with other telecommunication services (e.g., double-play subscriptions including fixed telephony and Internet), service providers may have different methods for allocating the total revenue from bundled services to individual services.

(continued)

Example:

The Swedish Post and Telecom Authority (PTS) compiles detailed annual statistics on the fixed telephone service revenue. As in many countries, revenues from fixed telephone services have been declining in Sweden. Between 2014 and 2018, fixed telephone services revenue dropped by almost 50 per cent, revenues from calls to fixed networks declined by over 60 per cent, while fixed charges (including subscriptions, connection fees, and other related revenue) dropped by 37 per cent.

Figure 58: Revenue from fixed telephone services (SEK million), Sweden

Note: * Excluding subscription charges for xDSL, fixed charges for value-added services and supplementary services and including installation charges, transfer charges, number portings, etc. ** Excluding calls from pre-paid telephone cards. *** Calls from/using pre-paid telephone cards from payphones (not international calls); calls with shared cost; directory enquiry services; pay telecom service and mass call service.

Source: The Swedish Post and Telecom Authority, The Swedish Telecommunications Market, available at: <https://statistik.pts.se/en/the-swedish-telecommunications-market/>.

Relevance:

Revenues from fixed network voice services, even if declining over time with respect to the total revenues, are still very relevant for all telecommunications service providers. The split of revenues by service (domestic calls, calls to mobile or to international, or fixed charges for installation or subscriptions, among others) is still relevant although tariffs no longer or rarely distinguish among these services. Note that the relevant figure to provide is the total of fixed telephone services revenues (Indicator 6.4: Revenue from fixed-telephone services (i71)). The detail by service, e.g., sub-indicators 6.4.a, 6.4.b and 6.4.c, is to be provided only if viable to collect.

Indicator 6.4a: Revenue from fixed-telephone connection charges (i711)

Definition:

Revenue from fixed-telephone connection charges refers to retail revenue received for connection (installation) of fixed-telephone services. This may include charges for transfer or cessation of services.

Clarifications and scope:

The indicator refers to retail revenue from fixed-telephone connection charges. This includes amounts paid for the installation, disconnection or transfer of fixed-telephone lines. The indicator should exclude refundable charges, connection charges for fixed (wired)-broadband services and revenue from sales of equipment.

Method of collection:

The data can be collected from licensed telecommunication operators and other telecommunication service entities providing fixed-telephone services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

Indicator i711 is a component of Indicator 6.4: Revenue from fixed-telephone services (i71).

Methodological issues:

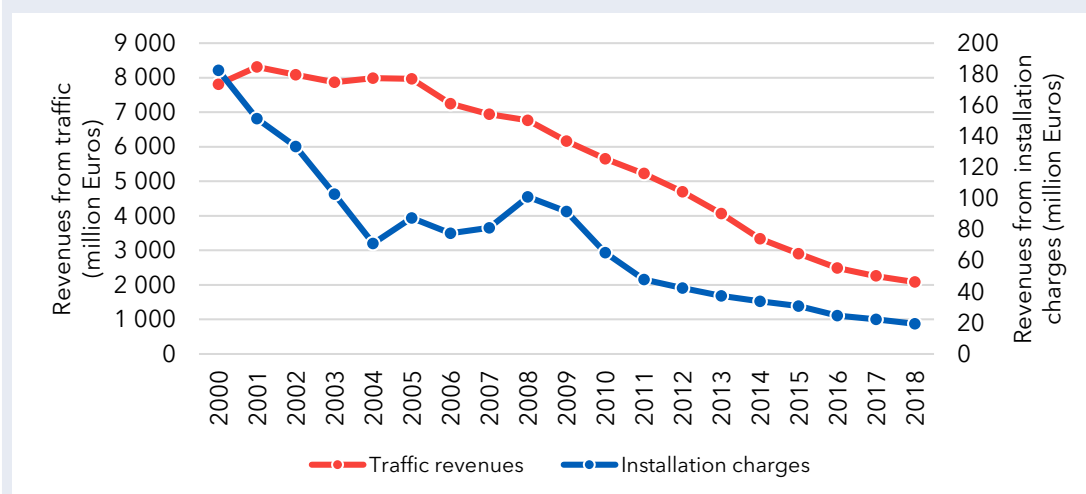
This indicator refers to fixed telephone service revenue earned by entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include fixed telephone service revenue from businesses that are not classified in ISIC Rev. 4, Division 61. In those cases where fixed-telephone services are bundled with other telecommunication services (e.g., double-play subscriptions including fixed telephony and Internet), service providers may have different methods for allocating the total revenue from bundled services to individual services.

(continued)

Example:

Revenues from installation or activation charges have declined constantly over the last decade in many countries, in parallel to the reduced demand for fixed telephone lines. In the next figure the evolution of revenues from installation charges and for fixed telephone traffic is depicted for Spain.

Figure 59: Revenues from activation/ installation of fixed telephone lines and revenues from placing voice calls from fixed networks in Spain (million Euros)



Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

Relevance:

Very often the connection or installation charge for the activation of a fixed connection is offered together with the access to a broadband connection. Many operators do not distinguish when charging for installation between the end use the consumer will be performing: either fixed telephony, fixed broadband, or both. In many cases, operators do not charge for this installation or activation service.

This indicator is included in Indicator 6.4: Revenue from fixed-telephone services (i71) and will not be collected individually by ITU.

Indicator 6.4b: Revenue from fixed-telephone subscription charges (i712)**Definition:**

Revenue from fixed-telephone subscription charges refers to revenue from recurring charges for subscriptions to the PSTN, including Internet access if it cannot be separated from fixed-telephone.

Clarifications and scope:

This indicator ideally refers only to retail revenue from fixed-telephone line subscriptions. Monthly equipment rentals should be excluded. For example, some countries might include connection charges; these should be included in Indicator i711 (Revenue from fixed-telephone connection charges) and not here. In some countries, free call minutes may be included with the subscription. If this is the case, it should be mentioned in a note. The indicator should exclude subscription charges for fixed (wired)-broadband services.

Method of collection:

The data can be collected from licensed telecommunication operators and other telecommunication service entities providing fixed-telephone services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

Indicator i712 is a component of Indicator 6.4: Revenue from fixed-telephone services (i71).

Methodological issues:

This indicator refers to fixed telephone service revenue earned by entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include fixed telephone service revenue from businesses that are not classified in ISIC Rev. 4, Division 61. In those cases where fixed-telephone services are bundled with other telecommunication services (e.g., double-play subscriptions including fixed telephony and Internet), service providers may have different methods for allocating the total revenue from bundled services to individual services. Some operators may only have aggregated data on equipment rental, and may include it with the revenue from fixed-telephone subscriptions.

Relevance:

Subscription charges for fixed telephony are relevant when only the fixed telephony service is contracted. Very often operators offer fixed telephony together with fixed broadband, and possibly other services, in the same commercial offer. When this bundling is contracted, the separation of billing concepts between subscription charge for fixed telephony and that corresponding to fixed broadband, or any other service included in the offer, is not clear. The amount of the total payment made by the consumer is to be divided between the traditional billing concepts and several services when bundling. This makes the allocation of revenues to each of the different billing components difficult and heterogeneous across operators.

This indicator i712 is a component of Indicator 6.4: Revenue from fixed-telephone services (i71) and will not be collected individually by ITU.

Indicator 6.4c: Revenue from fixed-telephone calls (i713)

Definition:

Revenue from fixed-telephone calls refers to retail fixed-telephone revenue received from charges for local, national long-distance, voice calls made to mobile networks and international calls. Indicator 4.c can be split into the following indicators:

Indicator 6.4c.1: Revenue from fixed local calls (i7131)

Refers to fixed-telephone retail revenue from local call charges, excluding interconnection charges.

Indicator 6.4c.2: Revenue from fixed national long-distance calls (i7132)

Refers to fixed-telephone retail revenue from domestic long-distance call charges. If all calls are considered local (e.g., all fixed line calls with a domestic termination on another fixed-line network are charged at the same rate), then this item should be reported under revenue from local calls. It should exclude interconnection charges.

Indicator 6.4c.3: Revenue from fixed-to-mobile national calls (i7134)

Refers to fixed-telephone retail revenue from national calls to mobile-cellular phones, excluding interconnection charges.

Indicator 6.4c.4: Revenue from fixed international calls (i7133)

Refers to fixed-telephone retail revenue from international calls, excluding interconnection charges.

Clarifications and scope:

The indicator should exclude revenue from interconnection charges. Indicator 713 may not be relevant in countries where all calls are considered local. Some countries may treat calls to neighbouring countries as domestic long-distance rather than international calls.

Method of collection:

The data can be collected from licensed telecommunication operators and other telecommunication service entities providing fixed-telephone services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level.

Relationship with other indicators:

Indicator i713 is equal to the sum of the values of Indicators i7131, i7132, i7133 and i7134. Indicator i713 and its sub-indicators are components of Indicator 6.4: Revenue from fixed-telephone services (i71).

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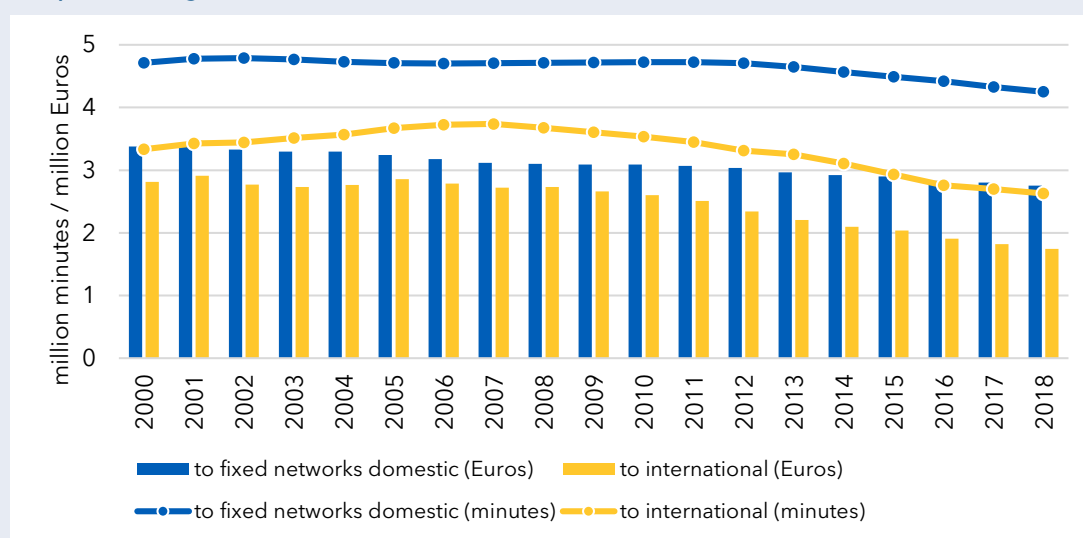
Methodological issues:

This indicator refers to fixed telephone service revenue earned by entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include fixed-telephone service revenue from businesses that are not classified in ISIC Rev. 4, Division 61. In those cases where fixed-telephone minutes are bundled together with other telecommunication services, service providers may have different methods for allocating the total revenue from bundled services to individual services. In the case of flat-rate tariffs, it may be difficult to differentiate between revenue from subscription charges and revenue from telephone calls.

Example:

Consumption of calls from fixed networks shows in general a declining trend, both in minutes used and in revenues. The substitution of fixed for mobile calls by consumers together with the emergence of over-the-top services that offer video and calling services have resulted in fixed networks being less used for placing, or receiving, calls.

Figure 60: Revenues and traffic (minutes) from domestic fixed and international calls in Spain, in logarithms (million minutes/ million Euros)



Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

Relevance:

Revenues derived from the provision of fixed telephone calls are a relevant revenue stream for operators, though declining both in volume of minutes and calls managed and in their corresponding revenues. In many countries fixed telephone services are offered under quasi-flat rate pricing, e.g., fixed payments in exchange of a specific volume of calls with specific destinations, usually local and long-distance domestic calls are included. Very often the payment charged is offered in exchange for an unlimited number of calls. In many countries this calling service is offered as well, bundled together with other additional services (e.g., calls to mobile or international destination, fixed broadband, pay TV).

This indicator (i713) is included in Indicator 6.4: Revenue from fixed-telephone services (i71) and will not be collected individually by ITU.

Indicator 6.5: Revenue from fixed Internet services (i7311)

Definition:

Revenue from fixed Internet services refers to retail revenue received from the provision of fixed Internet services such as subscriptions, traffic and data communication. It excludes the provision of access lines used to connect to fixed Internet (such as fixed-telephone lines used to access DSL connections). Indicator i7311 includes:

Indicator 6.5a: Revenue from fixed narrowband services (i7311_na)

Refers to all revenues from narrowband subscriptions, e.g., those connections to Internet that provide speeds below 256 kbit/s. It includes revenues from connections to the Internet via the copper-based network or any other network, such as wireless local loop or Wi-Max that offer speeds below 256 kbit/s.

Indicator 6.5b: Revenue from fixed broadband services (i7311_fb)

Refers to retail revenue from the provision of high-speed (at least 256 kbit/s) data connectivity and related services over fixed infrastructure. It includes services such as DSL, cable modem and FTTH, terrestrial fixed wireless, Wi-Max, or satellite technologies that provide broadband connectivity for fixed locations.

Clarifications and scope:

The indicator refers to retail revenue from the provision of fixed Internet services by telecommunication service providers. It excludes wholesale revenue and other monies received that are not of a revenue nature. It should include both residential level revenues as well as those received from the business/institutions sector.

Method of collection:

The data can be collected from ISPs and other telecommunication service operators providing fixed Internet services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications). This could include telephone companies providing DSL services, cable television companies providing cable broadband services and operators providing FTTH broadband access. Data are aggregated at the country level.

Relationship with other indicators:

Revenues from fixed Internet subscriptions is related to Indicator 3.4: Fixed Internet subscriptions (i4213).

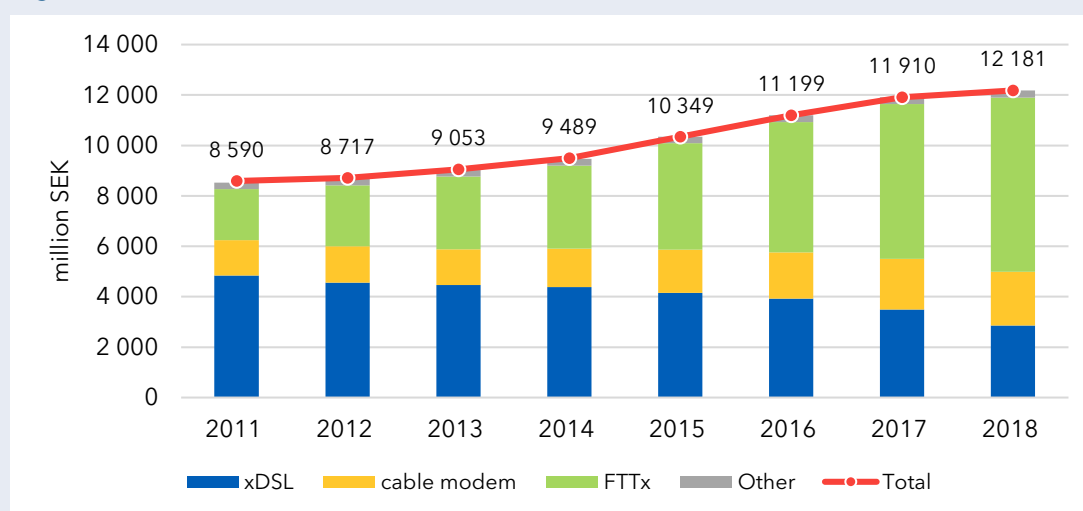
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Methodological issues:

This indicator refers to retail revenue from fixed Internet services earned by entities whose activities are included in ISIC Revision 4, Division 61.

Example:

The Swedish Post and Telecom Authority compiles data on revenues from fixed Internet access. All revenues are from fixed broadband, dial-up access to the Internet ended in 2015. The fixed broadband revenues are broken down by type of connection. The share of xDSL in fixed Internet revenue declined by 17 per cent between 2014 and 2018 while the share of optical fibre and fibre-LAN connections rose by 16 per cent. Cable modem revenue remained steady.

Figure 61: Revenues from Internet access in Sweden (million SEK)

Source: Swedish Post and Telecom Authority, The Swedish Telecommunications Market, available at: <https://statistik.pts.se/en/the-swedish-telecommunications-market/>

Relevance:

Broadband subscriptions and traffic flows grow year after year, as do revenues from this service, which grow in importance with respect to total operator revenues. Revenues obtained from Internet subscriptions together with Internet traffic indicators allow unit value analysis that may help in understanding trends in the telecommunications industry.

Indicator 6.6: Revenue from leased lines (i732)

Definition:

Revenue from leased lines refers to retail revenue received from the provision of leased lines or dedicated private connections. A leased line connects two locations for the provision of a private voice and/or data telecommunication service. The leased line could either be a dedicated physical cable or a virtual connection that reserves a circuit between two points. Leased lines most commonly are rented by businesses to connect branch offices, because the lines guarantee bandwidth for network traffic.

Clarifications and scope:

The indicator refers to retail revenue from the provision of leased-line services by telecommunication service providers.

Operators sometimes rent leased lines or circuits with a specific capacity to other telecommunication operators- this is a wholesale level transaction that should be excluded from this indicator.

Countries should provide a note on the scope of this indicator, in particular whether reported revenue covers only domestic leased-line services or includes international private leased lines.

Method of collection:

The data can be collected from operators that provide retail leased-line services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator is a component of Indicator 6.3: Revenue from all telecommunication services (i75).

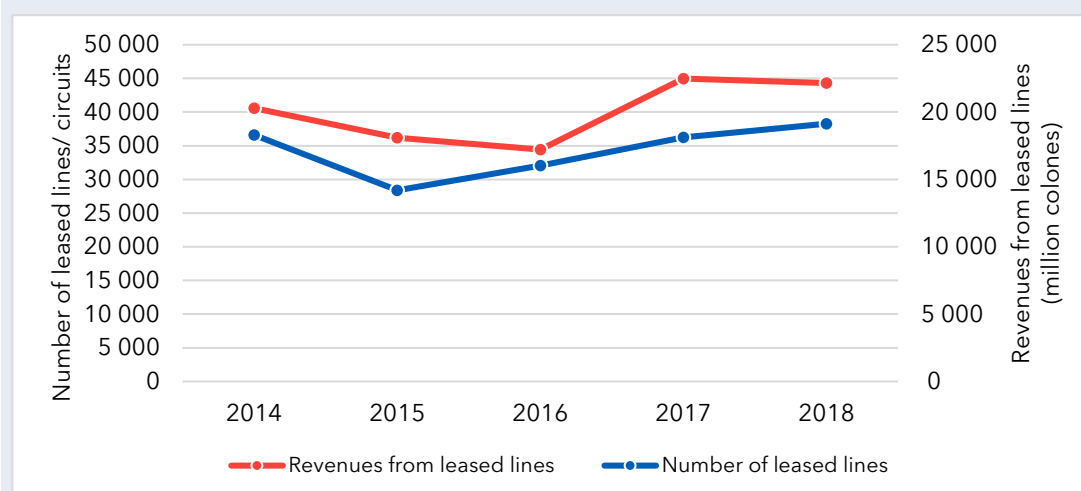
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Methodological issues:

Countries may differ in how they interpret this indicator. In particular, reported revenue may include both domestic leased-line services and international private leased lines. This indicator refers to retail revenue earned by entities whose activities are included in ISIC Revision 4, Division 61.

Example:

The regulatory authority for telecommunications in Costa Rica collects data on the number of leased lines or circuits rented and the corresponding revenues. Digital circuits that provide higher speeds become more important over time and an increasing trend in the number of total leased lines is observed.

Figure 62: Number of leased lines and revenues derived in Costa Rica (million Colones)

Source: SUTEL Estadísticas del sector de telecomunicaciones, Costa Rica 2018. [https://sutel.go.cr/sites/default/files/informe_estadisticas_del_sector_de_telecomunicaciones_2018_vf.pdf]

Relevance:

Leased lines are an important network service demanded by institutions and firms, since it provides specific quality of service parameters guaranteed for the connection, e.g., uploading/ downloading speeds, back up services, jitter or latency thresholds. The leased line service is important and contributes to the generation of total telecommunication revenues.

Box 10: Other fixed network data communication services

Certain value-added services offered by telecommunication operators are becoming an important part of their activities, and services to firms and institutions, which require specific services and guarantees, such as cloud services, hosting, or management of content delivery networks, are becoming more relevant. Many operators offer transit or interconnection services. Only retail level revenues are to be included. No wholesale transactions are to be included (services provided to another operator). It would be convenient to add an additional category of "Other fixed data communications services" to include these activities, independent of broadband or to leased line subscriptions, indicators already defined in this Handbook.

Indicator 6.7: Revenue from fixed value-added telecommunication services (i733)

Definition:

Revenue from fixed value-added telecommunication services refers to the retail revenue generated by the telecommunication service sector for fixed value-added telecommunication services, such as call forwarding, itemized billing, conference calls and voice-message services.

Clarifications and scope:

The indicator refers to retail fixed-telephone revenue from the provision of value-added services. It excludes wholesale revenue and other monies received that are not of a revenue nature.

Countries should specify the items included in this indicator in a note.

Method of collection:

The data can be collected from fixed-line telephone operators operating in the country whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator is a component of Indicator 6.3: Revenue from all telecommunication services (i75).

Methodological issues:

This indicator refers to value-added fixed-line telephone retail revenue, and countries will differ in what items they include. It refers to retail revenue earned by entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include revenue from businesses that are not classified in ISIC Rev. 4, Division 61.

Example:

Value-added services and information services are of smaller magnitude but relevant as a source of income for operators. The example in Table 15 shows that out of the total fixed telecommunication revenues in 2017, fixed telephony accounted for 29.2 per cent, broadband accounted for 53.5 per cent, and value-added fixed telephone and information services accounted to 0.2 per cent.

(continued)

Table 15: Distribution of revenues among the main fixed network services in Spain, 2017

	Revenues (million Euros)	shares (as % of total)
Fixed telephony	2436.5	29.2
Fixed broadband	4468.7	53.5
Circuit rental, line rental and corporate communications services	1433.9	17.2
Value added and information numbers	16.9	0.2
Total fixed network communications	8356	

Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]**Relevance:**

Certain value-added services are becoming more important in relation of the activities performed by telecommunications operators. This indicator refers to revenues generated by operators from value-added services such as information services and special value-added calls provided to residential subscribers.

Box 11: Roaming-out services

The use of mobile services when travelling in a foreign country is becoming increasingly important. In many areas of the world "free roaming areas" or similar regulatory frameworks are being implemented and as a result, roaming is used much more frequently by consumers.

Indicator i741 includes a sub-category "Revenues from roaming- out", which encompasses all revenues obtained by a domestic operator when its users make use of their mobile connection while abroad. It includes the use of the following services: voice services, messaging and, most importantly, broadband (data) consumption while abroad. It would be convenient to open this sub-category into the three components:

- (1) Revenues from roaming-out from voice service
- (2) Revenues from roaming-out from SMS/MMS service
- (3) Revenues from roaming-out from broadband (data) consumption

Revenues from mobile network services

Indicator 6.8: Revenue from mobile networks (i741)

Definition:

Revenue from mobile networks refers to retail revenue received from the provision of mobile-cellular communication services, including all voice, SMS and data (narrowband and broadband) services. This Indicator includes:

Indicator 6.8a: Revenue from voice services (i741v)

Refers to all mobile-cellular retail revenue from the provision of voice services. It includes voice revenues from national and international calls but excludes revenues from roaming services.

Indicator 6.8b: Revenue from outbound roaming (i7411r)

Refers to all mobile-cellular retail roaming revenue from own subscribers roaming abroad. It does not cover foreign mobile subscribers roaming into the country and international calls originating or terminating on the country's mobile networks.

This is a retail revenue that the operator obtains from its subscribers when they make or receive calls while in a foreign country. This revenue comes from outbound roaming for voice, for text/SMS/MMS, and for data (broadband).

It does not cover roaming revenue generated by foreign mobile-network subscribers roaming in the country nor originating or terminating international calls by them on mobile networks in the country.

Indicator 6.8c: Revenue from mobile data services (i741d)

Refers to revenue from the provision of non-voice services such as data and Internet services. It should exclude revenues from messaging (SMS/MMS) services since they are collected in a different indicator. It refers exclusively to revenues collected from domestic data consumption. It excludes other mobile-cellular services and wireless Internet access services not relating to mobile networks (e.g., satellite or terrestrial fixed wireless technologies) and revenues from outbound roaming.

Indicator 6.8d: Revenue from text and multimedia messaging services (i741m)

Refers to revenue from text messaging and multimedia messaging (SMS and MMS). Some countries may account for this in different ways. For example, some mobile plans include free SMS or MMS that are liable to be classified as voice revenue rather than mobile-messaging revenue. The treatment of premium messages – where users pay an additional amount over the regular messaging rate – can vary among operators, since they typically share the revenue with a premium-service provider. Operators may also include revenue from international messaging in other categories. The preference is to include all revenue earned by the operator from the provision of messaging services to retail customers. Any deviation from this definition should be explained in a note.

(continued)

Clarifications and scope:

The indicator refers to retail mobile-telephone revenue earned by telecommunication service providers. It includes the revenues described in sub-indicators mentioned above. It excludes wholesale revenue and other monies received that are not of a revenue nature. The indicator includes revenue from connection, subscription, call usage, messaging and data, but excludes interconnection charges and other sources of income such as those related to handsets. Any deviations from the definitions above (e.g., the inclusion of handset revenue) should be explained in a note.

In some countries a regulatory regime exists by which the subscriber does not pay any extra amount of money when using voice or data services while abroad, at least for a given volume of usage, i.e., roam-like-to-home. This implies that for specific (i.e., low enough) consumption of voice, messaging, or data while abroad, the domestic operator charges the usual domestic tariff that the final subscriber contracted for the domestic country usage. For consumption levels over and above those defined as standard use, additional (marginal) fees are to be paid for each minute or MB consumed while abroad. When a regime such as this exists, the operator will allocate as "revenues from outbound roaming " that part attributable to the subscriber while abroad, even if evaluated at domestic rates, plus the special amount of revenues derived from over-consumption above the predefined standard consumption level.

Method of collection:

The data can be collected from telecommunication service operators providing mobile-telephone services in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. Data for small providers (e.g., resellers and mobile virtual network operators) may be collected directly from their host network operators. Data are aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator includes the values of Indicator 6.8a: Revenue from voice services (i741v), Indicator 6.8b: Revenue from outbound roaming (i7411r), Indicator 6.8c: Revenue from mobile data services (i741d), and Indicator 6.8d: Revenue from text and multimedia messaging services (i741m) defined above. This indicator (i741) and its sub-indicators are components of Indicator 6.3: Revenue from all telecommunication services (i75).

Methodological issues:

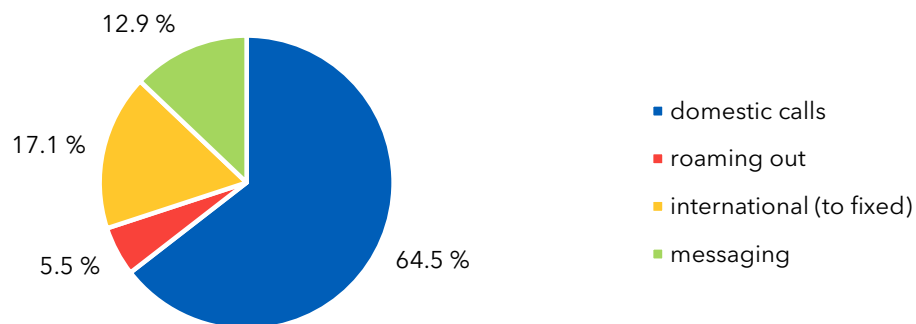
This indicator refers to retail mobile telephone service revenue of entities whose activities are included in ISIC Revision 4, Division 61.

(continued)

Example:

In Spain, the regulatory commission (CNMC) collects data periodically on revenues by service. In 2018, more than 64 per cent of all traffic related revenues came from domestic calls, 5.5 per cent from roaming-out and almost 13 per cent from messaging (SMS/MMS) services.

Figure 63: Revenues for different traffic related services in Spain



Source: CNMC, Spain [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]

Relevance:

Voice, broadband, roaming-out, and messaging are the main final services provided by mobile operators. It is important to split all revenues by these service categories to gauge the development of the mobile industry. In the future, this will help to include new data driven service indicators that will emerge with 5G service.

Indicator 6.9: Revenue from international inbound roaming (i76ri)

Definition:

Revenue from international inbound roaming refers to revenue received from visiting (foreign) subscribers making and receiving calls within the country. Network operators within the country obtain these revenues from network operators of visiting subscribers. The indicator refers to mobile-cellular roaming revenue from foreign subscribers roaming on the country's mobile networks. It does not cover domestic mobile subscribers roaming abroad, nor international calls originating or terminating on the country's mobile networks. It does not refer to the gross revenue generated by mobile roamers, since some portion will be shared with foreign operators.

This is a wholesale revenue derived from the use of domestic network facilities by visiting (foreign network) subscribers. For voice services, it refers to the origination and transport of the call in the domestic network and its handing to the foreign-destination operator. It encompasses revenues generated when a foreign subscriber while in the domestic country receives a call, which is terminated by the domestic operator.

For data services it includes revenues from the use of domestic networks for data consumption by subscribers that belong to a foreign operator.

Four sub-indicators that could be defined by the EGTI are:

Indicator 6.9a: Revenues from inbound roaming of voice calls originated in domestic country

Revenues from inbound roaming of voice calls originated in domestic country refer to wholesale level revenues received by a domestic operator in country A when subscribers of country B visit the country and while visiting make calls with their mobile handset. The subscribers belong to a foreign operator, in country B, but when visiting country A they make use of mobile networks and services of operators in the domestic (visited) country A. The operator in Country B to which the subscriber belongs, makes wholesale payments for the origination and transit of the call being made by its own subscriber base to the domestic operator (A).

Indicator 6.9b: Revenues from inbound roaming of SMS/MMS sent by a foreign user while in the domestic country

Revenues from inbound roaming of SMS/MMS sent by a foreign user while in the domestic country refer to wholesale level revenues received in country A when subscribers of country B visit the country and send SMS/MMS with their mobile handset. The subscribers belong to a foreign operator, in country B, but when visiting country A they make use of mobile networks and services of operators in the domestic (visited) country A.

Indicator 6.9c: Revenues from inbound roaming of calls received by foreign user while in domestic country

Revenues from inbound roaming of calls received by foreign user while in domestic country refer to wholesale level revenues received by a domestic operator in country A when subscribers of country B visit the country and receive calls. The subscribers belong to a foreign operator, in country B, but when visiting country A and receiving a mobile call an operator in the domestic country (operator A) has to locate the subscriber and terminate the call while visiting the country.

(continued)

Indicator 6.9d: Revenues from inbound data roaming, i.e., when a foreign user makes use of the domestic network for data consumption

Revenues from inbound data roaming, i.e., when a foreign user makes use of the domestic network for data consumption refer to wholesale level revenues obtained by a domestic operator in country A when subscribers of country B visit the country and access the internet with his/her smartphone using 3G/4G network. The subscriber belongs to a foreign operator, in country B, but when visiting country A and accessing the internet from their smartphones, the subscriber makes use of the domestic operator A. For this data consumption, the operator to which the subscriber belongs, B, shall make wholesale payments to operator A.

Clarifications and scope:

This Indicator is the only revenue indicator that deals with wholesale revenue. It corresponds to the wholesale revenue obtained by domestic mobile network operators from foreign mobile operators for the usage of their network for the purpose of providing international roaming services. It should include revenue from all roaming services, including voice, SMS and data.

Like other revenue indicators, it excludes monies received that are not of a revenue nature (see Indicator i75). For this element, and entities covered by this indicator, see Indicator 6.3: Revenue from all telecommunication services (i75).

Method of collection:

Data for this Indicator can be collected from licensed mobile-network operators operating in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for the data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator is not related to other Indicators in this Handbook, because it refers to wholesale revenue.

Methodological issues:

This Indicator refers to revenue earned by entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include mobile telephone service revenue from businesses that are not classified in ISIC Rev. 4, Division 61.

Example:

In Spain, the regulatory commission collects data on revenues from roaming in services and offers details by type of service, voice, messaging, and broadband (data). Table 16 shows that roaming-in revenues amount to a significant proportion (18.8 per cent) of total wholesale revenues from interconnection/termination services. Furthermore, included in roaming-in, the revenues stream derived from data services to foreign subscribers is the most important among the three main services.

(continued)

Table 16: Wholesale services in the mobile industry in Spain, 2017

	million Euros	% of total
Termination services in mobile networks	612.1	39.5
national	577.3	37.3
international	34.7	2.2
Access services	606.5	39.1
Roaming inbound (foreign operators)	291.3	18.8
voice	67.8	4.4
data	216.8	14.0
messaging	6.6	0.4
Other services	39.8	2.6
Total revenues from interconnection services	1549.7	100.0

Source: CNMC Spain data portal [http://data.cnmc.es/datagraph/jsp/inf_anual.jsp]**Relevance:**

International roaming at wholesale level is relevant because it provides information on the use of domestic-network resources by foreign-network subscribers. It is as well an important source of revenue for any operator offering mobile network voice and data (broadband) services. In the section on traffic indicators, the same detail of disaggregation is proposed as it is here: breakdown in inbound roaming by type of service: voice (minutes), messaging (units) and data (broadband in MB).

Box 12: Other mobile network data communication services

In the near future, with the deployment of 5G networks and the emergence of the Internet of Things (IoT) many new business models, services, and applications will be offered through mobile networks. Data traffic will increase as many new mobile terminals, objects, and machines demand connectivity. Existing indicators that cover mobile voice and broadband services revenue and traffic data will have trouble reflecting these new developments.

With the emergence of business services and 5G networks, it is important to add a mobile revenue indicator that compiles all revenues derived from business services offered via mobile (5G) networks, capacity and transmission services offered at the retail level.

Other telecommunication revenues

Indicator 6.10: Other telecommunication revenue (i74)

Definition:

Other telecommunication revenue refers to any other retail telecommunication revenue received but not accounted for elsewhere.

Clarifications and scope:

This indicator refers to all other retail telecommunication service revenue not identified in one of the other revenue indicators in this group. It should exclude interconnection charges or any other wholesale transaction.

Countries should specify the items included in this indicator in a note.

Method of collection:

The data can be collected from domestic fixed-telephone operators, mobile-cellular operators, and ISPs, whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for revenue data could be industry surveys carried out by the national statistical office, or other reputable organization

Relationship with other indicators:

This Indicator a component of Indicator 6.3: Revenue from all telecommunication services (i75).

Methodological issues:

This indicator refers to other telecommunication service retail revenues; items included will vary widely among countries.

Relevance:

This indicator is collected in order to have the total retail revenue from the telecommunication business of each and all operators in the industry.

6.3 Investment

140. Investment is vital to the roll-out, expansion, and upgrade of telecommunication networks. Investment, often referred to as capital expenditure in the financial statements of business entities, refers to expenditure on acquiring property and equipment. The investment indicators described below cover fixed, mobile and Internet networks and related service provision. The indicators can be used to derive various ratios, such as telecommunication investment as a percentage of gross fixed capital formation, which measures the share of telecommunication investment in total investment in the economy.

141. The indicators refer to investment made during the reference year, which is presumed to be the financial year ending 31 December for the previous year, unless specified otherwise. Where the calendar year is not the reference year, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data).

142. The investment indicators should include data from all operators (facilities and non-facilities based⁹) providing telecommunication services in the country. Like the indicators on employment and revenue, the businesses covered by the investment indicators are operating entities in the telecommunication services sector, as defined by ISIC Revision 4, Division 61 (Telecommunications).

⁹ 'Facilities-based' means an operator that owns its own infrastructure, whereas 'non-facilities-based' refers to an operator that leases infrastructure from another operator.

Indicator 6.11: Annual investment in telecommunication services (i81)

Definition:

Annual investment in telecommunication services, also referred to as annual capital expenditure, refers to the investment during the financial year in acquiring or upgrading property and networks. Property includes tangible assets such as plant, intellectual and non-tangible assets such as computer software. The indicator is a measure of investment in telecommunication infrastructure in the country and includes expenditure on initial installations and additions to existing installations where the usage is expected to be over an extended period of time. It excludes expenditure on research and development (R&D), annual fees for operating licences and the use of radio spectrum, and investment in telecommunication software or equipment for internal use.

The indicator can be broken down as follows:

Indicator 6.11a: Annual investment in fixed-telephone services (i83)

This indicator refers to annual investment in domestic assets (acquiring and upgrading property and networks within the country) related to fixed-telephone networks and the provision of services.

Indicator 6.11b: Annual investment in fixed-broadband services (i87)

This indicator refers to annual investment in domestic assets (acquiring and upgrading property and networks within the country) related to fixed (wired)-broadband networks and the provision of services.

Indicator 6.11c: Annual investment in mobile communication services (i841m)

This indicator refers to annual investment in assets (acquiring and upgrading property and networks within the country) related to mobile communication networks and the provision of services. It should include investments made for mobile-broadband services and investments in mobile-broadband networks.

Indicator 6.11d: Other annual investment in telecommunication services

This indicator refers to investment in other telecommunication services, such as fixed wireless-broadband, satellite, and leased lines.

Clarifications and scope:

This indicator refers to the total capital expenditure on acquiring or upgrading property and plant for all telecommunication (including Internet) services that are provided to the public by entities classified in ISIC Revision 4, Division 61 (Telecommunications). Non-tangible capital expenditure should be included, except for annual licence fees. It refers to investment in assets related to the provision of telecommunication networks and services in the country, and therefore should not include capital expenditure made by domestic operators for networks and property they own in other countries. The indicator excludes investments made by operators in other entities. Where data are only available on a different definitional basis, this should be explained in a note.

It may be difficult to distinguish capital expenditure on fixed-telephone networks and fixed-broadband networks, especially complex in new networks such as 5G, where investments in fixed and in mobile components of the network are complementary and sometimes difficult to separate. When this is the case, approximations of the share of each service out of the total capital expenditure should be provided, and estimates should be made and explained in a note.

Method of collection:

The data can be collected from all licensed telecommunication operators and other telecommunication service entities operating in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for investment data could be industry surveys carried out by the national statistical office, or other reputable organization.

(continued)

Relationship with other indicators:

This Indicator (i81) is equal to the sum of the values of sub-indicators mentioned above and includes the value of Indicator 6.12: Annual investment in non-tangible assets (i81t).

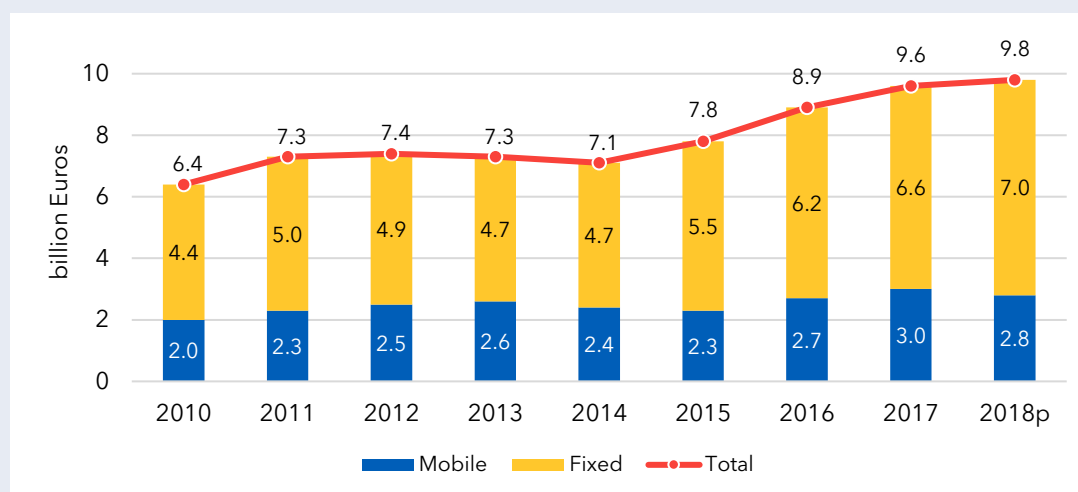
Methodological issues:

This indicator refers to annual investment by telecommunication service entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include investment by businesses that are not classified in ISIC Rev. 4, Division 61. Comparability issues may arise because of country differences in the interpretation and reporting of annual capital expenditure in the telecommunication industry. Some issues stand out, including the treatment of licence fees, and distinguishing capital expenditure on fixed-telephone and fixed-broadband networks. With respect to distinguishing capital expenditure, operators usually report data in terms of investment in fixed networks and mobile networks. Given the move to NGN and IP-based networks, the distinction between fixed networks and mobile networks is narrowing, especially for core networks. Another example is 'triple play'. When an operator invests in deploying fibre-to-the-home (FTTH), it may be difficult to distinguish the investment as telephone or broadband if it is providing fixed telephony (VoIP), Internet and TV (IPTV) services over the same infrastructure.

Some countries include licence fees in capital expenditure on mobile. This can create significant distortion since these fees tend to be relatively high compared to investment in plant and property.

Example:

The telecommunication and posts regulator in France (*Autorité de Régulation des Communications Electroniques et des Postes*, ARCEP) publishes data on investment in the telecommunication sector, disaggregated by fixed and mobile services. Total investment was EUR 9.8 million in 2018, comprising EUR 7 million for fixed services, and EUR 2.8 million for mobile services.

Figure 64: Telecommunication investment, France

Source: ARCEP (2019), Les chiffres-clés dans le secteur des télécoms, available at https://www.arcep.fr/uploads/tx_gspublication/panorama-chiffres-cles-secteur-telecoms-postal-juillet2019.pdf

Relevance:

The telecommunication industry is capital intensive. New fixed and mobile networks, new standards, new business models, and services call for constant capital investment. Investment, or capital expenditure, allows improvements in the telecommunication industry to be monitored.

Indicator 6.12: Annual investment in non-tangible assets (i81t)

Definition:

Annual investment in non-tangible assets refers to the investment during the financial year associated with acquiring non-tangible property such as intellectual property and computer software. Note that this applies to telecommunication services that are available to the public and excludes investment for internal use. It also excludes expenditure on annual licence fees.

It does not include investment in acquiring or creating content, since content creation is an activity that belongs to a different industry category based on ISIC (Rev. 4). Investment in the networks that are used in distributing content, or any other traffic are to be included.

Clarifications and scope:

The indicator refers to the total investment in non-tangible assets for all telecommunication (including Internet) services that are provided to the public by entities whose activities are classified in ISIC Revision 4, Division 61 (Telecommunications). It refers to the investment in non-tangible assets related to the provision of telecommunication networks and services in the country, and therefore should not include expenditure made by domestic operators in relation to other countries. The nature of such assets can make them hard to evaluate, and any divergence from the definition should be explained in a note.

Method of collection:

The data can be collected from all licensed telecommunication operators and other telecommunication service entities operating in the country and whose activities are included in ISIC Revision 4, Division 61 (Telecommunications), and then aggregated at the country level. An alternative source for investment data could be industry surveys carried out by the national statistical office, or other reputable organization.

Relationship with other indicators:

This Indicator is a component of Indicator 6.11: Annual investment in telecommunication services (i81).

Methodological issues:

This indicator refers to annual investment by telecommunication service entities whose activities are included in ISIC Revision 4, Division 61. Therefore, it does not include investment by businesses that are not classified in ISIC Rev. 4, Division 61. Comparability issues may arise because of country differences in the treatment of non-tangible investment.

Relevance:

This indicator collects investment in specific assets needed for telecommunication operators. It is no longer collected by ITU.

Indicator 6.13: Annual foreign investment in telecommunications (i841f)

Definition:

Annual foreign investment in telecommunications refers to investment during the financial year in telecommunication services (including fixed, mobile, and Internet services) coming from foreign sources, also referred to as foreign direct investment (FDI).

Clarifications and scope:

This indicator refers to the investment made by foreign-owned entities in the country. It refers to an entity in one country (direct investor) acquiring a direct investment in a telecommunication service provider in another country. The shareholding should be at least ten per cent. Direct investment is measured for the initial transaction as well as subsequent transactions.

Method of collection:

This indicator should be collected from the national authority responsible for compiling balance-of-payments statistics rather than from operators. This is generally either the central bank or the national statistical office. The national authority responsible for balance-of-payments statistics collects the information by means of questionnaires sent to businesses operating in the country. One drawback is that the data are not always disaggregated by sector so, while total FDI data are generally available for most countries, the breakdown for telecommunication may not be available. The responsible telecommunication authority could ask the national authority concerned to provide for this breakdown in the questionnaire sent to businesses, or pre-identify telecommunication businesses, whose FDI data could then be aggregated. Any difficulties splitting telecommunication FDI or any deviations from standard concepts for measuring FDI should be explained in a note.

Relationship with other indicators:

This Indicator (i841f) is not related to other indicators in the Handbook.

Methodological issues:

As the concept of foreign investment differs from the other investment indicators in this category, they are not directly comparable. Concepts used for measuring FDI and for identifying telecommunication-related FDI may vary between countries, leading to lack of comparability.

Example:

Many nations seek to attract foreign investment in their telecommunication sector in order to help fund infrastructure roll-out and upgrades. The State Bank of Pakistan, the country's central bank, regularly publishes data on FDI in the telecommunication sector.

Table 17: FDI in the telecommunication sector, Pakistan (USD million)

	2017-18	2018-19
Telecommunications FDI	288.5	235.5
Total FDI	3 494.5	2 785.2
Telecommunications share (%)	8.3%	8.5%

Note: Refers to financial year (July to June)

Source: State Bank of Pakistan, *Net Inflow of Foreign Direct Investment by Economic Groups*, available at [http://www.sbp.org.pk/ecodata/NIFP_Arch/index.asp]

Relevance:

Foreign Direct Investment (FDI) takes place in the telecommunication industry and it is linked to new networks being deployed, such as fixed networks (FTTx) or networks allowing for mobility (4G/LTE or 5G). In some countries FDI has made it possible to the general public to access new networks and services in a short period of time.

7 Broadcasting indicators

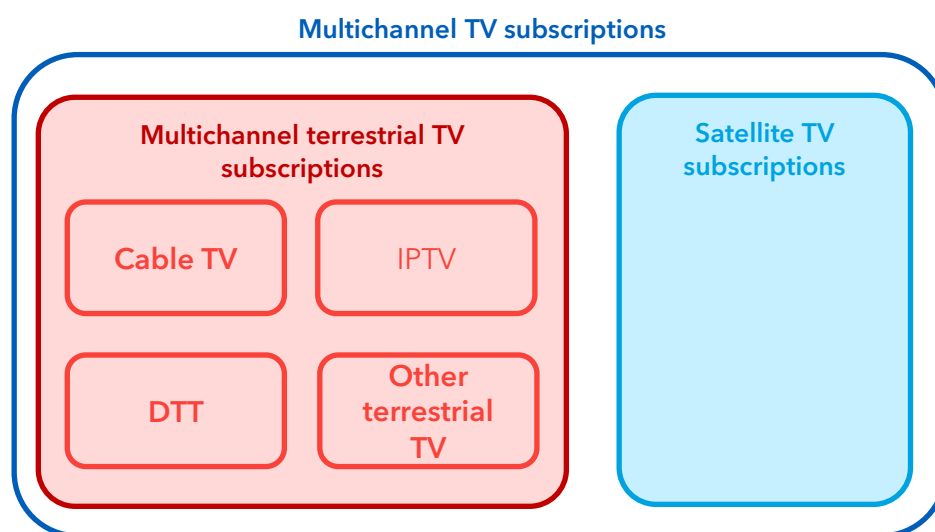
7.1 Multichannel TV subscriptions

143. In ISIC Revision 4, broadcast indicators relate to entities whose activities are classified in either Division 61 (Telecommunications) or Division 60 (Programming and broadcasting activities). Division 61 includes “The distribution of the complete television programmes by third parties, i.e., without any alteration of the content ... This distribution can be done through broadcasting, satellite or cable systems.” Hence, the assembly of packages of channels and the distribution of those packages via cable or satellite networks to viewers falls under Division 61 of ISIC.

144. Regarding multichannel TV, the main indicator collects the total number of subscriptions. This is provided through several distribution technologies (i.e., coaxial cable, Internet Protocol Television (IPTV), satellite, and terrestrial wireless). The total subscriber base to multichannel TV is split among terrestrial based distribution and satellite.

145. Some providers of video services use the public Internet as the distribution network to reach viewers. They are known as over-the-top (OTT) providers and in general do not own distribution networks but use the Internet. OTT providers are not included in the multichannel TV subscribers data.

Figure 65: Scope of the indicator for multichannel TV subscriptions

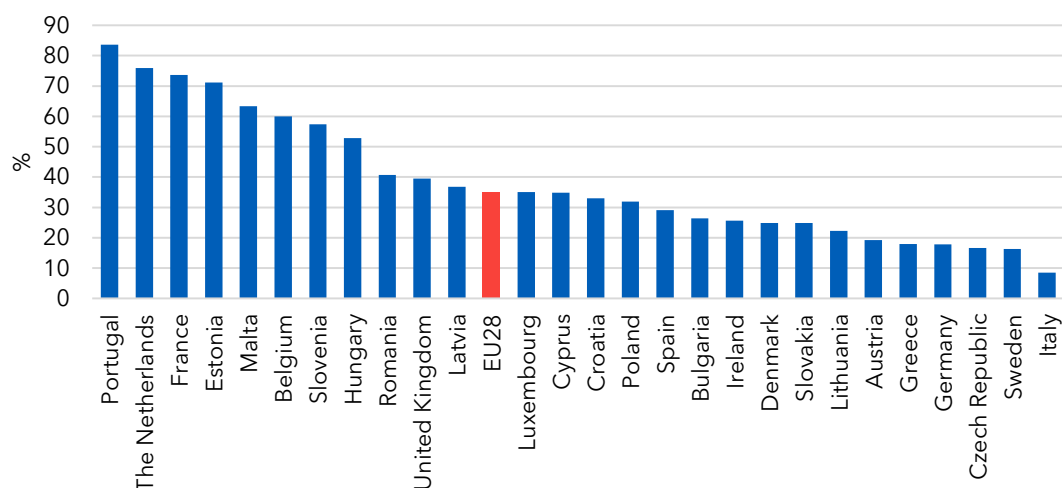


146. This group of indicators refers to annual (reference year) data, which should be provided with respect of the end of the calendar year (31 December). Where the calendar year is not the reference year, data should be provided closest to the end of the year to which they refer (e.g., financial year data ending 31 March in the current year should be provided as the previous year data). Where countries report data on a different date basis, this should be specified in a note.

147. In some countries and regions, multichannel TV service is contracted together with another (fixed or mobile) service, such as in the European Union, where in July 2017 over a third of households subscribed to multichannel TV through a bundle. With a triple play bundle, the subscriber contracts fixed telephony and fixed broadband together with pay TV service and

pays for the three services in one bill. Since the multichannel TV service is contracted, this is to be counted as well as a multichannel TV subscription.

Figure 66: Subscriptions to pay TV services as part of a bundle (% of households), July 2017, European Union



Source: European Commission, "Financial indicators, fixed and mobile telephony, broadcasting and bundled services indicators – 2017" available at: <https://ec.europa.eu/digital-single-market/en/connectivity>

148. The main indicator to be collected is the total number of subscriptions to multichannel, or pay-TV services. But since this service may be provided with different networks, the technological segmentation is relevant as well. In Table 18, the main technologies for the provision of this services are organized based on: (1) terrestrial subscriptions and (2) satellite-based subscriptions.

Table 18: Technologies underlying the provision of multichannel TV

(1) Terrestrial multichannel TV subscriptions
Cable TV
IP TV
Digital terrestrial TV (DTT)
Other terrestrial TV
(2) Satellite TV (direct-to-home)
Total (1) + (2)

Indicator 7.1: Multichannel TV subscriptions (i965m)

Definition:

Multichannel TV subscriptions refers to services that provide additional TV programming beyond free-to-air terrestrial channels. Multichannel TV services are cable TV, direct-to-home satellite services, Internet-protocol TV, and digital terrestrial TV. Multichannel TV subscriptions should only be included if additional channels are available through payment of a fee.

Multichannel TV services are categorized and defined as follows:

Indicator 7.1a: Cable television (CATV) service (i965cb)

Cable television (CATV) service refers to multichannel TV programming delivered over coaxial cable networks. It includes both analogue and digital cable-TV subscriptions. It excludes IPTV delivered over cable TV networks.

Indicator 7.1b: Direct-to-home (DTH) satellite TV subscriptions (i965s)

Direct-to-home (DTH) satellite-TV subscriptions refers to the number of pay direct-to-home (DTH) satellite subscriptions (i.e., pay TV received via a satellite dish capable of receiving satellite television broadcasts). This does not include free-to-air satellite TV.

Indicator 7.1c: Internet-protocol TV (IPTV) subscriptions (i965IP)

IPTV subscriptions refers to the number of subscriptions to Internet protocol television (IPTV), i.e., TV delivered over an IP-based network managed to support the required level of quality of service, quality of experience, security, interactivity and reliability. This does not include video accessed over the public Internet – for example, by streaming – and subscriptions to over-the-top audiovisual content providers.

Indicator 7.1d: Other terrestrial television subscriptions (i965oth)

Other terrestrial television subscriptions refers to pay-TV subscriptions other than IPTV, satellite TV, and cable TV. This includes subscriptions to TV platforms such as microwave multipoint distribution systems (MMDS) and pay digital terrestrial television (pay DTT). Free-to-air TV should not be included. The TV platforms corresponding to the data reported should be indicated in a note.

Clarifications and scope:

Cable television operators (including IPTV providers) provide multichannel services, as do satellite operators through small reception antennas (direct-to-home). The term *subscription* is used loosely, since free DTH services are available in many parts of the world and should be included in this indicator. Therefore, if a consumer has a DTH multichannel service, regardless of whether they are paying for it or not, they should be counted as a subscriber.

In countries where the digital switchover has already taken place, only DTT subscriptions offering more channels than the free-to-air terrestrial ones should be counted (i.e., only paid DTT subscriptions). Deviations from the definition should be explained in a note.

Multichannel TV can be bundled together with other services, as for example with fixed telephony and/or fixed broadband. Bundled subscriptions that include television services should be counted as multichannel subscriptions.

Both business/institutions and residential segment subscriptions are to be collected.

Method of collection:

The data can be collected from licensed pay television operators in the country, and then aggregated at the country level. Alternatively, the information may be available from industry associations (in the case of DTH, they may estimate the number of DTH homes based on antenna sales, in the absence of paid subscriptions).

Relationship with other indicators:

Indicator 7.1: Multichannel TV subscriptions (i965m) is the sum of the values of indicators on terrestrial multichannel TV subscriptions and direct-to-home (DTH) satellite antenna subscriptions.

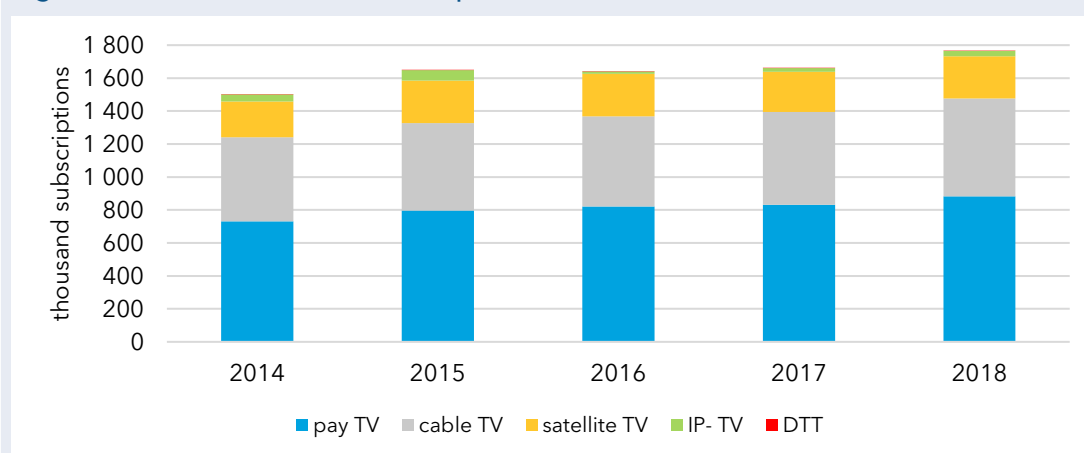
(continued)

Methodological issues:

This indicator refers to all multichannel television service subscriptions. In some countries, only paying subscribers may be included, even though free multichannel programming might be available through cable television or DTH satellite. Conversely, some countries include any DTT, cable television or SMATV household, even though they may only receive retransmissions of free-to-air channels.

Example:

In Costa Rica, the Superintendence of Telecommunications (SUTEL) collects data on multichannel television subscriptions. A breakdown is provided by distribution technology. The main distribution technology of pay TV or multichannel TV is cable, followed by satellite and a small portion offered by IPTV and digital terrestrial TV.

Figure 67: Multichannel TV subscriptions (000s), Costa Rica

Source: Estadísticas del sector de telecomunicaciones, Costa Rica 2018, SUTEL. [https://sutel.go.cr/sites/default/files/sutel_informe-esp_18_junio_ver_baja_0.pdf]

Relevance:

Multichannel TV is one of the main final services offered via telecommunication networks. Increasingly telecommunication operators offer this service together with additional (fixed or mobile networks) services, e.g., bundling. The evolution of the different distribution technologies is informative as it reflects the appearance of new networks and improvements in existing ones.

Indicator 7.2: Terrestrial multichannel TV subscriptions (i965c)

Definition:

Terrestrial multichannel TV subscriptions refers to the number of subscriptions to terrestrial multichannel TV such as cable TV, Internet protocol television (IPTV), digital terrestrial TV (DTT), and microwave multipoint distribution systems (MMDS).

Clarifications and scope:

This indicator refers to the number of terrestrial multichannel television subscriptions, as defined above. In some countries, SMATV (Satellite Master Antenna Television) is counted as a satellite subscription, as the programming is received by the distribution centre via satellite. However, since it is retransmitted to subscribers through cable, it has been included as a terrestrial multichannel subscription. Terrestrial multichannel TV subscriptions should only be included if additional channels are available through payment of a fee. Deviations from the definition should be explained in a note.

Method of collection:

The data can be collected from terrestrial pay television operators in the country, and then aggregated at the country level. Alternatively, the information may be available from industry associations for some countries.

Relationship with other indicators:

This Indicator (i965c) is a component of Indicator 7.1: Multichannel TV subscriptions (i965m)

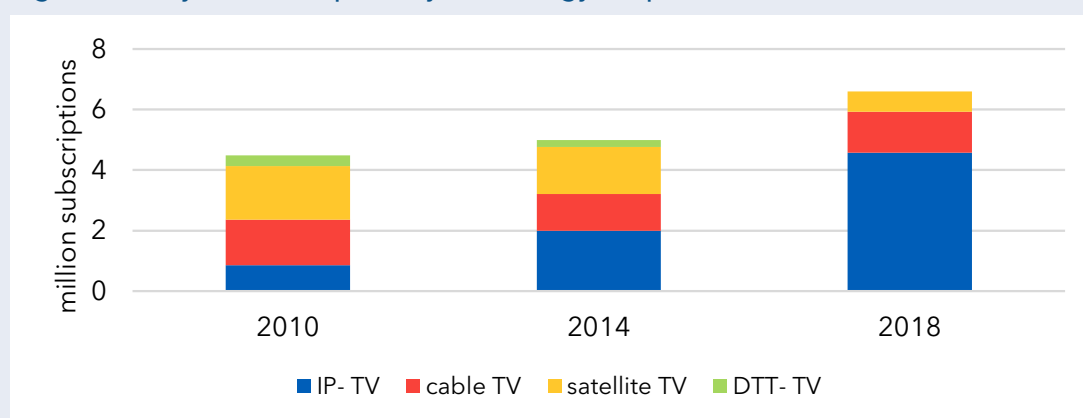
Methodological issues:

Comparability across countries may be affected by the inclusion of all users of cable television, SMATV or DTT, even though in some cases they are simply retransmitting free-to-air programmes. Some countries may exclude SMATV subscriptions from this indicator.

Example:

The technologies that support pay TV services reflected in this indicator are those that are wired or wireless that offer the service to a fixed location. In the case of Spain, satellite transmission direct to premises has diminished due to a merger in 2014 by which an optical fibre based provider acquired control of the former satellite provider and used increasingly thereafter IPTV over its own FTTP network. When the digital switchover occurred in Spain, new entrants came into the pay TV business offering service via terrestrial digital television, but after a few years they stopped trading.

Figure 68: Pay TV subscription by technology in Spain (million)



Source: CNMC, Spain. Data available at: [<http://data.cnmc.es/datagraph/>]

Relevance:

After the emergence of new optical fibre based (fixed) networks and the extending coverage of cable-based networks, multichannel (or pay-TV) subscriptions are increasingly being distributed through telecommunications networks and very often by telecommunications service providers. Multichannel TV is widely used service and requires advanced high speed capable networks.

Indicator 7.3: Satellite TV subscriptions (i965s)

Definition:

Satellite TV subscriptions refers to the number of pay direct-to-home (DTH) satellite subscriptions, i.e., pay-TV received via a satellite dish capable of receiving satellite television broadcasts. This does not include free-to-air satellite TV. Direct-to-home (DTH) satellite antenna subscriptions refers to the number of subscriptions that can receive television broadcasting directly from satellites.

Clarifications and scope:

This Indicator refers to the number of subscriptions for multichannel television programming received via a satellite dish. Referred to as direct-to-home (DTH), the service enables those with appropriate antenna dishes and set-top boxes to receive satellite television broadcasting programming*.

The term *subscription* is used loosely, since free DTH services are available in many parts of the world and should be included in this indicator. Therefore, if a consumer has a DTH multichannel service, regardless of whether they are paying for it or not, they should be counted as a subscriber.

Method of collection:

Subscriptions to satellite services should be collected from the providers of the service in the country.

Relationship with other indicators:

This Indicator (i965s) is a sub-indicator of Indicator 7.1: Multichannel TV subscriptions (i965m).

Relevance:

Satellite reception of content has been and continues to be one of the most frequent distribution channels for multichannel TV. The global coverage of satellites, and the one-to-many distribution method, makes satellite a very important network for multichannel TV contracting.

* Covering note. Telecommunications Development Bureau. New telecommunications/ICT indicators from administrative data sources 2011- 2013, ITU, February 2014.

Indicator 7.4: IPTV subscriptions (i965IP)

Definition:

IPTV subscriptions refers to the number of subscriptions to Internet protocol television (IPTV), i.e., TV delivered over an IP-based network managed to support the required level of quality of service, quality of experience, security, interactivity and reliability. This does not include video accessed over the public Internet – for example, by streaming – and subscriptions to over-the-top audiovisual content providers.

8 Quality of service indicators

149. It is important to measure the quality of the services provided by telecommunication networks in order to monitor their reliability and compare their performance. Indeed, quality of service monitoring is considered one of the core responsibilities of telecommunication regulators (Box 13). Quality of service (QoS) indicators also inform consumers and allow them to make informed decisions. The QoS indicators covered in this section relate mainly to mobile and broadband networks.

150. An important methodological issue concerns the measurement approach for technical indicators that measure QoS. Three main methods are used, each with differing properties that must be taken into account when benchmarking analysis is performed.

- i. The regulatory authority defines conditions and services to measure and the operators develop the measurements. Very often the regulatory authority defines a set of indicators on QoS to collect for a specific service, and the conditions and methods to be used in each case. The measurement itself of the parameters defined *ex ante* is developed by each operator, who later sends the information to the regulatory authority.
- ii. The regulatory authority or an independent third party develop the measurements on QoS. They are often based on international standards or practices (Box 14).
- iii. End user measurement consists of having users measure a specific parameter for the service. It may consist of having an app specifically installed on user smartphones or other devices who then activate the app to compile the measurements, which are sent to a central server for aggregation.

151. Quality of service (QoS) indicators have received continuous interest in EGTI meetings. As a result, new indicators on QoS have been introduced in the meetings held in 2011- 2013. One novelty of the new set of indicators lies in the focus on both voice services and on broadband, be it supported with mobile or with fixed networks.

152. Experience in collecting previous QoS indicators shows that a limited number of countries collect Indicator 8.1: Faults per 100 fixed-telephone lines per year (i143), or Indicator 8.2: Percentage of fixed-telephone faults cleared by next working day (i141). Both are kept in this Handbook in case any country finds of interest in collecting them and in order to have a homogeneous definition of them across the world. ITU will no longer be collecting these two indicators related to fixed voice service provision.

153. Due to the continuous interest in QoS monitoring of the main services, a sub-group on QoS was created to examine the definition of the indicators that ITU collects. This group made revisions on some clarification and scope aspects of existing indicators that are incorporated in this version of the Handbook. The sub-group shall most likely be proposing additional QoS indicators in the near future.

Box 13: Quality of service - regulatory roles and responsibilities

Often, a regulator has the responsibility to establish quality of service (QoS) guidelines or parameters, as well as the methods and procedures for monitoring operator performance against these established parameters. The fundamental objective in establishing QoS targets and reporting is to ensure that the general public (i.e., the consumer) is served and, at the same time, that the operator is not impeded from carrying out day-to-day operating routines as a result of excessive reporting requirements. The level of regulatory intervention with respect to QoS is often dependent on the degree of competitiveness that is present in the market. Generally, the regulator takes a more hands-off approach with respect to QoS monitoring and reporting requirements if a market is highly competitive. Nonetheless, the reporting and the report analysis process should not be too onerous for either the operator or the regulator irrespective of market conditions. In addition, it also should be developed through consultation between operators and the regulator to establish realistic benchmarks and make the process manageable and useful in identifying areas where the consumer is receiving inadequate service levels.

Although different approaches have been adopted in various jurisdictions, the regulatory goal should be to ensure: (i) the delivery of acceptable service for the telecommunications user; and (ii) that consumers are aware of the variations in performance from various service providers/operators thereby allowing them to make an educated choice regarding their preferred service provider. QoS indicators are one of the most effective regulatory tools in this regard.

Ultimately, consumers should reap the benefits from the enforcement of QoS regulations. In certain instances, for example, operators incur a penalty rather than invest to improve QoS. In such cases, the imposition of fines does not result in any direct benefit to consumers. On the other hand, consumers may benefit directly when the penalty for violating QoS standards is, for example, to provide consumers with services free of charge; to give the consumer retroactive rebates as compensation for the poor QoS; or to move them up to the top of a waiting list for the provision of services.

Source: ICT Regulation Toolkit at: <http://www.ictregulationtoolkit.org/toolkit/6.6>

Indicator 8.1: Faults per 100 fixed-telephone lines per year (i143)

Definition:

Faults per 100 fixed-telephone lines per year refers to the total number of reported faults for fixed-telephone lines. Faults that are not the direct responsibility of the public telecommunication operator should be excluded. The number of faults per 100 fixed lines per year should reflect the total reported by all fixed-telephone operators in the country.

Clarifications and scope:

The indicator refers to technical faults on the fixed-telephone line network that render a service unusable (i.e., the customer cannot make or receive calls). Faults that are not technical in nature or not under the control of the telephone operator should be excluded. This would include things such as the customer not plugging their phone in or extreme weather conditions.

Method of collection:

The data can be collected from all licensed fixed-telephone operators in the country. It is preferable to ask operators for the number of faults rather than the faults per 100 fixed lines. Data for each operator should be aggregated at the country level, and then divided by the total number of analogue fixed-telephone lines and multiplied by 100 to obtain the resulting indicator for the country.

Relationship with other indicators:

This Indicator (i143) should refer to faults reported for Indicator 1.4: Analogue fixed-telephone lines (i112a).

Methodological issues:

This indicator refers to technical faults on the fixed-telephone network. It does not reflect faults on other networks, such as mobile-cellular networks. For some countries, the indicator will include faults that are not technical in nature, where operators reporting the data do not have information on causes of faults.

Relevance:

This indicator is no longer being collected by ITU.

Indicator 8.2: Percentage of fixed-telephone faults cleared by next working day (i141)

Definition:

Percentage of fixed-telephone faults cleared by next working day refers to the number of reported faults for fixed-telephone lines that have been repaired by the end of the next working day (i.e., not including non-working days such as weekends and holidays). The indicator should reflect the total number of faults cleared across all fixed-telephone operators in the country.

Clarifications and scope:

This indicator refers to the percentage of fixed-telephone line faults repaired by the next working day. See the previous indicator for the definition of a fault. It does not refer to faults on the mobile-cellular network.

Method of collection:

The data can be collected from all licensed fixed telephone operators. Operators should be asked for the total number of faults cleared by the next working day as well as the total number of faults. These data should then be aggregated at the country level, by dividing the total number of faults cleared by the next working day by the total number of faults and multiplying by 100.

Relationship with other indicators:

This Indicator (i141) should refer to faults reported for Indicator 1.4: Analogue fixed-telephone lines (i112a)

Methodological issues:

This indicator refers to technical faults on the fixed-telephone network. It does not reflect faults on other networks, such as mobile-cellular networks. For some countries, the indicator will include faults that are not technical in nature, where operators reporting the data do not have information on causes of faults. It is possible that not all operators will report the fault-clearance rate.

(continued)

Example:

The Telecommunications Regulatory Authority of India (TRAI) publishes a number of QoS statistics, which include data relating to the fixed-telephone network. The fixed telephone network quality parameters compare the performance of operators in the country against benchmarks TRAI has established (Table 19).

Table 19: Fixed telephone network quality of service, India, Q1 2011

Parameters	Benchmark	Service providers not meeting the benchmarks
Fault incidences per 100 subs/month	≤5	BSNL - Chhattisgarh (5.56), HP (6.77), MH (6.28), UP-W (5.08), Uttaranchal (5.37), WB (5.19) MTNL - Delhi (6.06), Mumbai (6.05) Bharti Airtel - MP (6.00) HFCL - Punjab (5.29)
% fault repaired by next working day	≥ 90%	BSNL - A&N (84.85%), HP (87.86%), J&K (61.87%), Kolkata (88.80%), KR (79.37%), MH (82.00%), NE-II (87.81%), WB (89.19%) MTNL - Delhi (87.29%) HFCL - Punjab (88.53%)
% fault repaired within 3 days	≥ 100%	BSNL - AP (96.79%), Assam (98.39%), Bihar (95.15%), CHN (98.55%), Chhattisgarh (98.90%), GJ (98.19%), HP (97.74%), HR(99.98%), J&K (72.45%), Kolkata (97.54%), Kerala (92.58%), KTK (97.63%), MH (86.50%), NE-I (99.37%), OR (99.78%), PB(99.50%), Raj(98.86%), TN(98.77%), UP E(99.39%), UP-W(99.07%), Uttaranchal (97.02%), WB(92.02%) Bharti Airtel - MP(99.23%) MTNL - Delhi (93.85%), Mumbai (97.51%) HFCL - Punjab(98.36%)

Source: Adapted from TRAI (2011), *The Indian Telecom Services Performance Indicators, January-March 2011*, available at: http://www.trai.gov.in/WriteReadData/trai/upload/Reports/55/Indicator_Report-Mar-11.pdf.

Relevance:

This indicator is no longer collected by ITU.

Box 14: ETSI QoS standards

The European Telecommunications Standards Institute (ETSI) has produced standards for measuring quality of service. The relevant documents are:

1. ES 202 057-1 contains general user related QoS parameter definitions and measurement methods that can be applied to any service. Additional parts of the present document will contain service specific user related QoS parameter definitions and measurement methods.
2. EG 202 057-2 [i.4] contains user related QoS parameter definitions and measurement methods for voice, Group 3 fax, modem data services and SMS accessed via the public telecommunication network. The data parameters are specified for the case where an ITU-T Recommendations V.90 [4] and V.92 [5], compliant modem is used since this kind of modem is in common use.
3. EG 202 057-3 [i.5] contains user related QoS parameter definitions and measurement methods for public land mobile networks (PLMN).
4. EG 202 057-4 [i.6] contains user related QoS parameter definitions and measurement methods specific to Internet access.

Source: ETSI ES 202 057-1 V2.1.1 (2013-01) https://www.etsi.org/deliver/etsi_es/202000_202099/20205701/02.01.01_60/es_20205701v020101p.pdf

154. In successive EGTI meetings (2011-2013), a number of new QoS indicators were approved and later presented in the corresponding World Telecommunication/ICT Indicators Symposium (WTIS). These new indicators refer to problems with voice calls when made from a mobile network, relative number of complaints by users of fixed and mobile services, and the time needed for a fixed broadband connection to be activated. The definitions follow the Covering Note (ITU, 2014)¹⁰ as well as additional clarification and examples provided in the subgroup report in EGTI 2019 meeting¹¹.

¹⁰ ITU Covering Note, 2014, op. cit.

¹¹ Summary report on the QoS subgroup work, presented at EGTI meeting, September 2019.

Indicator 8.3: Mobile cellular unsuccessful call ratio (i146u)

Definition:

Mobile-cellular telephony unsuccessful call ratio refers to the ratio of unsuccessful mobile-cellular calls to the total number of mobile-cellular call attempts in a given year. An unsuccessful call is a call attempt to a valid number where (a) the call is not answered, (b) there is no called party busy tone, and (c) there is no ringing tone on the caller's side within 40 seconds from the moment when the last digit of the called number is received by the network. The caller must be within coverage of a mobile-cellular network.

The data should be expressed as a percentage.

Clarifications and scope:

This indicator should include all mobile telephone call attempts that satisfy all the following criteria: (1) in a coverage area, (2) within 40 seconds and (3) a valid number is being called.

The mobile telephone calls attempts will be considered unsuccessful due to any of the following reasons: (a) no answer, (b) busy tone, or (c) no ringing tone

The formula to be used for this indicator is given by:

$$\left\{ \frac{\text{Number of call attempts} - \text{Number of successful calls}}{\text{Number of calls attempts}} \right\} \times 100$$

Method of collection:

The data can be collected from two sources: (1) operator, or (2) field work (testing) by the regulatory authority or an independent authority. If method (1) is followed the regulatory authority must provide specific parameters to be tested, location, network level, and other specifications so that the measurement by each operator is done under the same conditions and with same method. Some regulatory authorities use the international standards as defined by ETSI (ETSI EG 202 057) in order to have homogeneous testing methods*.

If the data is being provided by the operators, it is recommended that the following principles are followed:

- Service providers should use an automatic data collection system, based on network counters, that register the real traffic of the network.
- The network counters collect information for 24 hours a day, every day of the year, in such a way that they reflect the variations in traffic, which occur during the different days, weeks, and months of the year.
- The measurements must provide a relative accuracy greater than 10 per cent with a level of reliability of 95 per cent.
- The ratio is calculated by dividing the number of successful calls by the total number of calls during the measurement period.

As the methodology used can create comparability problems across countries or operators, please indicate succinctly the method being followed in the QoS measurements.

Relationship with other indicators:

This Indicator (i146u) should refer to unsuccessful calls reported for mobile cellular subscriptions (i271).

Methodological issues:

The data either comes from operators or from an independent authority that performs the testing for each operator under conditions established ex ante. Once the information at operator level is gathered, the figures are to be aggregated to the national level. Weighting of the data by operator market share is important because it leads to a representative view of the whole market. Market share may be computed based on the portion of subscribers to the final service by each operator.

(continued)

Example:

The Telecommunications Regulatory Authority (TRA) of Sultanate of Oman requires that the service providers of telecommunication services, mobile and/or fixed, report their QoS achievements to TRA for specified number of indicators every quarter. QoS achievements are published by TRA on its website and on the service provider websites and local newspapers. The value of the indicator is an aggregation of the entire network traffic during the course of the quarter.

Table 20: Mobile unsuccessful call ratio in Oman, 2018

ITU indicator			Mobile-cellular Unsuccessful Call Ratio (%)				
Equivalent TRA indicator	Threshold	Service Provider	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Overall 2018 (Avg.)
Call Setup Success Rate	>98%	Operator 1	99.04%	99.05%	99.11%	99.01%	99.05%
		Operator 2	99.85%	99.83%	99.86%	99.87%	99.85%

Source: TRA, Oman.

Relevance:

Quality of service, be it measured by an independent agent or measured as perceived by the user, is an important element to be monitored. Consumers complain when quality is not as expected. Often licence conditions or telecommunication regulations call for specific quality of service thresholds that operators must abide by and therefore should be measured.

* https://www.etsi.org/deliver/etsi_eg/202000_202099/20205701/01.03.01_60/eg_20205701v010301p.pdf

Indicator 8.4: Mobile cellular dropped call ratio (i146d)

Definition:

Mobile-cellular telephony dropped call ratio refers to the proportion of incoming and outgoing mobile-cellular calls which, once they have been connected and therefore have an assigned traffic channel, are dropped or interrupted prior to their normal completion by the user. The cause of the early termination being within the operator network.

The data should be expressed as a percentage.

Clarifications and scope:

This indicator should include all incoming and outgoing mobile telephone calls with successful establishment under the following condition: (1) in a coverage area, (2) to a valid number, and (3) with assigned traffic channels.

The mobile cellular telephony calls are considered dropped if there is any cause of interruption before the completion of the call by the user.

The formula to be used is given by:

$$\left\{ \frac{\text{Total Number of Dropped Calls in the reporting period}}{\text{Total Number of Calls in the reporting period}} \right\} \times 100$$

Method of collection:

The data can be collected from two sources: (1) operator, or (2) field work (testing) by the regulatory authority or an independent authority. If method (1) is followed:

- Service providers should use an automatic data collection system, based on network counters, that register the real traffic of the network.
- The network counters collect information for 24 hours a day, every day of the year, in such a way that they reflect the variations in traffic, which occur during the different days, weeks and months of the year.
- The measurements must provide a relative accuracy greater than 10 per cent with a level of reliability of 95 per cent.
- The ratio is calculated by dividing the number of successful calls by the total number of calls during the measurement period.

As the methodology used can create comparability problems across countries or operators, please indicate succinctly the method being followed in the QoS measurements.

Relationship with other indicators:

This Indicator (i146d) should refer to dropped calls reported for mobile cellular subscriptions (i271).

Methodological issues:

The data either comes from operators or from an independent authority that performs the testing to each operator under conditions established ex ante. Once the information at operator level is gathered, the figures are to be aggregated to the national level. Weighting of the data by market shares of each operator is recommended.

(continued)

Example:

The Telecommunications Regulatory Authority of Sultanate of Oman requires that the service providers of telecommunication services, mobile and/or fixed, report their QoS achievements to TRA for specified number of indicators every quarter of a year. QoS achievements are published by TRA on its website and on the service provider websites and local newspapers.

The value of the indicator is an aggregation of the entire network traffic during the course of the quarter.

Table 21: Mobile call dropped ratios in Oman, 2018

ITU indicator		Mobile-cellular Dropped Call Ratio (%)				
Equivalent TRA indicator	Thres-hold	Service Provider	Q1 2018	Q2 2018	Q3 2018	Q4 2018
Call Drop Rate	<0.8%	Operator 1	0.24%	0.25%	0.30%	0.21%
		Operator 2	0.29%	0.27%	0.22%	0.19%

Source: TRA, Oman

Relevance:

Telecommunication end users place calls mostly via mobile networks. It is important to measure the quality provided by mobile network operators for this service both for consumer awareness and for monitoring purposes by regulatory agencies.

Indicator 8.5: Complaints per 100 mobile cellular subscriptions (i146c)

Definition:

Complaints per 100 mobile-cellular subscriptions refers to the number of complaints related to the provision of mobile-cellular services received in a given year, divided by the total number of active mobile-cellular subscriptions, multiplied by 100.

Clarifications and scope:

Statistics should include all complaints related to the provision of mobile-cellular services (including voice, SMS and data) received in the given year, regardless of the validity and subject of the complaint. Where more than one complaint is made by the same customer on the same subject, each instance of the complaint should be counted separately. If a customer complains again before an existing complaint has been closed, then this should not be treated as a separate complaint, but as a continuation of the first unclosed complaint.

Method of collection:

The data can be collected from two sources: (1) operator, or (2) field work (testing) by the regulatory authority or an independent authority. If method (1) is followed the regulatory authority must provide specific parameters to be tested, location, network level and other specifications so that the measurement by each operator is done under the same conditions and with same method. Some regulatory authorities use the international standards as defined by ETSI (ETSI EG 202 057) in order to have homogeneous testing methods.

As the methodology used can create comparability problems across countries or operators, please indicate succinctly the method being followed in the QoS measurements.

Relationship with other indicators:

This Indicator (i146c) should refer to complaints reported for mobile cellular subscriptions (i271).

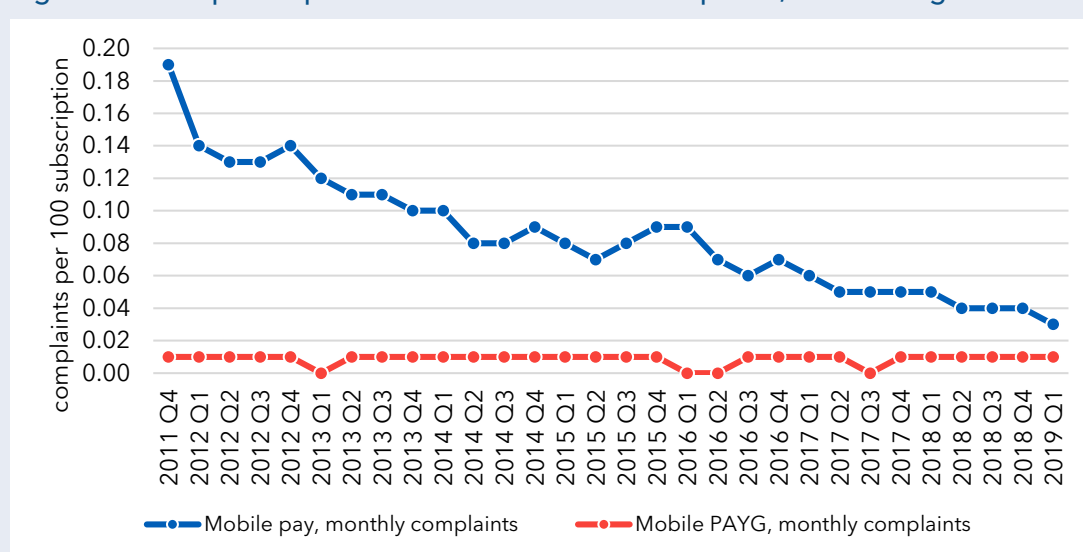
Methodological issues:

The data either comes from operators or from an independent authority that performs the testing to each operator under conditions established ex ante. Once the information at operator level is gathered, the figures are to be aggregated to the national level. Weighting of the data by market shares of each operator is recommended.

(continued)

Example:

Ofcom, the telecommunications regulator in the United Kingdom, compiles quarterly data on complaints across different services. In the United Kingdom, consumers generally raise their complaint with the service provider first. Service complaints made to Ofcom can be made by telephone, letter or an online form on their website. Ofcom publishes data both by operator and industry averages. For mobile, Ofcom distinguishes between post-paid and prepaid. There are fewer complaints with prepaid but this may be because users can easily switch. Complaints about post-paid services have gradually dropped. Ofcom notes that the main types of complaints related to post-paid mobile providers were complaints handling; issues relating to billing, pricing, and charges; and, issues relating to changing provider. Ofcom also notes that complaints it receives may reflect the relative (lack of) quality of complaints handling services by an operator.

Figure 69: Complaints per 100 mobile cellular subscriptions, United Kingdom

Note: The data only covers complaints that consumers have chosen to report to Ofcom and does not incorporate complaints consumers may have made directly to their providers or to other agencies. As such it only provides a partial picture of complaints relating to any provider.

Source: Ofcom. 2019. Telecoms and pay TV complaints. https://www.ofcom.org.uk/_data/assets/pdf_file/0018/158013/telecoms-pay-tv-complaints-q1-2019.pdf

Relevance:

Consumers react by placing complaints when perceived quality of service does not match with what is expected or offered in advance by operators. It is relevant to know and follow over time the volume of complaints by consumers.

Indicator 8.6: Complaints per 100 mobile broadband subscriptions (i146mw)

Definition:

Complaints per 100 mobile broadband subscriptions refers to the number of complaints related to the provision of mobile-broadband services received in a given year, divided by the total number of active mobile-broadband subscriptions, multiplied by 100.

Clarifications and scope:

Statistics should include all complaints related to the provision of mobile-broadband services received in the given year, regardless of the validity and subject of the complaint. Where more than one complaint is made by the same customer on the same subject, each instance of the complaint should be counted separately. If a customer complains again before an existing complaint has been closed, then this should not be treated as a separate complaint, but as a continuation of the first unclosed complaint.

Method of collection:

The data either comes from operators or from an independent authority that performs the testing to each operator under conditions established ex ante. Once the information at operator level is gathered, the figures are to be aggregated to the national level. Weighting of the data by market shares of each operator is recommended.

Relationship with other indicators:

This Indicator (i146mw) should refer to complaints reported for mobile cellular subscriptions (i271).

Methodological issues:

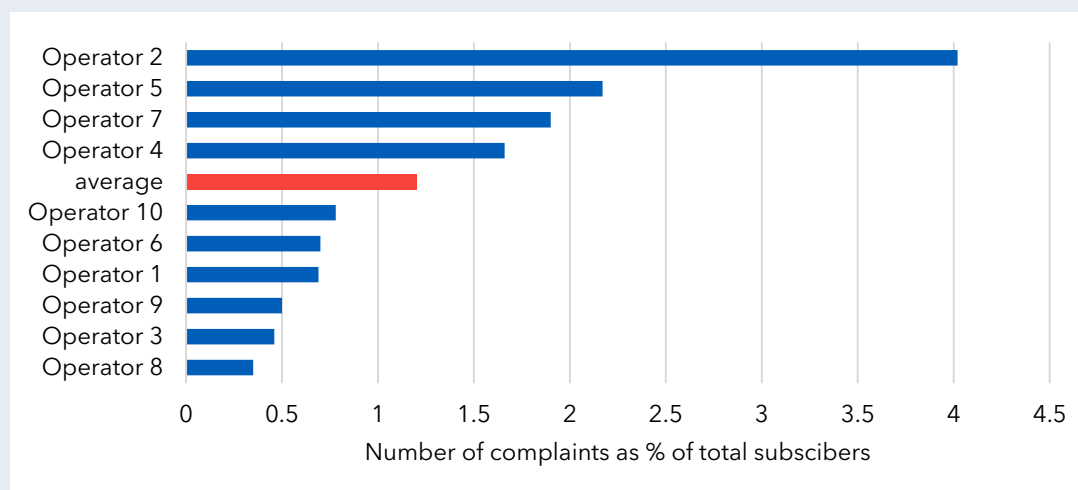
As the methodology used can create comparability problems across countries or operators, please indicate succinctly the method being followed in the complaints measurement and aggregation stages.

(continued)

Example:

The Ministry of Economy in Spain is responsible for quality of service (QoS) regulation of telecommunications services. It collects data periodically on the number of complaints related to fixed voice or the fixed broadband service. On average during the third quarter of 2019, a total of 1.2 complaints regarding the fixed service (voice or broadband) were registered by operators per 100 residential subscribers.

Figure 70: Average number of complaints registered on fixed services (voice or broadband) in Spain, 3Q- 2019



Source: Informe de seguimiento de los niveles de calidad de los servicios. Tercer trimestre 2019, Ministerio Economía, Spain

Relevance:

Mobile broadband service has the highest take-up rate. More and more consumers use mobile broadband both at home and when travelling abroad. New technologies offer higher speeds and better quality. It is important to follow quality parameters and complaints in order to monitor connectivity improvements over time.

Indicator 8.7: Complaints per 100 fixed broadband subscriptions (i147c)

Definition:

Complaints per 100 fixed broadband subscriptions refers to the number of complaints related to the provision of fixed broadband services received in a given year, divided by the total number of fixed broadband subscriptions, multiplied by 100.

Clarifications and scope:

Statistics should include all complaints related to the provision of fixed broadband services received in the given year, regardless of the validity and subject of the complaint. Where more than one complaint is made by the same customer on the same subject, each instance of the complaint should be counted separately. If a customer complains again before an existing complaint has been closed, then this should not be treated as a separate complaint, but as a continuation of the first unclosed complaint.

Method of collection:

The data is collected by the entity responsible for receiving complaints from consumers about telecommunications services. In some countries multiple agencies may be responsible for collecting telecommunications service complaints. It may also be the case that consumers should first take the complaint up with the operator. The complaint process including the responsible agency and any limitations should be summarized in a note.

As the methodology used can create comparability problems across countries or operators, please indicate succinctly the method being followed in the complaints measurement and aggregation stages.

Relationship with other indicators:

This Indicator (i147c) should refer to complaints reported for fixed-broadband subscriptions (i4213tfbb).

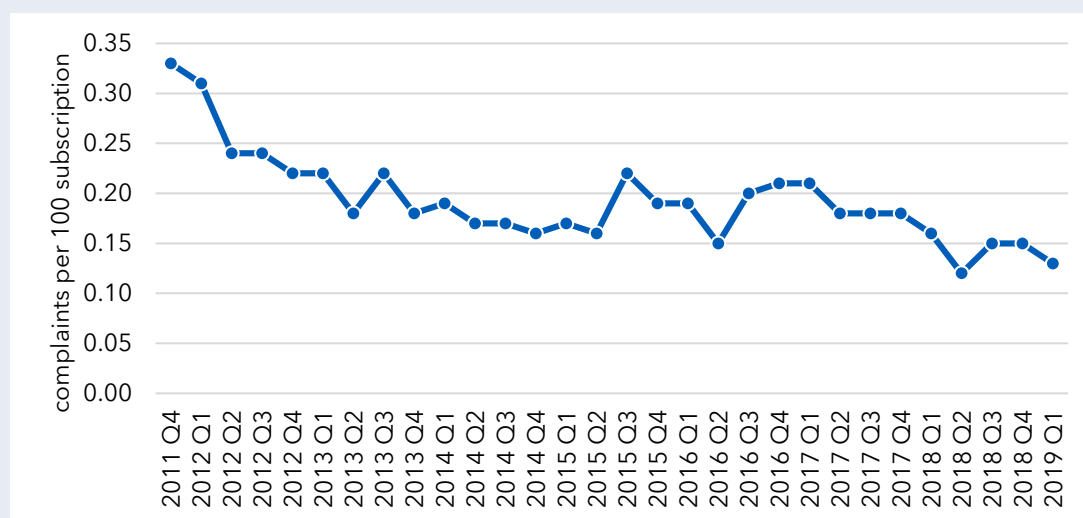
Methodological issues:

The data either comes from operators or from an independent authority that performs the testing to each operator under conditions established ex ante. Once the information at operator level is gathered, the figures are to be aggregated to the national level. Weighting of the data by market shares of each operator is recommended.

(continued)

Example:

Ofcom, the telecommunications regulator in the United Kingdom, compiles quarterly data on complaints across different services. In the United Kingdom, consumers generally raise their complaint with the service provider first. Service complaints made to Ofcom can be made by telephone, letter, or an online form on their website. Ofcom publishes data by operator and by industry averages.

Figure 71: Complaints per 100 fixed broadband subscriptions, United Kingdom

Note: The data only covers complaints that consumers have chosen to report to Ofcom and does not incorporate complaints consumers may have made directly to their providers or to other agencies. As such it may only provide a partial picture of complaints relating to any provider.

Source: Ofcom. 2019. Telecoms and pay TV complaints. https://www.ofcom.org.uk/__data/assets/pdf_file/0018/158013/telecoms-pay-tv-complaints-q1-2019.pdf

Relevance:

Fixed broadband offers vary depending on the nominal (downloading/uploading) speed announced. Consumer complaints may relate to aspects of the contract that are not being provided, such as the connection speed.

Indicator 8.8: Service activation time for fixed broadband service (i147t)

Definition:

Service activation time for fixed broadband service refers to the time from the date of application to the date of service activation. The average service activation time for all new applications received while in coverage area within the given year should be provided.

Clarifications and scope:

Service activation time for fixed broadband services refers to services included in Indicator 3.4b: Fixed-broadband subscriptions (i4213tfbb). Fixed broadband services are those services categorized of high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to or greater than 256 kbit/s. Fixed broadband service covers:

- Cable modem, DSL, fibre-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband.
- Fixed WiMAX and any other fixed wireless technologies.
- Residential subscriptions and subscriptions for organizations.

It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks.

This total is measured irrespective of the method of payment.

Method of collection:

The data either comes from operators or from an independent authority that performs the testing to each operator under conditions established ex ante. Once the information at operator level is gathered, the figures are to be aggregated to the national level. Weighting of the data by market shares of each operator is recommended.

In any case and since the methodology followed can create important divergences and comparability problems across countries or operators, please indicate succinctly the method being followed in the QoS measurements.

Relationship with other indicators:

This Indicator (i147t) should refer to service activation time reported for Indicator 3.4b: Fixed-broadband subscriptions (i4213tfbb)

Methodological issues:

The service activation time of fixed broadband service subscriptions should be averaged for the year, which is from the time of requesting the service from the service provider, to the activation of the service by the end subscriber. Calendar days should be considered.

$$[Time] = \frac{\sum_{i=1}^N (t_{2,i} - t_{1,i})}{N}$$

Service activation time for FBB:

where, ($t_{1,i}$) point of time when service event i is applied

($t_{2,i}$) point of time when service supply event i is activated

N is the number of service applications

The service activation time is to be measured for each operator and then aggregated to the national level, weighting the market share based on subscribers to this final service with respect to the total.

Some regulatory authorities that monitor this parameter, measure it with respect to a specific maximum duration of the activation process, say 10, 15, or 25 days, depending on the jurisdiction and the service.

(continued)

Example:

The Telecommunications Regulatory Authority of Sultanate of Oman requires that the service providers of telecommunication services (mobile and/or fixed) report QoS data for a specified number of indicators every quarter. QoS reports are published on the regulator website, on the service provider websites, and in local newspapers.

Table 22: Compliance with the 10-day service activation time for fixed broadband in Oman, 2018

ITU indicator		Service Activation Time for Fixed Broadband Service (in days)					
Equivalent TRA indicator	Thres-hold	Service Provider	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Overall 2018 (Avg.)
Percentage of orders for access lines in the served area completed in 10 working days	>90%	Operator 1	98.22%	97.89%	97.01%	97.29%	97.6%
		Operator 2	99.95%	99.97%	99.97%	99.95%	99.96%

Source: TRA, Oman

Relevance:

Once a household or a premise is covered by a fixed network, the time taken to carry out a new connection should be monitored to identify any problems with connections in specific locations.

9 ICT Price data collection and benchmarking

155. Data on the level and structure of prices (prices of ICT services) serve several analytical purposes. First, prices provide information about the affordability of ICT services. Second, the structure of prices illustrates the emphasis placed on fixed charges versus usage charges.

156. ITU has been collecting prices for the following services: fixed telephone, mobile cellular services (voice and SMS), fixed broadband, and since 2012, mobile broadband. As will be detailed later, for benchmarking purposes a basket of specific volumes of each service has been assumed ex ante, so that expenditures on a given set of services and volumes consumed could be obtained. For international comparability all prices were expressed in USD, in purchasing power parity (PPP) USD, and a percentage of GNI per capita in each country. The consumption period assumed is monthly.

157. The basket used was revised during 2017 with the creation of a subgroup in the EGTI that analysed the evidence on consumption patterns and proposed some changes and additions to benchmarking¹².

158. The baskets approach followed by ITU allows the comparability with other baskets and results obtained by other international institutions (OECD, European Commission, among others), as well as making it easier to introduce new services and bundles in the consumption baskets over time¹³.

159. Some trends in consumer behaviour are being observed recently. Voice calls are being placed more frequently on mobile networks, in clear substitution of fixed networks. The emergence of over-the-top providers (OTT) has enabled the use of a myriad of new services via mobile networks, and some of these services are very similar to those offered by traditional operators. A call can be placed today via any operator network or by using the open Internet with the use of a specific app, bypassing the traditional business offer of the operator.

160. Innovation, the emergence of OTT providers and in general, the competitive landscape in mobile markets have led to a decreasing trend in prices for services. Mobile calls show for many years decreasing rates of change. Data or broadband consumption with smartphones shows increasing usage, in parallel, there is a clear reduction in the price per GB or MB consumed, especially when new technologies or standards that enable higher speeds are deployed.

161. To make distinct prices comparable different methodologies may be followed. The benchmarking method chosen by ITU as well as by many other international institutions is based on defining a consumption basket, i.e., specific consumption of voice and data per month and per user, that represents what the average consumption of a user would be. This basket approach matches the assumed consumption for at least one service with each of the available prices being offered by operators and from there a final expenditure is obtained for each price, given the consumption volumes assumed ex ante.

¹² From 2011 to 2013, several mobile broadband prices were approved for collection, see *New telecommunication/ICT indicators from administrative data sources, 2011-2013*, Covering Note, Telecommunication Development Bureau, ITU, February 2014.

¹³ For a description of the baskets assumed by the OECD, *Revised OECD telecommunication price baskets*, Working Party on Communication Infrastructures and Services Policy, OECD, DSTI/CDEP/CISP(2017)4/Final, December 2017.

162. Of course, the methodology specifies many other issues that relate both to how prices are to be selected for benchmarking and which specific service characteristics and consumption patterns are to be assumed.

163. For the benchmarking exercise all available plans may be selected for the comparison of expenditures, but this is a costly process. Operators with high market shares are more representative than small operators that direct their offerings to niche segments. The collection of all available prices is costly, and resource intensive, requiring the preparation of each price component to be ready for the calculation of the expenditure that is being collected. One plan may allow only for on-net calls, while another may have a balance of on-net and off-net calls. Some plans have very low off-peak rates (when calling by night) and others may not discriminate among hours of the day or week. Which plan is to be selected? Are all sets of plans really comparable, once the final expenditure is obtained from them?

164. For all relevant dimensions where prices differ, the baskets approach calls for hypotheses to be made so that consumption assumed is homogeneously applied to all prices. A detailed description of the hypotheses needed to benchmark mobile services prices will be presented in this section.

9.1 Baskets revision 2018

165. The need to update the consumption volumes assumed in the different baskets led an EGTI subgroup in 2017 to revise previous consumption patterns and propose new baskets. The subgroup collected evidence on average consumption of voice, SMS, and data services from a large set of countries, which resulted in the grouping around two baskets (low/high). Most countries in the sample were included in one of the two baskets for mobile services.

166. The main changes approved in EGTI/WTIS 2018 related to mobile services for which higher consumption levels were adopted. Table 23 provides the main changes in the volumes of consumption assumed in the old and the new baskets.

Table 23: The revised ICT price baskets of mobile network services

Services	Old baskets (until 2017)	New baskets (from 2018)
Voice	50 min + 100 SMS	70 min + 20 SMS
Voice+ data	no collection	Low: 70 min + 20 SMS+ 500 MB
		High: 140 min + 70 SMS+ 1.5 GB
Data-only (broadband)	Prepaid, handset-based: 500 MB	1.5 GB/month, for either smartphone or computer-based subscription
	Postpaid, computer-based: 1 GB	

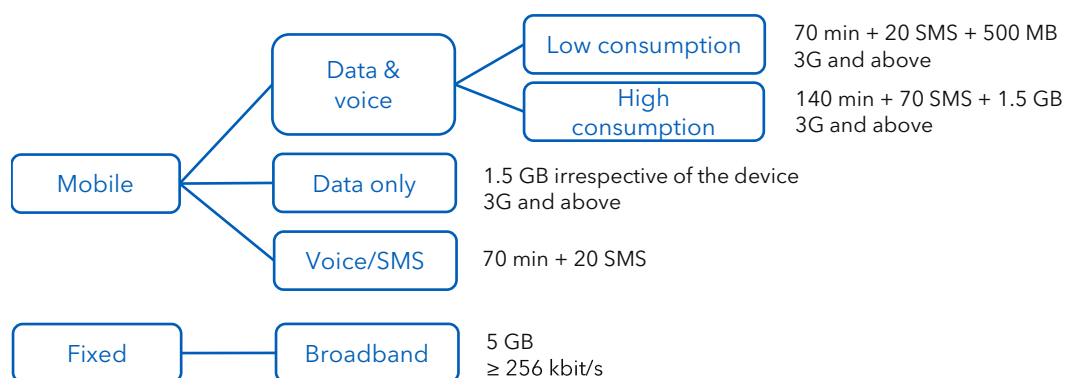
167. The revision performed in 2018 brought important changes in mobile baskets:

- Since 2018 the possibility of a basket bundle that combines voice and data (broadband) was introduced. This bundle was defined for two different intensities or volumes of consumption for voice and data: low and high.
- Until 2018 a distinction based on the terminal used for consuming broadband was made (computer-based vs. handset-based). In 2018, this distinction was eliminated.
- Until 2018, the amount of SMS included in the basket was relatively high (100 SMS per month). Given the trends in SMS consumption practically all over the world, which shows clear reductions year after year, the amount of SMS included in the basket has been reduced, i.e., 20 SMS in the low, and 70 SMS in the high consumption basket.
- The amount consumed of data (broadband) was increased: from 1 GB (or 500 MB for smartphones) to 1.5 GB. This renders the consumption much more representative across the world.
- For voice only prices, the amount of minutes assumed was increased (from 50 to 70 minutes).

168. During the EGTI 2018 meeting, the new baskets were approved and a general recommendation on revising the baskets periodically was made clear.

169. In order to compare expenditures, the basket of consumption needs to define how much of each service an individual is assumed to consume per month. Figure 72 presents the different consumption baskets for mobile voice only, only data (broadband) and both voice and data basket.

Figure 72: ITU ICT price baskets approved in 2018



Source: ITU

170. Given these assumed consumption levels, the next step is to select those prices that are to be used to calculate the expenditure of a given consumption level.

9.2 Prices of mobile network services

171. Figure 72 clearly shows that three distinct mobile services baskets are used:

- (1) **mobile consumption (low/high) that encompass the three services:** voice, SMS, and data. The selected plan here might be a bundled plan (offering the three services in the same commercial offer), or it might be composed of two distinct offers: one offering voice and SMS, and another offer that provides only mobile data (given that all the offers allow for at least the low/high consumption levels indicated). If two distinct offers are selected, the total expenditure of each is summed up, to get the total expenditure of the three services.
- (2) **mobile data (only):** select the plan that allows for at least 1.5 GB per month consumption of data. The selected plan might be a bundled plan (say data and voice) if this one is cheaper for the 1.5 GB consumption of data indicated. Or there might be a stand-alone offer of 1.5 GB per month that is cheaper. If this is the case, this second plan (stand-alone data) is to be selected for benchmarking purposes as it is the cheapest available option.
- (3) **mobile voice and SMS only:** select a plan that provides the consumer the possibility to consume 70 minutes of voice and 20 SMS. It might be that this consumption volume is best offered by a bundled offer or by a stand-alone offer of each service (voice, on the one hand, and SMS, on the other). Depending on which offer is the cheapest, the bundle or the stand alone should be selected for benchmarking purposes.

172. Prices for mobile services have changed over time, as have the contracting modalities. Initially, mobile calls were charged based on minutes consumed and a set-up cost had to be paid. Many users now contract block-plans, by which a total amount of minutes are included in a global price. The more minutes consumed, the lower the average price paid for the voice call will result.

173. Mobile services reflect important economies of scale and scope, since the fixed investment initially needed to deploy a network is distributed over many minutes, gigabytes, and users. This has facilitated the bundling of several final services into one single commercial offer. Bundling of voice, SMS, and broadband access is today a very common contracting modality.

174. These trends affect pricing observed in mobile services. Initially, simple per minute prices were offered for voice services both in prepayment and in the contract modality, with different unit prices depending on the call (on-net/off-net, domestic/international, to mobile/to fixed network). Later quasi flat rates appeared, offering distinct payments in exchange for different volumes of calls (minutes) allowed. With the deployment of 3G networks data allowance was bundled together with volumes of calls. Limitless data and voice plans were later introduced as 4G/LTE networks covered more of the population, as were the inclusion of additional services in the final price. The result has been a huge variety of plans available to end users.

175. The variety of plans offered for mobile services across the world is extensive. In many countries the most frequently purchased plans for voice (and for data) are based on per-minute (or per MB) consumed. From these individual (per unit consumed) prices, it is possible to obtain the total expenditure implied by a given consumption volume for each service. This link needs the service characteristics to be considered: a specific proportion of calls will be assumed to be off-net, a specific proportion will be assumed to have international (or domestic or fixed network) destination, a specific amount of calls will be in off-peak (peak) times. Each specific type of call

depending on its destination and time of consumption may have different unit prices. Set up charges for the call to be initiated in some countries are to be included as well and distributed over a specific duration of an average call (2 minutes).

In many countries per-minute prices are no longer announced. Most plans offer block pricing, or specific amounts of minutes (i.e., calls) or data consumption (i.e., broadband) that can be consumed during the month or relevant period in exchange of a fixed payment. The expenditure for a specific basket of consumption assumed is not constructed based on per-minute prices but by checking first that the selected plans allow for the consumption basket to be fulfilled and then by selecting the plan with the lowest expenditure.

176. Prices of mobile services are to be collected for voice and broadband as stand-alone services, bundled services, or add-ons.

177. Some plans offer unlimited voice or data services. The contract should be read carefully since very often there are conditions such as data caps or limitations applied to usage (e.g., fair usage policies), by either throttling (limiting speed) or by cutting the service altogether.

178. Rules applied in collecting mobile-cellular prices:

1. The prices of the operator with the largest market share (measured by the number of subscriptions) are used. If prices vary between different regions of the country, prices refer to those applied in the largest city (in terms of population) or in the capital city.
2. Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.
3. Prices refer to the most common contract modality (prepaid/postpaid) in the country. If more than 50 per cent of mobile-cellular subscriptions are postpaid, then a postpaid plan should be chosen. Otherwise a prepaid plan should be selected.
4. Where the operator offers different packages with a certain number of calls and/or SMS messages included, the cheapest one on the basis of 70 voice minutes and 20 SMS per month (i.e., with a 30-day validity) should be selected. If instead of a pay-per-use plan a package is selected for the whole basket (e.g., a bundle including 100 minutes, 50 SMS and 100 MB) or for some of its elements (e.g., a package including 100 SMS), it should be indicated in the notes.
5. If per-minute prices are only advertised in internal units rather than in national currency, the price of the top-up/refill charge is used to convert internal units into national currency. If there are different refill prices, then the 'cheapest/smallest' refill card is used. If different refill charges exist depending on the validity period, the validity period for 30 days (or closest to 30 days) is used.
6. Prices refer to a regular (non-promotional) plan and exclude special or promotional offers, limited discounts or options such as special prices to certain numbers or restricted to new customers, or plans where calls can only be made during a limited number of (or on specific) days during the month.
7. If subscribers can choose "favourite" numbers (for family, friends, etc.) with a special price, this special price will not be taken into consideration, irrespective of the quantity of numbers involved.
8. Prices refer to outgoing local calls. If different rates apply for local and domestic long-distance calls, then the local rate is used. If different charges apply depending on the mobile operator called, the price of calls to the operator with the second largest market

share (measured by the number of subscriptions) should be used, indicating in the notes the rates of calling to other mobile operators. If charges apply to incoming calls, these are not taken into consideration.

9. If prices vary between minutes (1st minute = price A, 2nd minute = price B), the per minute cost of a two-minute call should be reported (for example: price per minute = $(A+B)/2$). Call set-up rates should not be included in the per minute price but reported under call connection charge.
10. If prices vary beyond two minutes, the average price per minute is calculated based on the actual cost of the first two minutes.
11. If there is a connection cost per call, then this is taken into consideration in the formula for the mobile-cellular basket, based on 35 calls.
12. If there are different off-peak prices, then the one that is the cheapest before midnight is used. If the only off-peak period is after midnight, then this is not used. Instead, the peak price is used.
13. If there are different peak prices, the most expensive one during the daytime is used.
14. If peak and off-peak SMS prices exist, the average of both is used for on-net and off-net SMS.
15. If calls are charged by call or by hour (and not by the minute), the mobile-cellular basket formula will be calculated on the basis of 35 calls or 70 minutes. Similarly, if calls are charged by call or by number of minutes for a specific network/time of the day, this will be taken into account for that particular network/time of the day.
16. Where monthly, recurring charges exist, they are added to the basket.

Basket 1: Mobile-cellular low-usage basket

Indicators and definitions:

The mobile-cellular voice and SMS basket refers to the price of a standard basket of 70 minutes and 20 SMS messages per month in predetermined on-net/off-net/fixed ratios. This basket is based on the most common contract modality (prepaid or postpaid) in the given economy, i.e., if more than 50 per cent of subscriptions are prepaid, then prepaid is selected. Likewise, if more than 50 per cent of subscriptions are postpaid, then a postpaid plan is selected. The mobile-cellular low-usage basket consists of the indicators specified below.

Mobile-cellular operator (i153_low_OPc)

Mobile-cellular operator refers to the name of the selected operator with the largest market share (measured by the number of mobile-cellular subscriptions) for which prices are collected.

Mobile-cellular, name of the plan (i152_low_Plan)

Mobile-cellular, name of the plan refers to the name of the selected plan for which prices are collected.

Mobile cellular, tax rate (i153Tax)

Mobile cellular, tax rate refers to the tax rate applicable to and included in the mobile-cellular prices.

Mobile cellular, link (i153_low_Link)

Mobile cellular, link refers to the website link of the selected plan.

Mobile-cellular connection charge (i151p)

Mobile-cellular connection charge is the initial, one-time charge for a new prepaid mobile-cellular subscription. Refundable deposits should not be counted. The connection fee corresponds usually to the price charged for the subscriber identity module (SIM) card but may include other fees. It should be specified in a note if free minutes, free SMS or other free services are included in the connection charge. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - call connection charge (i153_low_pc)

Mobile cellular - call connection charge refers to the one-off fee that may apply for the establishment of a call. If the charge differs according to whether the call is on-net/off-net or peak/off-peak, this should be specified in a note. Please note that the call connection charge is not a per-minute charge, but a per call fee.

Mobile cellular - price of a one-minute local call (peak, to fixed) (i153_low_pf)

Mobile cellular - price of a one-minute local call (peak, to fixed) refers to the price per minute of a peak rate call from a mobile-cellular telephone to a fixed-telephone subscriber. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - price of one-minute local call (off-peak, to fixed) (i153_low_pof)

Mobile cellular - price of one-minute local call (off-peak, to fixed) refers to the price per minute of an off-peak rate call from a mobile-cellular telephone to a fixed-telephone subscriber. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

(continued)

Mobile cellular - price of a one-minute local call (peak, on-net) (i153_low_pn)

Mobile cellular - price of a one-minute local call (peak, on-net) refers to the price per minute of a call made from a mobile-cellular network to a mobile-cellular subscriber of the same network during peak time. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - price of a one-minute local call (off-peak, on-net) (i153_low_pon)

Mobile cellular - price of a one-minute local call (off-peak, on-net) refers to the price per minute of a call from a mobile-cellular telephone to the same mobile-cellular network during off-peak time. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - price of a one-minute local call (peak, off-net) (i153_low_po)

Mobile cellular - price of a one-minute local call (peak, off-net) refers to the price per minute of a peak rate call from a mobile-cellular telephone to a mobile-cellular subscriber of another (competing) network. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - price of a one-minute local call (off-peak, off-net) (i153_low_poo)

Mobile cellular - price of a one-minute local call (off-peak, off-net) refers to the price per minute of an off-peak rate call from a mobile-cellular telephone to a mobile-cellular subscriber of another (competing) network. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - price of SMS (on-net) (i153_low_psms)

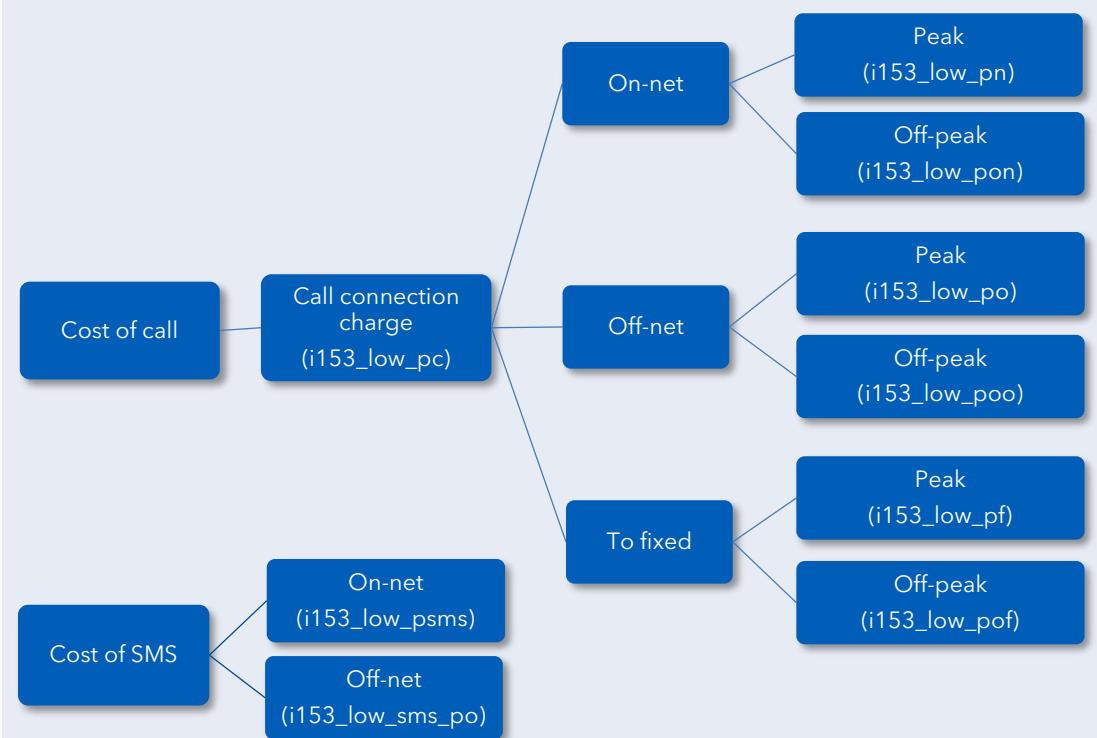
Mobile cellular - price of SMS (on-net) refers to the price of sending a short-message service (SMS) message from a mobile-cellular telephone to a mobile-cellular number of the same network (on-net). Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Mobile cellular - price of SMS (off-net) (i153_low_sms_po)

Mobile cellular - price of SMS (off-net) refers to the price of sending a short-message service (SMS) message from a mobile-cellular telephone to a mobile-cellular number of a competing network (off-net). Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

(continued)

Figure 73: Composition of mobile-cellular basket



Source: ITU

(continued)

Clarifications and scope:

The *mobile-cellular connection charge (i151p)* refers to the one-time amount paid to have a prepaid mobile-telephone service. Cost of the handset, deposits, other refundable amounts, transfer fees and equipment charges should be excluded. This indicator does not cover the connection charge for a postpaid mobile service, a fixed-telephone service or a mobile data service. If the connection charge includes an initial communications credit, this should be specified in a note.

If calls are charged in seconds or other intervals, they should be converted to one-minute equivalents. If the same price applies across all networks (on-net, off-net, to fixed), then that price should be used.

For Indicators i153_low_pn, i153_low_po and i153_low_pf, if there are different peak prices, use the one that is the most expensive during the daytime. The peak-rate time period should be included in a note. It does not cover other time periods (e.g., evening, weekend).

For Indicators i153_low_pon, i153_low_poo, i153_low_pof, if there are several off-peak times on weekdays, the cheapest time before midnight should be used. The off-peak rate time period should be included in a note.

For Indicator i153_low_pc, if the charge differs according to whether the call is on-net/off-net or peak/off-peak, this should be specified in a note. Please note that this differs from the other sub-indicators; it is not a per-minute charge, but a one-off fee applying to each call.

The i153_low_psms and i153_low_sms_po refer to the price of a domestic text message and not an international message. If there are different peak and off-peak rates, they should be averaged. The indicator refers to the default price a prepaid user pays to send an SMS. Therefore, it should refer to the price paid without consideration of special SMS packages, "buckets", discounts of free SMS for recharging, etc. It does not cover the price of an international SMS or the price of SMS sent from computers. If there is no distinction between on-net and off-net SMS pricing, then the price of sending a normal SMS should be used. In countries applying receiving party pays (RPP), users may be charged to receive a text message. If this is the case, it should be specified in a note.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of mobile-cellular subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

The underlying indicators in the mobile-cellular low-usage basket listed above should refer to the same operator and plan.

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and inclusion of an initial credit in the connection charge. In some countries, the connection charge refers to the price of the SIM card needed to access the network. Many operators include free calls or text messages in the connection charge in order to attract customers to their network. This can affect the comparability of the indicator because it makes the connection charge effectively zero or of significantly low value.

Lack of comparability may arise because of differences in prices, for instance, use of most expensive rate if there is more than one peak rate.

Lack of comparability may arise because of differences in on-net/off-net rates, e.g., where there is no distinction between them.

(continued)

Example:

Prepaid mobile-cellular prices for Orange, the largest mobile operator in Senegal (by number of subscriptions), are shown below. The data are then mapped to the corresponding prepaid price indicator.

Table 24: Prepaid mobile prices, Orange Senegal, October 2011

You pay XOF 2 000 for the Prepay Starter Pack and get XOF 2 000 worth of initial communications credit. Scratch cards are available in XOF 1 000, 2 500, 5 000, 10 000 or 25 000 denominations (VAT included).

Destination	Price/minute
Calls to Orange mobiles - Peak (0600 - 0000 hours)	XOF 85
Calls to Orange mobile - Off-peak (0000 - 0600 hours)	XOF 50
Calls to fixed lines	XOF 85
Calls to other mobile operators	XOF 85
SMS on-net	XOF 20
SMS off-net	XOF 30
Destination	Price/minute

Source: Adapted from Orange Senegal. Extracted in October 2011 from <http://www.orange.sn/>.

Prepaid mobile prices, methodology for conversion to the appropriate indicator

Indicator	Peak	Off-peak	Note
Mobile-cellular prepaid connection charge	2 000		Including VAT. XOF 2 000 worth of credit
Mobile-cellular prepaid - price of a local call per minute (on-net)	85	85	VAT already included.
Mobile-cellular prepaid - price of a local call per minute (off-net)	85	85	VAT already included
Mobile-cellular prepaid - price of a local call per minute (to fixed)	85	85	VAT already included
Mobile-cellular prepaid - price of SMS (on-net)	20		VAT already included
Mobile-cellular prepaid - price of SMS (off-net)	30		VAT already included

Note: Since the off-peak period is after midnight, it is not used. Instead, the peak rate is taken. Since there is no weekend price, the normal (peak) price is also used for the weekend.

(continued)

Relevance:

The connection charge (i151p) made to activate a prepaid subscription may be a relevant cost faced by the final consumer if it is applied by operators. As such it should be counted for in any benchmarking when effective costs of using the service is to be performed.

In many countries mobile calls are charged based on each minute consumed. These unit prices may vary a lot depending on the destination network (on-net/ off- net/ fixed) or the moment of the day with high (peak) or low (off- peak) demand. Hence, all these different unit prices (per minute) are to be collected if benchmarking is to be performed.

179. Rules applied in collecting mobile broadband data and voice prices:

1. Prices should be collected based on 3G technologies or above, such as UMTS, HSDPA+/HSDPA, CDMA2000, IEEE 802.16e, LTE, LTE-Advanced, and WiMAX/Wireless MAN. Prices applying to WiFi or hotspots should be excluded.
2. Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.
3. Only residential, single user prices should be collected. If prices vary between different regions of the country, prices applying to the largest city (in terms of population) or to the capital city should be provided.
4. Prices refer to the most common contract modality (prepaid/postpaid) in the country. If more than 50 per cent of mobile-cellular subscriptions are postpaid, then a postpaid plan should be chosen. Otherwise a prepaid plan should be selected.
5. Prices should be collected from the operator with the largest market share measured by the number of mobile-cellular subscriptions.
6. The validity period considered for the basket is 30 days or four weeks. If a plan with a validity of 15 days is selected, it will be taken twice to cover the whole period. Likewise, if a plan with a validity of a day or a week is selected, it will be taken as many times as necessary to cover a period of four weeks. The cheapest plan on the basis of a validity period of 30 days or four weeks should be selected.
7. Price data should be collected for two data and voice baskets separately. The cheapest plan meeting the requirements of each data and voice basket should be selected:
 - a. Low-usage data and voice basket: 70 minutes, 20 SMS and 500 MB.
 - b. High-usage data and voice basket: 140 minutes, 70 SMS and 1.5 GB.
8. The selected plan should not necessarily be the one with the data, voice and SMS allowances closest to the consumption set for each data and voice basket, but rather the cheapest including the minimum allowances set for each consumption profile. For example, if an operator offers a plan including 35 minutes, 10 SMS and 250 MB, and a plan including 1 GB and unlimited domestic voice and SMS, either twice the first plan (if the package can be purchased twice per month) or the second plan could be selected for the low-consumption data and voice basket. The cheapest option should be chosen. Data volumes should refer to both upload and download data volumes. If prices are linked to 'hours of use' and not to data volumes, this information should be added in a separate note. Note: ITU will most likely not be able to include these cases in a comparison.

9. The excess price per voice minute should be reported as the on-net prices. If different peak and off-peak prices exist, an average will be reported. If prices vary between minutes (1st minute = price A, 2nd minute = price B, call set-up rate= C), the per minute cost of a two-minute call should be reported (i.e., (A+B+C)/2). Call set-up rates should be included in the per-minute price of excess usage and indicated in the corresponding note. If the excess price reported corresponds to a package of minutes, the total price for the package should be reported and the number of minutes included should be specified in a note.
10. The excess price per SMS should be reported as the on-net SMS price. If different peak and off-peak prices exist, the average will be reported. If the excess price reported corresponds to a package of SMS, the total price for the package should be reported and the number of SMS included should be specified in a note.
11. Pay-as-you-go offers should be used when they are the cheapest option for a given data and voice basket or the only option available. If operators charge different pay-as-you-go rates depending on the time of the day (peak/off-peak), then the average of both should be recorded. Night-time data allowances will not be considered.
12. Even if the plan is advertised as 'unlimited', the fine print should be carefully reported since most often there are limits in the data volumes (e.g., fair usage policies), either applied by throttling (limiting the speed) or by cutting the service.
13. Non-recurrent fees, such as installation/set-up fees are not collected.
14. Preference should be given to the cheapest available package even if this is bundled with other services (e.g., online TV content). If the plan chosen includes other services besides data, voice and SMS, these should be specified in a note. Zero-rated services (i.e., services that can be consumed besides the monthly allowances) should be specified in a note.
15. Prices refer to a regular (non-promotional) plan and exclude promotional offers and limited discounts or special user groups (for example, existing clients). Special prices that apply to a certain type of phone (e.g., iPhone, iPad) should be excluded. Allowances during the night are not included.

180. Due to the rapid success in mobile broadband adoption since the deployment of 3G and 4G/LTE networks, ITU adopted during 2012 and 2013 specific indicators to capture prices for mobile broadband plans, be it in the prepayment or in the post-payment mode¹⁴. Note that the following two indicators have been updated to consumption volumes approved in EGTI meeting 2018, when the consumption assumed of data was increased to 1.5 GB per month. Additionally, the distinction between hand-set based consumption and computer-based usage has been eliminated for price data collection purposes.

¹⁴ "New telecommunication/ICT indicators from administrative data sources 2011- 2013", Covering Note, Telecommunication Development Bureau, ITU, February 2014.

Basket 2: Mobile broadband data and voice basket: low usage

Indicators and definitions:

Mobile broadband data and voice low usage basket is based on a monthly data usage of a minimum of 500 MB, 70 minutes, and 20 SMS. For plans that limit the monthly amount of data transferred by including data volume caps below 500 MB, the cost for the additional bytes is added to the basket. The minimum speed of a broadband connection is 256 kbit/s. The data and voice basket is based on the most common contract modality (prepaid or postpaid) in the given economy, i.e., if more than 50 per cent of subscriptions are prepaid, then prepaid is selected. Likewise, if more than 50 per cent of subscriptions are postpaid, then a postpaid plan is selected. The low-consumption data and voice basket consists of the indicators as specified below.

Data and voice low-usage basket, operator (i271mb_low_Opf)

Data and voice low-usage basket, operator refers to the name of the selected operator with the largest market share (measured by the number of mobile-cellular subscriptions) for which prices are collected.

Data and voice low-usage basket, name of the plan (i271mb_low_Plan)

Data and voice low-usage basket, name of the plan refers to the name of the selected plan for which prices are collected.

Data and voice low-usage basket, tax rate included (i271mb_low_tax)

Data and voice low-usage basket, tax rate included refers to the tax rate applicable to and included in the data and voice prices.

Data and voice low-usage basket, link (i271mb_low_link)

Data and voice low-usage basket, link refers to the website link of the selected plan.

Data and voice low-usage basket, price of the plan (i271mb_low_bs)

Data and voice low-usage basket, price of the plan refers to the price of the selected plan. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data and voice low-usage basket, data cap, in MB (i271mb_low_c)

Data and voice low-usage basket, data cap, in MB refers to the maximum amount of Internet data, in megabytes (MB), included in the selected plan.

Data and voice low-usage basket, price of excess usage, per MB (i271mb_low_cp)

Data and voice low-usage basket, price of excess usage, per MB refers to price per additional megabyte (MB) of Internet data downloaded once the allotted limit of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data and voice low-usage basket, minutes included (i271mb_low_min)

Data and voice low-usage basket, minutes included refers to the maximum number of voice minutes included in the selected base plan that can be consumed within the given validity period. For more information on the validity period, see indicator *data and voice low-usage basket, validity of plan (i271mb_low_v)* below.

Data and voice low-usage basket, price of excess voice, per minute (i271mb_low_xmin)

Data and voice low-usage basket, price of excess voice, per minute refers to the price per additional voice minute once the allotted limit of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

(continued)

Data and voice low-usage basket, SMS included (i271mb_low_sms)

Data and voice low-usage basket, SMS included refers to the maximum number of SMS included in the selected base plan that can be consumed within the given validity period. For more information on the validity period, see indicator *data and voice low-usage basket, validity of plan (i271mb_low_v)* below.

Data and voice low-usage basket, price of excess SMS, per SMS (i271mb_low_xsms)

Data and voice low-usage basket, price of excess SMS, per SMS refers to the prices per additional SMS once the allotted limited of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data and voice low-usage basket, validity of plan (days) (i271mb_low_v)

Data and voice low-usage basket, validity of plan (days) refers to the validity (in number of days) of the selected base plan.

Data and voice low-usage basket, technology used (i271mb_low_Tech)

Data and voice low-usage basket, technology used refers to the type of technology used (e.g., UMTS, LTE) for the selected plan.

Clarifications and scope:

Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.

Prices refer to the most common contract modality (prepaid/postpaid) in the country. If more than 50 per cent of mobile-broadband subscriptions are postpaid, then a postpaid plan should be chosen. Otherwise a prepaid plan should be selected.

Prices should be collected for the cheapest available plan meeting the criteria of the basket. In this case, the cheapest plan offering at least 500 MB data, 70 minutes voice, and 20 SMS is to be selected, and not necessarily a plan closest to the data cap or minutes/SMS allocation.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of mobile-cellular subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

The underlying indicators in the data and voice low-usage basket listed above should refer to the same operator and plan.

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and differences in on-net/off-net rates, e.g., where there is no distinction between them. Many operators include free calls or text messages in the connection charge in order to attract customers to their network. This can affect the comparability of the indicator because it makes the connection charge effectively zero or of significantly low value.

Indicators i271mb_low_c, i271mb_low_min and 271mb_low_sms are not applicable when there is no cap on the monthly subscription. Differences in the treatment of exceeding the allocated cap may lead to restricted comparability.

Indicator i271mb_low_cp is not applicable when there is no cap on the monthly broadband subscription. Lack of comparability may arise because of differences in units (e.g., hours instead of MB) and treatment of limits (for instance, a reduction in speed when a monthly limit is exceeded instead of the application of a charge for excess usage). Similarly, lack of comparability could arise from the following indicators when there is no cap: i271mb_low_xmin, i271mb_low_xsms.

Relevance:

Bundling of mobile services such as voice, SMS, and data has become an increasingly widespread practice across the world. Collecting prices for bundles allows following the market dynamics. In order to capture the price points of various user patterns, both low and high consumption baskets are collected for data and voice basket.

Basket 3: Mobile broadband data and voice basket: high usage

Indicators and definitions:

Mobile broadband data and voice high-usage basket is based on a monthly data usage of a minimum of 1.5 GB, 140 minutes, and 70 SMS. For plans that limit the monthly amount of data transferred by including data volume caps below 1.5 GB, the cost for the additional bytes is added to the basket. The minimum speed of a broadband connection is 256 kbit/s. The data and voice basket is based on the most common contract modality (prepaid or postpaid) in the given economy, i.e., if more than 50 per cent of subscriptions are prepaid, then prepaid is selected. Likewise, if more than 50 per cent of subscriptions are postpaid, then a postpaid plan is selected. The high-usage data and voice basket consists of the indicators as specified below.

Data and voice high-usage basket, operator (i271mb_high_Opf)

Data and voice high-usage basket, operator refers to the name of the selected operator with the largest market share (measured by the number of mobile-cellular subscriptions) for which prices are collected.

Data and voice high-usage basket, name of the plan (i271mb_high_Plan)

Data and voice high-usage basket, name of the plan refers to the name of the selected plan for which prices are collected.

Data and voice high-usage basket, tax rate included (i271mb_high_tax)

Data and voice high-usage basket, tax rate included refers to the tax rate applicable to and included in the data and voice prices.

Data and voice high-usage basket, link (i271mb_high_link)

Data and voice high-usage basket, link refers to the website link of the selected plan.

Data and voice high-usage basket, price of the plan (i271mb_high_bs)

Data and voice high-usage basket, price of the plan refers to the price of the selected plan. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data and voice high-usage basket, data cap, in GB (i271mb_high_c)

Data and voice high-usage basket, data cap, in GB refers to the maximum amount of Internet data, in gigabytes (GB), included in the selected base plan.

Data and voice high-usage basket, price of excess usage, per GB (i271mb_high_cp)

Data and voice high-usage basket, price of excess usage, per GB refers to the price per additional gigabyte (GB) of Internet data downloaded once the allotted limit of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data and voice high-usage basket, minutes included (i271mb_high_min)

Data and voice high-usage basket, minutes included refers to the maximum number of voice minutes included in the selected base plan that can be consumed within the given validity period. For more information on the validity period, see indicator data and voice high-usage basket, validity of plan (i271mb_high_v) below.

Data and voice high-usage basket, price of excess voice, per minute (i271mb_high_xmin)

Data and voice high-usage basket, price of excess voice, per minute refers to the price per additional voice minute once the allotted limit of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

(continued)

Data and voice high-usage basket, SMS included (i271mb_high_sms)

Data and voice high-usage basket, SMS included refers to the maximum number of SMS included in the selected base plan that can be consumed within the given validity period. For more information on the validity period, see indicator data and voice high-usage basket, validity of plan (i271mb_high_v) below.

Data and voice high-usage basket, price of excess SMS, per SMS (i271mb_high_xsms)

Data and voice high-usage basket, price of excess SMS, per SMS refers to the price per additional SMS once the allotted limit of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data and voice high-usage basket, validity of plan (days) (i271mb_high_v)

Data and voice high-usage basket, validity of plan refers to the validity (in number of days) of the selected base plan.

Data and voice high-usage basket, technology used (i271mb_high_Tech)

Data and voice high-usage basket, technology used refers to the type of technology used (e.g., UMTS, LTE) for the selected plan.

Clarifications and scope:

Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.

Prices refer to the most common contract modality (prepaid/postpaid) in the country. If more than 50 per cent of mobile-broadband subscriptions are postpaid, then a postpaid plan should be chosen. Otherwise a prepaid plan should be selected.

Prices should be collected for the cheapest available plan meeting the criteria of the basket. In this case, the cheapest plan with at least 1.5 GB, 140 minutes, and 70 SMS is to be selected, and not necessarily a plan closest to the data cap or minutes/SMS allocation.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of mobile-cellular subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

The underlying indicators in the data and voice high-usage basket listed above should refer to the same operator and plan.

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and differences in on-net/off-net rates, e.g., where there is no distinction between them. Many operators include free calls or text messages in the connection charge in order to attract customers to their network. This can affect the comparability of the indicator because it makes the connection charge effectively zero or of significantly low value.

Indicators i271mb_high_c, i271mb_high_min and i271mb_high_sms are not applicable when there is no cap on the monthly subscription. Differences in the treatment of exceeding the allocated cap may lead to restricted comparability.

Indicator i271mb_high_cp is not applicable when there is no cap on the monthly broadband subscription. Lack of comparability may arise because of differences in units (e.g., hours instead of GB) and treatment of limits (for instance, a reduction in speed when a monthly limit is exceeded instead of the application of a charge for excess usage). Similarly, lack of a cap restricts comparability for the following indicators: i271mb_high_xmin, i271mb_high_xsms.

Relevance:

Bundling of mobile services such as voice, SMS, and data has become an increasingly widespread practice across the world. Collecting prices of bundles allows a better monitoring of market dynamics. In order to capture price points of various user patterns, both low and high consumption baskets are collected for data and voice basket.

181. Rules applied in collecting mobile-broadband data only prices:

1. Prices should be collected based on 3G technologies or above, such as UMTS, HSDPA+/HSDPA, CDMA2000, IEEE 802.16e, LTE, LTE-Advanced and WiMAX/Wireless MAN. Prices applying to WiFi or hotspots should be excluded.
2. Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.
3. Only residential, single user prices should be collected. If prices vary between different regions of the country, prices applying to the largest city (in terms of population) or to the capital city should be provided.
4. Prices refer to the most common contract modality (prepaid/postpaid) in the country. If more than 50 per cent of mobile-broadband subscriptions are postpaid, then a postpaid plan should be chosen. Otherwise a prepaid plan should be selected.
5. Mobile-broadband prices should be collected from the operator with the largest market share measured by the number of mobile-broadband subscriptions. If this information is not available, mobile-broadband prices should be collected from the mobile-cellular operator with the largest market share (measured by the number of mobile-cellular subscriptions) in the country.
6. The validity period considered for the basket is 30 days or four weeks. If a plan with a validity of 15 days is selected, it will be taken twice to cover the whole period. Likewise, if a plan with a validity of a day or a week is selected, it will be taken as many times as necessary to cover a period of four weeks. The cheapest plan on the basis of a validity period of 30 days or four weeks should be selected.
7. Price data should be collected for the cheapest plan with a data volume allowance of a minimum of 1.5 GB per month (irrespective of the device used). The selected plan should not necessarily be the one with the cap closest to 1.5 GB, but include a minimum of 1.5 GB. For example, if an operator offers a 500 MB and a 2 GB plan, the 2 GB plan or three times the 500 MB plan (if the package can be purchased thrice for a monthly capacity of 1.5 GB) could be selected for the data-only mobile-broadband basket. The cheapest option should be chosen. Data volumes should refer to both upload and download data volumes. If prices are linked to 'hours of use' and not to data volumes, this information should be added in a separate note. Note: ITU will most likely not be able to include these cases in a comparison.
8. Pay-as-you-go offers should be used when they are the cheapest option for a given basket or the only option available. If operators charge different pay-as-you-go rates depending on the time of the day (peak/off-peak), then the average of both should be recorded. Nighttime data allowances will not be considered.
9. Even if the plan is advertised as 'unlimited', the fine print should be carefully reported since most often there are limits in the data volumes (e.g., fair usage policies), either applied by throttling (limiting the speed) or by cutting the service.
10. Non-recurrent fees, such as installation/set-up fees are not collected.
11. Preference should be given to the cheapest available package even if this is bundled with other services (with voice services, for example). If the plan chosen includes other services besides mobile-broadband access, these should be specified in a note. Zero-rated services (i.e., services that can be consumed besides the monthly data allowance) should be specified in a note.

12. Prices refer to a regular (non-promotional) plan and exclude promotional offers and limited discounts or special user groups (for example, existing clients). Special prices that apply to a certain type of phone (e.g., iPhone, iPad) should be excluded. Allowances during the night are not included

Basket 4: Mobile-broadband data-only basket

Indicators and definitions:

Mobile broadband *data-only basket* is based on a monthly data usage of a minimum of 1.5 GB. For plans that limit the monthly amount of data transferred by including data volume caps below 1.5 GB, the cost for the additional bytes is added to the basket. The minimum speed of a broadband connection is 256 kbit/s. The data-only mobile-broadband basket is based on the most common contract modality (prepaid or postpaid) in the given economy, i.e., if more than 50 per cent of subscriptions are prepaid, then prepaid is selected. Likewise, if more than 50 per cent of subscriptions are postpaid, then a postpaid plan is selected. The data-only mobile-broadband price basket consists of the indicators as specified below.

Data-only mobile broadband 1.5GB, operator (i271mb_Opf)

Data-only mobile broadband 1.5GB, operator refers to the name of the selected operator with the largest market share measured by the number of mobile-broadband subscriptions. If this information is not available, mobile-broadband prices should be collected from the mobile-cellular operator with the largest market share (measured by the number of mobile-cellular subscriptions).

Data-only mobile broadband 1.5GB, name of the plan (i271mb_Plan)

Data-only mobile broadband 1.5GB, name of the plan refers to the name of the selected plan for which prices are collected.

Data-only mobile broadband 1.5GB, tax rate included (i271mb_tax)

Data-only mobile broadband 1.5GB, tax rate included refers to the tax rate applicable to and included in the mobile-broadband prices.

Data-only mobile broadband 1.5GB, link (i271mb_link)

Data-only mobile broadband 1.5GB, link refers to the website link of the selected plan.

Data-only mobile broadband 1.5GB, price of the plan (i271mb_bs)

Data-only mobile broadband 1.5GB, price of the plan refers to the price of the selected plan. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data-only mobile broadband 1.5GB, data cap, in GB (i271mb_c)

Data-only mobile broadband 1.5GB, data cap, in GB refers to the maximum amount of Internet data, in gigabytes (GB), included in the selected base plan.

Data-only mobile broadband 1.5GB, price of excess usage, per GB (i271mb_cp)

Data-only mobile broadband 1.5GB, price of excess usage, per GB refers to the price per additional gigabyte (GB) of Internet data downloaded once the allotted limit of the selected base plan is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Data-only mobile broadband 1.5GB, validity of plan (days) (i271mb_v)

Data-only mobile broadband 1.5GB, validity of plan (days) refers to the validity (in number of days) of the selected base plan.

Data-only mobile broadband 1.5GB, technology used (i271mb_Tech)

Data-only mobile broadband 1.5GB, technology used refers to the type of technology used (e.g., UMTS, LTE) for the selected plan.

(continued)

Clarifications and scope:

Prices should be collected for the cheapest available plan meeting the criteria of the basket. In this case, the cheapest plan with at least 1.5 GB is to be selected, and not necessarily a plan closest to the data cap.

Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.

Prices refer to the most common contract modality (prepaid/postpaid) in the country. If more than 50 per cent of mobile-broadband subscriptions are postpaid, then a postpaid plan should be chosen. Otherwise a prepaid plan should be selected.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of mobile-broadband subscription or mobile-cellular subscriptions if the former is unavailable). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

The underlying indicators in the data-only mobile-broadband 1.5 GB basket listed above should refer to the same operator and plan.

Methodological issues:

Lack of comparability may arise due to differences in the treatment of taxes.

The *data-only mobile broadband 1.5GB, data cap, in GB (i271mb_c)* indicator is not applicable when there is no cap on the monthly broadband subscription. Differences in the treatment of exceeding the allocated cap may lead to restricted comparability.

The *data-only mobile broadband 1.5GB, price of excess usage, per GB (i271mb_cp)* is not applicable when there is no cap on the monthly broadband subscription. Lack of comparability may arise because of differences in units (e.g., hours instead of GB) and treatment of limits (for instance, a reduction in speed when a monthly limit is exceeded instead of the application of a charge for excess usage).

Relevance:

Many consumers contract mobile broadband plans as stand-alone subscription i.e., without contracting additionally voice services. As the consumption basket assumed in 2018 established a minimum consumption of 1.5 GB per month, it is relevant to collect the cost of this contracting modality.

9.3 Prices of fixed network services

182. This section includes indicators measuring the retail prices paid by consumers for fixed-broadband and fixed telephone services.

183. Given the large number of plans and variations in countries, these price indicators aim for practicality in order to reduce the burden on data compilers and improve comparability of data across countries. The indicators included in this section reflect the scope of the price data collection carried out by ITU, and the constraints of carrying out such comprehensive data collection. Countries may further expand the scope of the collection at the national level by collecting additional indicators to those proposed in this section or by extending the data collection to more operators.

Fixed-broadband prices

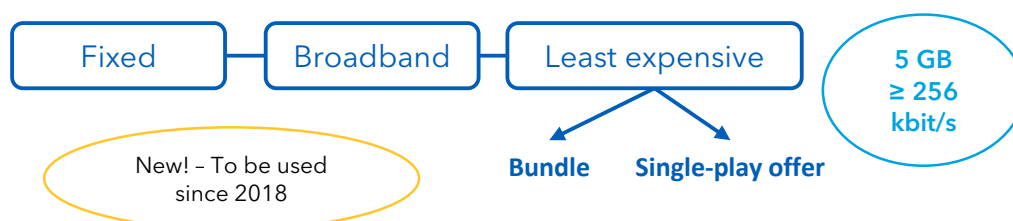
184. Fixed broadband has had a very rapid growth in terms of penetration achieved over households and firms. At the beginning of the 2000's the first fixed broadband connections were offered either via the copper-based network of incumbent operators or via the cable-TV networks deployed. Data speeds were low. With the different xDSL upgrades and transmission standards used with cable-TV networks higher and higher speeds were offered. Fibre deployment in many countries in the last decade has put in place networks that may provide 1 Gbit/s, or even higher transmission speeds.

185. Offered fixed-broadband plans have evolved as well, but the increments in speeds and other quality related parameters has been of a much bigger magnitude.

186. As download/upload broadband speeds increase, much higher volumes of data are in fact used by final consumers. Together with the revision of volumes of minutes and GB consumed in mobile networks, the consumption of fixed broadband was as well analysed and updated by ITU in 2018.

187. The definition of broadband stays at same threshold as before: any connection that provides a connection speed of at least 256 kbit/s, but the amount of GB consumed in a month was increased from 1 GB to 5 GB as a result of the trends occurring in the market.

Figure 74: Revised fixed-broadband price basket



188. A development that is observed in many countries is the selling of the fixed broadband subscription together with telephone service and very often as well with pay TV or mobile services, i.e., bundling. This has implications as well for prices of the service, i.e., the most frequent way of contracting broadband is together with other (more than one) services for example in the United States of America, Canada, and the Europe region.

189. For fixed broadband, the following prices can be compared:

1. individual price of the fixed-broadband connection plus any other relevant costs associated, or else;
2. the (bundled) plans that combines fixed broadband with any other final service integrated in the offer.

190. Rules applied in collecting fixed-broadband prices:

1. The prices of the operator with the largest market share (measured by the number of fixed-broadband subscriptions) should be used.

2. Prices should be collected in the currency they are advertised in, including taxes. If prices are not advertised in local currency, a note should be added specifying the currency.
3. Only residential, single user prices should be collected. If prices vary between different regions of the country, prices applying to the largest city (in terms of the population) should be provided. If that information is not available, prices applying to the capital city should be reported. The selected city should be mentioned in a note in the monthly subscription indicator.
4. From all fixed-broadband plans meeting the above-mentioned criteria, the cheapest one on the basis of a 5 GB monthly usage and an advertised download speed of at least 256 kbit/s should be selected. If there is a price distinction between residential and business prices, the residential prices should be used.
5. If the plan selected has no limit for the monthly data usage, the cap should be set at zero (0) and a note added to that indicator specifying "Unlimited".
6. Plans with limited hours of use will not be considered.
7. In case operators propose different commitment periods, the twelve-month plan (or the one closest to this commitment period) should be used. If the plan selected requires a longer commitment (i.e., above twelve months), it should be indicated in the note of the monthly subscription. Furthermore, if there are different prices (for example, a discounted price for the first year, and a higher price as of the 13th month), then the price after the discount period should be selected (e.g., the price as of the 13th month). The discounted price charged during the initial period should be indicated in a note under the monthly subscription charge. The reason is that the initial price paid is considered a limited/discounted price, while the other one is the regular price.
8. Prices should be collected for the fixed-broadband (access) technology with the greatest number of subscriptions in the country (FTTH, DSL, cable, etc.).
9. The same price plan should be used for collecting all the data specified. For example, if a given Plan A is selected for the fixed-broadband service, according to the criteria mentioned above, the elements in Plan A apply to the monthly subscription, to the price of the excess charge, the volume of data that can be downloaded, etc.
10. Prices should be collected for regular (non-promotional) plans and should not include promotional offers or limited or restricted discounts (for example, only to students, or to already existing customers, etc.).
11. With convergence, operators are increasingly providing multiple (bundled) services such as voice telephony, Internet access and television reception over their networks. They often bundle these offers into a single subscription. This can present a challenge for price data collection since it may not be possible to isolate the prices for one service.
12. The cost of a fixed-telephone line should be excluded if it can be used for other services as well. If a monthly rental for the physical line is not required (e.g., naked DSL), this should be mentioned in a note. If a monthly rental of a fixed-telephone line is required, this should also be explained in a note.

Basket 5: Fixed-broadband 5 GB basket

Definition and indicators:

The *fixed-broadband 5 GB basket* refers to the price of a monthly subscription to an entry level fixed broadband plan. For comparability reasons, the fixed-broadband basket is based on a monthly data usage of a minimum of 5 GB. For plans that limit the monthly amount of data transferred by including data volume caps below 5 GB, the cost for the additional bytes is added to the basket. The minimum speed of a broadband connection is 256 kbit/s. The fixed-broadband 5 GB basket consists of the indicators as specified below.

Fixed broadband, name of ISP (i4213_5GB_ISP)

Fixed broadband, name of ISP refers to the name of the selected Internet service provider with the largest market share (measured by the number of fixed-broadband subscriptions).

Fixed broadband, name of the plan (i4213_5GB_Plan)

Fixed broadband, name of the plan refers to the name of the selected plan for which prices are collected.

Fixed broadband, tax rate (i4213Tax)

Fixed broadband, tax rate refers to the tax rate applicable to and included in the fixed-broadband prices.

Fixed broadband, link (i4213_5GB_Link)

Fixed broadband, link refers to the website link of the selected plan.

Fixed broadband connection charge (i4213_5GB_bc)

Fixed broadband connection charge refers to the initial, one-time charge for a new fixed-broadband Internet connection. Refundable deposits should not be counted. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Fixed broadband monthly subscription charge (i4213_5GB_bs)

Fixed broadband monthly subscription charge refers to the monthly subscription charge for fixed broadband Internet service. Fixed broadband is any dedicated connection to the Internet at downstream speeds equal to, or greater than, 256 kbit/s. If several offers are available, preference should be given to the cheapest meeting the criteria of the basket (e.g., on the basis of a 5 gigabyte (GB) monthly usage).

Fixed broadband cap, in GB (i4213_5GB_bs_c)

Fixed broadband cap, in GB refers to the maximum amount of Internet data, in gigabytes (GB), that can be transferred within a month, included in the fixed-broadband monthly subscription.

Fixed broadband, price of excess usage per GB (i4213_5GB_bs_cp)

Fixed broadband, price of excess usage per GB refers to the price per additional gigabyte (GB) of Internet data downloaded once the monthly allotted limit of the fixed-broadband subscription is used up. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate.

Fixed broadband speed, in Mbit/s (i4213_5GB_bs_s)

Fixed broadband speed, in Mbit/s refers to the advertised maximum theoretical download speed, and not speeds guaranteed to users associated with a fixed-broadband Internet monthly subscription.

Fixed broadband prices, technology used (i4213_5GB_Tech)

Fixed broadband prices, technology used refers to the type of technology used (e.g., DSL, cable, FTTH) for the selected fixed-broadband plan.

(continued)

Clarifications and scope:

The *fixed broadband connection charge (i4213_5GB_bc)* indicator refers to the initial, one-time charge for a new fixed (wired)-broadband Internet connection. The prices should represent the cheapest fixed-broadband plan on the basis of a 1 GB monthly usage. The indicator should exclude refundable deposits, optional charges for installation that can generally be performed by most users (such as connecting the modem to the computer), installation charges for a fixed-telephone line or cable television connection, equipment rentals and any charges that are not required.

The *fixed broadband monthly subscription charge (i4213_5GB_bs)* should include all associated monthly charges for fixed-broadband access. If the ISP charge (the price of accessing Internet content and applications) is separate from the network charge (the price of establishing the physical connection to the Internet), they should be added together. The indicator should refer to the entry-level broadband plan (the cheapest plan with a download speed of at least 256 kbit/s). It should exclude the cost of the fixed-telephone line subscription if it can be used for other services. However, if a monthly rental for the physical line is not required (e.g., naked DSL, which does not require a telephone-line rental), this should be mentioned in a note. If a monthly rental of a fixed-telephone line is required, even though telephone service will not be used, this should be explained in a note. Equipment rentals should also be excluded (e.g., modem). Where plans include other features such as free telephone calls, inclusion of the telephone-line rental or free video programming, it may not be possible to identify the price of broadband Internet access. In that case, it is important to explain in a note what other services are included with the broadband subscription.

The *fixed broadband speed, in Mbit/s (i4213_5GB_bs_s)* indicator refers to the published download speed of the fixed broadband monthly subscription. It does not refer to the actual speed delivered. It refers to fixed broadband, and not to speeds less than broadband or to wireless broadband. The upload speed should be mentioned in a note.

The *fixed broadband cap, in GB (i4213_5GB_bs_c)* indicator refers to any usage cap imposed on the fixed-broadband Internet monthly subscription (expressed in GB). If there is no cap, then the value of zero should be entered. If there are separate caps for domestic and international traffic, then the international cap should be entered and explained in a note. If the cap is expressed in hours, or there are other actions when the cap is exceeded (e.g., no more service for the month, reduction of speed), then this should be explained in a note.

The *fixed broadband, price of excess usage per GB (i4213_5GB_bs_cp)* indicator refers to the additional charges the fixed (wired)-broadband subscriber pays once the Internet data cap is exceeded. This refers to the excess charge per GB that subscribers pay when they exceed the monthly usage allotment. It is applicable to fixed-broadband subscriptions, and not wireless broadband or non-broadband fixed. Where the unit is not Gigabytes (e.g., if it is hours), this should be specified in a note. Cases where there is no excess charge, but service is interrupted, a new monthly subscription is required or the speed is reduced should be specified in a note.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Method of collection:

Data should be collected from the ISP with the largest market share (measured by the number of fixed-broadband subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

The underlying indicators in the fixed-broadband 5 GB basket listed above should refer to the same operator and plan.

(continued)

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes, other charges (such as rental for a fixed- telephone line) and the inclusion of other features (such as free telephone calls). In addition, the indicator is not always comparable because the speed of the minimum broadband entry-level plan (the cheapest plan with a download speed of at least 256 kbit/s) varies between countries. For that reason, it may be useful to supplement this indicator with a measurement of the price per Mbit/s (dividing the monthly subscription charge by the download speed to which it refers). Another factor that may affect comparability is the practice in some countries or operators of separating the broadband access charge from the Internet access charge. The data should refer only to the price of broadband Internet access.

The speed refers to the advertised download speed, not the actual speed that is delivered.

The *fixed broadband cap, in GB (i4213_5GB_bs_c)* indicator is not applicable when there is no cap on the monthly broadband subscription. Differences in the treatment of exceeding the allocated cap may lead to restricted comparability.

The *fixed broadband, price of excess usage per GB (i4213_5GB_bs_cp)* indicator is not applicable when there is no cap on the monthly broadband subscription. Lack of comparability may arise because of differences in units (e.g., hours instead of GB) and treatment of limits (for instance, a reduction in speed when a monthly limit is exceeded instead of the application of a charge for excess usage).

Example:

Batelco is the dominant fixed-broadband provider in Bahrain, and ADSL is the main fixed-broadband technology in the country. Fixed-broadband price data information from Batelco (for October 2011) is shown in Example 29, along with the corresponding indicator and the value that should be used. The 640 kbit/s package is the entry-level offer. There is a monthly cap of 2 GB; any amount after that is charged at the rate of BHD 0.001 per MB. Note that the installation charges (Registration fees) are free. Taxes are already included.

Table 25: Residential fixed broadband and its main components in Bahrain, 2011

	Residential package	Indicator
	Light	
Monthly tariff (VAT included)	BHD 10	Fixed broadband monthly subscription
Monthly data usage allowance (cap), GB	2	Fixed broadband cap
Excess usage charge (VAT incl.)	BHD 0.001 / MB	Fixed broadband price in excess usage
Download speed (Kbit/s)	640	Fixed broadband speed
Registration fees	0	Fixed broadband connection charge

Source: Adapted from Batelco, extracted March 2011 from http://www.batelco.com/portal/broadband/broadband_packages.asp.

(continued)

Relevance:

The main element to be compared when benchmarking fixed broadband costs is the recurrent (monthly) subscription fee.

If a broadband offer allows for a consumption of data (uploading and downloading) smaller than 5 GB, then in order to make this offer comparable with the rest, which allow at least 5 GB per month, the cost of using broadband for 5 GB will be calculated as the price of the monthly subscription (i4213_5GB_bs_c) plus the price (per MB) in excess of usage of indicator i4213_5GB_bs_cp for the amount needed to reach the 5 GB consumption threshold.

When collecting prices for broadband some additional elements of the plans are relevant for collection, such as speed, data caps, additional restrictions or services included in the offer otherwise the comparability may be hindered.

9.4 Fixed telephone service prices

191. Fixed local telephone service prices refer to the consumer cost for subscribing to and using the public switched telephone network (PSTN). In some countries, installation and subscription charges vary according to category of user (residential and business). There are separate indicators that reflect this difference. Some countries also have a variety of fixed-line plans with varying levels of free calls or minutes included. Prepaid options are also available in some countries. Some operators may offer VoIP plans using a broadband connection.

192. The price indicators in this section refer to postpaid, entry-level PSTN charges. The fixed-telephone price data components (installation fee, monthly subscription and cost of a local call) should refer to the same plan.

193. Due to trends observed in the marketplace these indicators on voice and access to PSTN lines are no longer to be collected by ITU. On voice services only mobile provided (originated) calls are to be collected and benchmarked.

Indicator 9.1: Installation fee for residential telephone service (i151)

Definition:

Installation fee for residential telephone service refers to the one-off charge involved in applying for a basic residential fixed-telephone service.

Clarifications and scope:

This indicator refers to the one-time amount paid to have a residential fixed-telephone service connected. If there are multiple plans available, the preference is for the entry-level, fixed, PSTN, postpaid service. If this is not the case, it should be specified in a note. This indicator does not cover installation charges for business users, installation charges for a fixed-broadband service or installation charges for voice services provided over mobile-cellular networks. It excludes deposits, other refundable amounts, and transfer fees. Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Where there are different charges for different exchange areas, the charge for the largest urban area in terms of population should be used, and this should be specified in a note. If different prices apply to the installation of a fixed-telephone line – depending on whether an apartment/house was previously connected to a fixed line, or not – the connection fee of a new but previously existing fixed-telephone line should be provided. A note should specify the price for installing a completely new line.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

This Indicator (i151) should refer to the same operator and plan used for Indicator 9.2: Monthly subscription for residential telephone service (i152), Indicator 9.3 (Price of a three-minute local call to a fixed-telephone line) and Indicator 9.4 (Price of a three-minute local call to a mobile-cellular phone).

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and the choice of service reported. In particular, there are often ranges of prices associated with acquiring residential fixed-telephone services that vary according to the circumstances. These can include refundable deposits, different charges depending on whether it is a new installation or a transfer, different charges depending on whether or not the internal wiring exists, and charges for equipment purchase. Although only one-off, non-refundable, required charges should be included, this may not always be possible.

Relevance:

This indicator on fixed voice service is no longer to be collected by ITU.

Indicator 9.2: Monthly subscription for residential telephone service (i152)

Definition:

Monthly subscription for residential telephone service refers to the recurring fixed charge for subscribing to a residential postpaid PSTN service. The charge should cover the rental of the line, but not the rental of the terminal (e.g., telephone set), where the terminal equipment market is liberalized. If the rental charge includes any allowance for free or reduced-rate call units, this should be indicated.

Clarifications and scope:

This indicator refers to entry-level monthly rental for a residential fixed-telephone line. The preference is for a plan without the inclusion of free minutes or calls. If all plans contain free minutes or calls, the number of such should be specified in a note. Rentals that are charged on some other periodicity should be converted to monthly equivalents. It does not include a business fixed telephone line monthly subscription or a fixed (wired) broadband Internet monthly subscription. Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Where there are different charges for different exchange areas, the charge for the largest urban area in terms of population should be used, and this should be specified in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

This Indicator (i152) should refer to the same operator and plan used for Indicator 9.1: Installation fee for residential telephone service (i151), Indicator 9.3 (Price of a three-minute local call to a fixed-telephone line) and Indicator 9.4 (Price of a three-minute local call to a mobile-cellular phone).

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and the choice of plan reported. In particular, some countries/operators may only offer plans that include a certain number of minutes. Higher subscription charges may result from the inclusion of usage charges or low usage charges.

Relevance:

This indicator on fixed voice service is no longer to be collected by ITU.

Indicator 9.3: Price of a three-minute call to a fixed-telephone line

Definition:

Price of a three-minute local call to a fixed-telephone line refers to the price of a three-minute local call from a residential fixed-telephone line, including any call set-up charges, within the same exchange area using the subscriber own terminal (i.e., not from a public telephone). The indicator should be split as follows:

Indicator 9.3a: Price of a three-minute local call to a fixed-telephone line, peak rate (i153)

The price of a three-minutes local call originated and ended in a fixed number is composed of the set-up charge, if any, required to initiate the local call plus the variable charge, if it applies, to a call with a three minutes duration. The set-up charge is to be distributed over the three minutes duration call. The relevant costs refer to a call initiated in a fixed telephony subscription with a local destination, e.g., the same metropolitan area as the origination. This indicator refers to the (set-up and variable charges) that apply to a peak-call, i.e., a call made during the high demand periods for calling as defined by the operator (usually they cover calls made during the day on week days).

Indicator 9.3b: Price of a three-minute local call to a fixed-telephone line, off-peak rate (i153o)

The price of a three minutes local call originated and ended in a fixed number is composed of the set-up charge, if any, required to initiate the local call plus the variable charge, if it applies, to a call with a three minutes duration. The set-up charge is to be distributed over the three minutes duration call. The relevant costs refer to a call initiated in a fixed telephony subscription with a local destination, e.g., the same metropolitan area as the origination. This indicator refers to the (set-up and variable charges) that apply to an off-peak call, i.e., a call made during the low demand periods for calling as defined by the operator (usually they cover calls made during night periods or during weekends).

Clarifications and scope:

This indicator refers to the price of a three-minute local call from a residential fixed-telephone line to another fixed-telephone line. It does not refer to a fixed-to-mobile call, nor to a fixed-to-fixed long-distance call.

If calls are charged on a flat-rate basis (e.g., one price for a call of unlimited length), this should be indicated in a note. If there is no charge for local calls (usage included in the subscription charge), then the value entered should be zero, and this should be indicated in a note. If other particular plan structures apply (e.g., users are charged per call or per hour), this should be indicated in a note. If there is a different price for the telephone usage portion of dial-up Internet or if telephone usage charges are not applied to dial-up Internet, this should be indicated in a note. If there is no distinction between peak and off-peak, then for Indicator 9.3b, the peak rate should be entered.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Where there are different charges for different exchange areas, the charge for the largest urban area in terms of population should be used, and this should be specified in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

(continued)

Relationship with other indicators:

This Indicator (i153) and Indicator 9.3b. Price of a three-minute fixed-telephone local call (off-peak rate) (i153o) complement each other, and should refer to the same operator and plan used for Indicator 9.1: Installation fee/ for residential telephone service (i151), Indicator 9.2: Monthly subscription for residential telephone service (i152), and Indicator 9.4 (Price of a three-minute local call to a mobile-cellular phone).

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes, charging basis (e.g., flat-rate basis) and method of charging for dial-up Internet.

Relevance:

This indicator on fixed voice service is no longer to be collected by ITU.

Indicator 9.4: Price of a three-minute-call to a mobile-cellular phone (i153fm)

Definition:

Price of a three-minute local call to a mobile-cellular phone refers to the price of a three-minute local call from a residential fixed-telephone line, including any call set-up charges, to a mobile-cellular number. The indicator should be split as follows:

Indicator 9.4a: Price of a three-minute local call to a mobile-cellular phone (peak rate)

Indicator 9.4b: Price of a three-minute local call to a mobile-cellular phone (off-peak rate)

Clarifications and scope:

This refers to the price of a three-minute local call from a residential fixed-telephone line to a mobile-cellular number. The definition applies to both peak and off-peak calls, according to the time of the day when the call is made.

If calls are charged on a flat-rate basis (e.g., one price for a call of unlimited length), this should be indicated in a note. If there is no charge for local calls (usage included in the subscription charge), then the value entered should be zero, and this should be indicated in a note. If other particular plan structures apply (e.g., users are charged per call or per hour), this should be indicated in a note. If there is a different price for the telephone usage portion of dial-up Internet, or if telephone usage charges are not applied to dial-up Internet, this should be indicated in a note. For Indicator 9.4b, if there is no distinction between peak and off-peak, then the peak rate should be entered.

Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Where there are different charges for different exchange areas, the charge for the largest urban area in terms of population should be used, and this should be specified in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

Indicator 9.4a and Indicator 9.4b complement each other, and should refer to the same operator and plan used for Indicator 9.1: Installation fee for residential telephone service (i151), Indicator 9.2: Monthly subscription for residential telephone service (i152), and Indicator 9.3 (Price of a three-minute local call to a fixed-telephone line).

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes, charging basis (e.g., flat-rate basis) and method of charging for dial-up Internet.

Relevance:

This indicator on fixed voice service is no longer to be collected by ITU.

Indicator 9.5: Installation fee for business telephone service (i151b)

Definition:

Installation fee for business telephone service refers to the one-off charge involved in applying for a business basic fixed-telephone service.

Clarifications and scope:

This indicator refers to the one-time amount paid to have a business fixed-telephone service connected. Deposits, other refundable amounts and transfer fees should be excluded. If there are multiple plans available, the preference is for the entry-level, fixed, PSTN, postpaid service. If this is not the case, it should be specified in a note. This indicator does not cover installation charges for residential users or installation charges for voice services provided over mobile-cellular networks. If there is no distinction between residential and business subscribers, the residential charge should be reported. Taxes should be included. If taxes are not included, this information, and the applicable tax rate, should be provided in a note.

Where there are different charges for different exchange areas, the charge for the largest urban area in terms of population should be used, and this should be specified in a note. If different prices apply to the installation of a fixed-telephone line – depending on whether the premises where the business is located were previously connected to a fixed line, or not – the connection fee of a new but previously existing fixed-telephone line should be provided. A note should specify the price for installing a completely new line.”

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

Indicator i151b should refer to the same operator and plan used for Indicator i152b (Monthly subscription for business telephone service).

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and the choice of service reported.

Relevance:

This indicator on fixed voice service is no longer to be collected by ITU

Indicator 9.6: Monthly subscription for business telephone service (i152b)

Definition:

Monthly subscription for business telephone service refers to the recurring fixed charge for subscribing to a postpaid fixed telephone service for business use. The charge should cover the rental of the line but not the rental of the terminal (e.g., telephone set), where the terminal equipment market is liberalized. If the rental charge includes any allowance for free or reduced rate call units, this should be indicated.

Clarifications and scope:

This indicator refers to entry-level monthly rental for a business fixed-telephone line. The preference is for a plan without the inclusion of free minutes or calls. If all plans contain free minutes or calls, the least expensive plan should be used and the number of free included minutes or calls should be specified in a note. Rentals that are charged on some other frequency should be converted to monthly equivalents. The indicator does not include a residential fixed-telephone line monthly subscription (however, if there is no distinction between residential and business subscribers, the residential charge should be reported) or a fixed (wired) broadband monthly subscription. Taxes should be included. If not included, this information, and the applicable tax rate, should be provided in a note.

Where there are different charges for different exchange areas, the charge for the largest urban area in terms of population should be used, and this should be specified in a note.

Method of collection:

Data should be collected from the operator with the largest market share (measured by the number of subscriptions). If the operator has been sold or merged, then the data should be collected from the successor business. Price data are generally available on the operator website in most countries.

Relationship with other indicators:

This Indicator (i152b) should refer to the same operator and plan used for i151b (Installation fee for business telephone service).

Methodological issues:

Lack of comparability may arise because of differences in treatment of taxes and the inclusion of free calls or minutes in the monthly rental. In particular, some countries/operators may only offer plans that include a certain number of minutes. This generally results in higher subscription charges (as do situations where there are low usage charges). Therefore, it is imperative to include both subscription and usage charges when making cross-country comparisons.

Example:

Fixed-telephone installation, rental and usage charges for Mauritius Telecom are shown in Table 26, while Table 27 shows the methodology for converting them to the appropriate indicator.

(continued)

Table 26: Fixed-line telephone prices, Mauritius, October 2011

One-off fees (MUR)		Residential		Business	
New conventional telephone line					
Security deposit *		Mauritian citizen	1 000	2 000	
		Non-Mauritian citizen	5 000		
Installation fee **			1 000	2 000	
Cost of apparatus (optional) **			1 000	1 000	
Take-over of an active line (MUR)					
Security deposit *		Mauritian citizen	1 000	2 000	
		Foreign citizen	5 000		
Installation fee **			Free	Free	
Extension					
Cost per socket **			50		
Wiring fee per socket **			150	350	
* Fees not subject to VAT, ** Fees subject to VAT					
Local-call price (MUR)		Price for residential customers		Price for businesses	
		1st indivisible minute	additional second	1st indivisible minute	additional second
Monthly rental		90		225	
Domestic calls	Normal hours	0.85	0.01	0.85	0.01
	Off-peak (20h30 to 06h30)	0.60	0.01	0.60	0.01
Source: Adapted from Mauritius Telecom, at http://www.mauritiustelecom.com/home_services/once_off_fees.htm					

(continued)

Table 27: Fixed-line telephone prices, methodology for conversion to the appropriate indicator

Indicator	Value	Calculation
Indicator 9.1 Installation fee for residential telephone service (i151)	1 150	1 000 + VAT (15%)
Indicator 9.5: Installation fee for business telephone service (i151b)	2 300	2 000 + VAT (15%)
Indicator 9.2: Monthly subscription for residential telephone service (i152)	103.5	90 + VAT (15%)
Indicator 9.6: Monthly subscription for business telephone service (i152b)	258.8	225 + VAT (15%)
Indicator 9.3a. Price of a three-minute fixed-telephone local call (peak rate) (i153)	2.4	$(0.85 + (0.01 \times 60) \times 2) + \text{VAT (15\%)}$
Indicator 9.3b. Price of a three-minute fixed-telephone local call (off-peak rate) (i153o)	2.1	$(0.60 + (0.01 \times 60) \times 2) + \text{VAT (15\%)}$
Relevance: This indicator on fixed voice service is no longer to be collected by ITU		

ANNEX 1: Summary of indicators and their relationships

Ch. Ind#	ITU Code	Indicator Name	Sub-indicators	Indicator relationships
1. Fixed-telephone networks				
1.1	i117	Total capacity of local public switching exchanges		$i117 = i112a + i28c + \text{unsubscribed lines}$
1.2	i4213cv	Number of households covered by a fixed wired network, by network technology	1.2a to 1.2e	
1.3	i112	Fixed telephony subscriptions		$i112 = i112a + i112IP + i112w + i28c + i1112$
1.4	i112a	Analogue fixed-telephone lines		i112a is a component of i112
1.5	i112IP	VoIP Subscriptions		i112IP is a component of i112
1.6	i112w	Fixed wireless local loop subscriptions		i112w is a component of i112
1.7	i28	ISDN subscriptions	1.7a and 1.7b	$i28 = i281 + i282$
1.8	i28c	ISDN voice-channel equivalents		i28c is a component of Indicator i112; $i28c = i281 * 2 + i282 * (23 \text{ or } 30)$
1.9	i1112	Public Payphones	1.9a and 1.9b	i1112 is a component of Indicator i112
1.10	i116	Percentage of fixed-telephone subscriptions that are residential		denominator of i116 is i112
1.11	i1162	Percentage of fixed-telephone subscriptions in urban areas		denominator of i1162 is i112
1.12	i112pt	Fixed-telephone numbers ported		
2. Mobile-cellular networks				
2.1 Subscriptions				
2.1	i271	Mobile-cellular telephone subscriptions, by postpaid/prepaid	2.1a and 2.1b	$i271 = i271p + i271pd$; complements i271 breakdown by technology
2.2	i271	Mobile-cellular telephone subscriptions, by technology	2.4a to 2.4d	
2.3	i271mw	Active mobile-broadband subscriptions	2.3a and 2.3b	$i271mw = i271_mb_active + i271md$
2.4	i271mwa	Active subscriptions to LTE/ Wi-Max mobile broadband		subset of i271mw
2.2 Coverage				
2.5	i271Land	Percentage of the land area covered by mobile-cellular network		i271land complements i271pop
2.6	i271pop	Percentage of the population covered by a mobile-cellular network		i271pop includes i271G and i271GA; complements i271land

(continued)

Ch. Ind#	ITU Code	Indicator Name	Sub-indicators	Indicator relationships
2.7	i271G	Percentage of the population covered by at least a 3G mobile network		i271G is a component of i271pop and includes i271GA
2.8	i271GA	Percentage of the population covered by at least a 4G/LTE mobile network		i271GA is a component of i271G (and i271pop)
2.3 Portability				
2.9	i271pt	Mobile-cellular numbers ported		
2.4 Data Services				
2.10	i271m2m	Machine-to-Machine mobile network subscriptions- M2M		
2.5 Spectrum				
2.11	i271_spec_a	Amount of spectrum offered for IMT systems, in MHz	2.11a to 2.11c	i271_spec_a = i271_spec_a1 + i271_spec_a1to6 + i271_spec_aG6
2.12	i271_spec_li	Amount of spectrum licensed for IMT systems, in MHz	2.12a to 2.12c	i271_spec_li = i271_spec_li1 + i271_spec_li1to6 + i271_spec_liG6
3. Internet [fixed network services]				
3.1	i4214l	Lit/equipped international bandwidth capacity, in Mbit/s		
3.2	i4214u	International bandwidth usage, in Mbit/s		
3.3	i4214d	Domestic Internet bandwidth, in Mbit/s		i4214d complements i4214u
3.4	i4213	Fixed Internet subscriptions	3.4a and 3.4b	i4213 includes but may not equal the sum of i4213d and i4213tfbb
3.5	i4213tfbb	Fixed broadband subscriptions, by technology	3.5a to 3.5f	i4213tfbb = i4213cab + i4213dsl + i4213ftth/b + i4213ob + i271s + i271fw; complements i271mw
3.6	i4213sp	Fixed broadband subscriptions, by speed	3.6a to 3.6i	i4213sp = i4213_256to2 + i4213_2to10 + i4213_G10; and i4213 = i4213_G10 = i4213_10to100 + i4213_100to1G + i4213_G1G; i4213sp complements i4213tfbb
3.7	i4213tfb_o	Fixed broadband subscriptions for organizations		i4213tfb_o is part of i4213tfbb
3.8	i4213l	Leased-line subscriptions		
4. Bundles [ex6]				

(continued)

Ch. Ind#	ITU Code	Indicator Name	Sub-indicators	Indicator relationships
4.1	4213_2x	Subscriptions to fixed-broadband and fixed-telephone bundles		
4.2	4213_3x	Subscriptions to fixed-broadband, fixed-telephone and pay TV bundles		
5. Traffic				
5.1 Fixed telephone traffic				
5.1	i131m	Domestic fixed-to-fixed telephone traffic, in minutes	5.1a and 5.1b	$i131m = i1311m + i1312m$; but not related to other indicators in the Handbook
5.2	i1313wm	Fixed-to-mobile telephone traffic, in minutes		
5.3	i132mb	International incoming and outgoing fixed-telephone traffic, in minutes	5.3a and 5.3b	$i132mb = i132m + i132mi$
5.2 Mobile telephone traffic				
5.4	i133wm	Domestic mobile-telephone traffic, in minutes	5.4a to 5.4c	$i133wm = i1331wm + i1332wm + i1333wm$
5.5	i1333wm	Outgoing mobile traffic to international, in minutes		$i1333wm$ is a component of $i132t$
5.6	i1335wm	Incoming international traffic to mobile network, in minutes		$i1335wm$ is a component of $i132ti$
5.7	i1334wm	Roaming by home subscribers abroad (outbound roaming), in minutes		
5.8	i1336wm	Roaming by foreign subscribers		
5.9	1334sms	SMS/MMS Roaming by domestic subscribers (outbound SMS roaming)		
5.10	1336sms	SMS/MMS Roaming by foreign subscribers (inbound SMS roaming)		
5.11	i133sms	SMS sent		
5.12	i133smsi	SMS international		$i133smsi$ is a component of $i133sms$
5.13	i133mms	MMS sent		
5.14	i131VoIP	VoIP traffic, in minutes		$i131VoIP$ is generated by subscribers defined in $i112IP$
5.15	i132tb	Total international incoming and outgoing telephone traffic, in minutes	5.15a and 5.15b	$i132tb = i132t + i132ti$; sub-indicators: $i132t = i132m + i1333wm$; $i132ti = i132mi + i1335wm$
5.16	i4214dt	Domestic Internet traffic		

(continued)

Ch. Ind#	ITU Code	Indicator Name	Sub-indicators	Indicator relationships
5.17	135tfb	Fixed broadband internet traffic		135tfb is strictly related to i4213tffb
5.18	i136mwi	Mobile broadband internet traffic -within the country		
5.19	136mwo	Mobile broadband internet traffic outside the country- data roaming out		
6. Employment-Revenue-Investment				
6.1 Persons employed				
6.1	i51	Full-time equivalent telecommunication employees, by operator type	6.1a and 6.1b	i51 = i51ft + i51w; complements indicator i51 by gender
6.2	i51	Full-time equivalent telecommunication employees, by gender	6.2a and 6.2b	i51 = i51f + i51m; complements indicator i51 by operator type
6.2 Revenues				
6.3	i75	Revenue from all telecommunication services		i75 = i71 + i741 + i7311 + i732 + i733 + i74
6.4	i71	Revenue from fixed-telephone services	6.4a to 6.4c4	i71 = i711 + i712 + i713; component of i75
6.4c1	i7131	Revenue from fixed local calls		
6.4c2	i7132	Revenue from fixed national long-distance calls		
6.4c3	i7134	Revenue from fixed-to-mobile national calls		
6.4c4	i7133	Revenue from fixed international calls		
6.5	i7311	Revenue from fixed (wired) Internet services	6.5a and 6.5b	i7311 is a component of i75; related to i4213
6.6	i732	Revenue from leased lines		i732 is a component of i75
6.7	i733	Revenue from fixed value-added telecommunication services		i733 is a component of i75
6.8	i741	Revenue from mobile networks	6.8a to 6.8d	i741 includes i741v, i7411r, i741d and i741m; component of i75
6.9	i76ri	Revenue from international inbound roaming	6.9a to 6.10	
6.10	i74	Other telecommunication revenue		i74 is a component of i75
6.3 Investment				
6.11	i81	Annual investment in telecommunication services	6.11a to 6.11d	i81 = i81 + i83 + i841m + other investments; (in turn, includes i81t)

(continued)

Ch. Ind#	ITU Code	Indicator Name	Sub-indicators	Indicator relationships
6.12	i81t	Annual investment in non-tangible assets		
6.13	i841f	Annual foreign investment in telecommunications		
7. Broadcasting				
7.1	i965m	Multichannel TV subscriptions	7.1a to 7.1d	i965m = i965cb + i965s + i965IP + i965oth
7.2	i965c	Terrestrial multichannel TV subscriptions		i965c is a component of i965m
7.3	i965s	Satellite TV subscriptions		i965s is a component of i965m
7.4	i965IP	IPTV subscriptions		
8. Quality of Service				
8.1	i143	Faults per 100 fixed-telephone lines per year		
8.2	i141	Percentage of fixed-telephone faults cleared by next working day		
8.3	i146u	Mobile cellular unsuccessful call ratio		
8.4	i146d	Mobile cellular dropped call ratio		
8.5	i146c	Complaints per 100 mobile cellular subscriptions		
8.6	i146mw	Complaints per 100 mobile broadband subscriptions		
8.7	i147c	Complaints per 100 fixed broadband subscriptions		
8.8	i147t	Service activation time for fixed broadband service		
9. Prices				
9.1 Prices of mobile network services				
	Basket 1	Mobile-cellular voice and SMS basket		Basket 1 includes i153_low_OPc, i152_low_Plan, i153Tax, i153_low_Link, i151p, i153_low_pc, i153_low_pf, i153_low_pof, i153_low_pn, i153_low_pon, i153_low_po, i153_low_poo, i153_low_psms and i153_low_sms_po

(continued)

Ch. Ind#	ITU Code	Indicator Name	Sub-indicators	Indicator relationships
	Basket 2	Data and voice mobile broadband basket: low usage		Basket 2 includes i271mb_low_Opf, i271mb_low_Plan, i271mb_low_tax, i271mb_low_link, i271mb_low_bs, i271mb_low_c, i271mb_low_cp, i271mb_low_min, i271mb_low_xmin, i271mb_low_sms, i271mb_low_xsms, i271mb_low_v and i271mb_low_Tech
	Basket 3	Data and voice mobile broadband basket: high usage		Basket 3 includes i271mb_high_Plan, i271mb_high_tax, i271mb_high_link, i271mb_high_bs, i271mb_high_c, i271mb_high_cp, i271mb_high_min, i271mb_high_xmin, i271mb_high_sms, i271mb_high_xsms, i271mb_high_v and i271mb_high_Tech
	Basket 4	Data-only mobile-broadband price basket		Basket 4 includes i271mb_Opf, i271mb_Plan, i271mb_tax, i271mb_link, i271mb_bs, i271mb_c, i271mb_cp, i271mb_v and i271mb_Tech
9.2 Prices of fixed network services				
	Basket 5	Fixed-broadband 5 GB basket		Basket 5 includes i4213_5GB_ISP, i4213_5GB_Plan, i4213Tax, i4213_5GB_Link, i4213_5GB_bc, i4213_5GB_bs, i4213_5GB_bs_c, i4213_5GB_bs_cp, i4213_5GB_bs_s and i4213_5GB_Tech
9.3 Fixed telephone service tariffs				
9.1	i151	Installation fee for residential telephone service		
9.2	i152	Monthly subscription for residential telephone service		
9.3	-	Price of a three-minute call to a fixed-telephone line	9.3a to 9.3b	
9.4	i153fm	Price of a three-minute call to a mobile-cellular phone	9.4a to 9.4b	
9.5	i151b	Installation fee for business telephone service		
9.6	i152b	Monthly subscription for business telephone service		

ANNEX 2: Indicators previously collected by ITU not included in this Handbook

ITU code	Name of indicator
1142	Percentage of fixed-telephone lines connected to digital exchanges
123	Waiting list for fixed-telephone lines
1311im	Internet dial-up traffic (minutes)
133rm	Number of countries with which there is a roaming agreement
151c	Mobile-cellular postpaid connection charge
152c	Mobile-cellular monthly subscription charge
153c	Mobile-cellular prepaid – price of a three-minute local call (peak, on-net)
153co	Mobile-cellular prepaid – price of a three-minute local call (off-peak, on-net)
153tm	International telephone call prices
2712	Digital mobile-cellular subscriptions
311	Telex subscription lines
4213c	Dial-up Internet connection charge
4213p	Dial-up Internet – price per minute (peak)
4213po	Dial-up Internet – price per minute (off-peak)
4213s	Dial-up Internet monthly subscription
422	Number of computers
51fp	Female professional telecommunication staff
51wf	Female mobile telecommunication staff
51wfp	Female professional mobile telecommunication staff
731	Revenue from data services
955	Number of radio sets
965	Number of TV sets
* For definitions of these indicators, see ITU, <i>Definitions of World Telecommunication/ICT Indicators</i> , March 2010, available at: http://www.itu.int/ITU-D/ict/handbook.html .	

ANNEX 3: Terms and abbreviations

2G mobile-cellular network	Second generation of mobile communications technology. It differs from its predecessor technologies in that it is a digital cellular technology. It includes standards such as Global system for mobile communications (GSM) and cdmaOne.
2.5G mobile-cellular network	Used to refer to General packet radio service (GPRS) mobile communications technology. GPRS is a packet-data technology that allows GSM operators to offer wireless data services at throughput rates of up to 115 kbit/s.
3G mobile-cellular network	Third generation of mobile communications technology, a group of mobile technologies that have been approved by ITU as IMT-2000. These technologies allow voice, data and video communications. Currently, five standards have been specified as IMT-2000, based on various combinations of mobile technologies: CDMA direct spread (WCDMA), CDMA multicarrier (CDMA2000), CDMA time division (TD-CDMA), TDMA single carrier and FDMA/TDMA and OFDMA TDD WMAN (IEEE 802.16).
active subscription	A subscription where the system was used at least once during the last three months.
ADSL	Asymmetric digital subscriber line: A modem technology that converts twisted-pair telephone lines into access paths for multimedia and high-speed data communications. The bit rates transmitted in both directions are different.
bandwidth	A bit-rate measure of available or consumed data communication resources, expressed in bits/second or multiples thereof (kilobits/s, megabits/s, etc.).
bit	The basic information unit in binary systems.
BPL	Broadband over powerline: A technology that allows Internet data to be transmitted over utility power lines. To use BPL, the subscriber needs to use a special broadband modem (phone, cable or satellite) that plugs into an electrical outlet.
broadband access	Access to the public Internet (through a TCP/IP connection) at downstream speeds greater than, or equal to, 256 kbit/s.
byte	8 bits.
cable modem	A cable modem is a modulator-demodulator device at subscriber locations intended for use in conveying data communications on a cable-television system.
CATV	Cable-television service: Multichannel programming delivered over a coaxial cable for viewing on television sets.
CDMA	Code division multiple access: A digital cellular technology that does not assign a specific frequency to each user; instead, every channel uses the full available spectrum.
CDMA2000	CDMA multicarrier; see 3G mobile-cellular network.
coaxial cable	A type of wire that consists of a centre wire surrounded by insulation and then a grounded shield of braided wire. The shield minimizes electrical and radio-frequency interference. Coaxial cabling is the primary type of cabling used by the cable-television industry, and is also widely used for computer networks, such as ethernet.

(continued)

contracted capacity	Bandwidth put into service but not all of which is used; some is held in reserve for restoration or redundancy.
dark fibre	Unlit transmission capacity, not in use, in a fibre-optic system.
DEL	Direct exchange line: Equivalent to an analogue fixed-telephone line.
dial-up Internet	Type of narrowband Internet access that uses a modem to connect to the Internet through a fixed-telephone line; it requires the modem to dial a phone number when Internet access is needed.
DTT	Digital terrestrial television: The technological evolution from analogue to digital terrestrial television, providing capability for significantly more channels.
DTH satellite	Direct-to-home satellite services: Satellite television broadcast services received via a satellite dish.
DSL	Digital subscriber line: A technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines.
EB	Exabyte (1 exabyte is equivalent to 10^{18} bytes)
EDGE	Enhanced data rates for GSM evolution: A faster version of GSM wireless service enabling data to be delivered at faster rates.
EGTI	ITU Expert Group on Telecommunication/ICT indicators.
ethernet (LAN)	Family of computer networking technologies for local area networks (LANs) commercially introduced in 1980. Standardized in IEEE 802.3, ethernet has largely replaced competing wired LAN technologies.
Eurostat	The statistical office of the European Union.
EV-DO	Evolution data optimized: A telecommunication standard for the wireless transmission of data through radio signals, typically for broadband Internet access; it is part of the CDMA2000 family of standards.
FDI	Foreign direct investment.
fibre optic	A flexible, transparent fibre made of very pure glass not much wider than a human hair that acts as a "light pipe" to transmit light between the two ends of the fibre.
FTE	Full-time equivalent: The unit representing the conversion of part-time work to full-time. The preferred method is to convert part-time workers on the basis of hours worked, using an 8-hour workday as full-time.
FTTH	Fibre-to-the-home: Fibre goes directly to the subscriber's premises.
FTTB	Fibre-to-the-building: Fibre connection that terminates no more than 2 metres from an external wall of the subscriber's building, but does not reach the premises.
GB	Gigabyte (one thousand million bytes).
Gbit/s	Gigabits per second (1 000 Mbit/s).

(continued)

GPRS	General packet radio service mobile communications technology: A packet-data technology that allows GSM operators to offer wireless data services at throughput rates of up to 115 kbit/s.
gross fixed capital formation	Consists of resident producers' acquisitions of fixed assets during a given period, less disposals, plus certain additions to the value of non-produced assets realized by the productive activity of producer or institutional units.
GSM	Global system for mobile communications: A standard set to describe technologies for second-generation (or "2G") digital cellular networks.
HHI	Herfindahl-Hirschman index: An index of market concentration, which consists of the sum of the squares of the market share of the competitors in the relevant market. The index can take the values ranging from 0 to 10 000. A value of 10 000 corresponds to a market entirely controlled by a single firm, and the value decreases as concentration reduces.
HSPA	High speed packet access: An amalgamation of two mobile-telephony protocols that extend and improve the performance of existing WCDMA protocols.
HTTP	Hypertext transfer protocol: The underlying protocol used by the World Wide Web.
ICT	Information and communication technology.
IMT-2000	International Mobile Telecommunications 2000: ITU Recommendations and Radio Regulations for 3G technologies. See also 3G mobile-cellular network.
incumbent	A telecommunication entity first established as a regulated monopoly with special and exclusive rights granted by government or a public operator, which enjoyed a <i>de facto</i> monopoly before liberalization.
intellectual property/asset	Refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images and designs used in commerce.
international calls	Calls originating in a country and terminating abroad. They also include calls from fixed geographic numbers to foreign fixed and mobile numbers.
IPTV	Internet-protocol television: Multimedia services such as television/video/audio/text/graphics/data delivered over an IP-based network managed to support the required level of quality of service, quality of experience, security, interactivity and reliability; it does not include video accessed over the public Internet, for example, by streaming. IPTV services are also generally aimed at viewing over a television set rather than a personal computer.
IP	Internet protocol: The most commonly-used set of rules for dispatching data across a large computer network.
IP telephony	Service that enables the exchange of voice information, primarily in the form of packets, using IP protocols.
ISDN	Integrated services digital network: A network that provides digital connections between user-network interfaces.
ISP	Internet service provider.
ITU	International Telecommunication Union.

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KB	Kilobyte.
kbit/s	Kilobits per second (1 kilobit per second = one thousand bits per second).
LAN	Local area network: A wired or wireless computer network that interconnects computers in a limited area such as an office building.
leased line	A leased line connects two locations for private voice and/or data telecommunication service, either through a dedicated physical cable or a virtual connection.
lit capacity	Turned on bandwidth in a fibre-optic system – capacity that is ready for use.
LTE	Long-term evolution: A 4G wireless-broadband technology developed by the Third Generation Partnership Project (3GPP), an industry trade group.
M2M	Machine to Machine communication.
managed VoIP	A publicly available telephone service provided using voice over Internet protocol (VoIP) for call origination whereby the operator controls the quality of service provided.
Mbit/s (or Mbps)	Megabits per second (1 000 kbit/s).
MDGs	Millennium development goals (United Nations).
MMDS	Microwave multipoint distribution systems.
MMS	Multimedia messaging service. An MMS may convey text, graphic and audio content.
Modem	Short for modulator-demodulator, a modem is a device that enables a computer to transmit data over, for example, telephone or cable lines.
MRTG	Multi-router traffic grapher: A software for monitoring and measuring the traffic load on network links. It allows the user to see traffic load on a network over time in graphical form.
MVNO	Mobile virtual network operator, an organisation which provides mobile cellular services to its customers, but does not have allocation of spectrum.
naked DSL	DSL service that does not require a telephone-line rental.
narrowband Internet access	Access to the public Internet (through a TCP/IP connection) at downstream speeds below 256 kbit/s.
national calls	All national public voice-telephony calls, including local calls, dial-up calls to the Internet and long-distance calls.
NGN	Next-generation network: A packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies.
NRA	National regulatory authority.
NSO	National statistical office.

(continued)

number portability	Mechanism that allows a user to retain the same directory number, regardless of the service provider subscribed to. Number portability may be limited to specific geographical areas.
OECD	Organisation for Economic Co-operation and Development.
off-net	Refers to a call originating in one mobile network and terminating in a different mobile network.
off-peak rate	Refers to the discount tariffs offered in some tariff plans for voice and SMS services during certain hours of weekdays. Only off-peak periods before midnight are considered.
on-net	Refers to a call originating and terminating in the same mobile network.
operator	Service provider in the telecommunication/ICT sector, including fixed- and mobile-telephone operators and Internet service providers.
OTT	Over-The-Top. Refers to IP-based applications and services offered by content providers to users over a broadband Internet connection, independent of the telecommunication network operator providing the internet connection.
<i>Partnership</i>	Partnership on Measuring ICT for Development.
PBX	Private branch exchange: A telephone switching entity forming part of a private telephone installation that has access to the PSTN.
peak rate	As opposed to off-peak rate, refers to tariffs in busy hours, usually during weekdays.
postpaid subscription	A subscription where the subscriber is billed after their use of services, typically at the end of each month.
potential capacity	Total theoretical available bandwidth.
prepaid subscription	A subscription where, instead of paying an ongoing monthly fee, users purchase blocks of usage time in advance of using the service.
private trunked mobile radio	A private mobile radio system.
PSTN	Public switched telephone network: A telecommunication network established to provide telephone services for public subscribers, not restricted to a specific user group.
Public Internet exchange	Also referred as Internet exchange point (IXP), public Internet exchange is a physical infrastructure where ISPs connect to exchange traffic directly between their networks.
public payphone	A telephone where payment is made upon use, may be coin or card operated, and includes phones installed in private places.
PWLAN	Public wireless local area network, also called Wi-Fi hotspot: PWLANs are based on IEEE standard 802.11 (commonly referred to as Wi-Fi).
QoS	Quality of service.

(continued)

radio paging	A pager (often called a beeper) is a simple personal telecommunication device for short messages.
RPP	Receiving party pays: A retail billing mechanism whereby the receiving party pays part of the call.
roaming	The ability of users to access wireless telecommunication services from a serving network different from the network they have subscribed.
satellite broadband	Broadband Internet access via a satellite connection.
SIM card	Subscriber Identity module card: An integrated circuit that securely stores the service-subscriber key (IMSI) used to identify a subscriber on mobile-telephony devices (such as mobile phones and computers).
SMATV	Satellite master antenna television.
SMP	Significant market power: A single or joint dominant position in a given market.
SMS	Short message service: A text messaging service component of phone, web or mobile communication systems, using standardized communications protocols that allow the exchange of short text messages between fixed-line or mobile-phone devices.
TB	Terabytes (equivalent to 10^{12} bytes)
TCP/IP	Transmission control protocol/Internet protocol.
telemetry service	A type of telecommunication service that uses short messages, requiring a very low transmission rate, between the user and the network, such as for example telealarm or telecommand.
UMTS	Universal mobile telecommunications system: See 3G mobile-cellular network.
unlit capacity	Dark fibre – capacity not in use in a fibre-optic system.
USB modem	Universal serial bus modem: A modem that can be connected to a computer through a universal serial bus, an external bus standard that supports high data transfer rates.
used capacity	Bandwidth in a fibre-optic system which is available to carry traffic.
VDSL	Very high-speed digital subscriber line: A modem technology that enables twisted-pair telephone lines to be used as access paths for multimedia and high-speed data communications. VDSL enables higher bit rates than ADSL in short local loops. These bit rates may or may not be different in both directions.
VoB	Voice over broadband: VoB is the same as managed VoIP.
VoIP	Voice over Internet protocol: refers to managed VoIP and is the same as IP telephony.
WCDMA (or W-CDMA)	Wideband code division multiple access: See 3G mobile-cellular network.
Wi-Fi	Wireless fidelity: A wireless local area network based on the IEEE standard 802.11.

(continued)

WiMAX	Worldwide interoperability for microwave access: A family of telecommunication protocols that provide fixed and mobile Internet access based on IEEE standard 802.16.
WLAN	Wireless local area network.
WLL	Wireless local loop: The use of a wireless communications link as the "last-mile / first-mile" connection between the subscriber and the telephone exchange.
WSIS	World Summit on the Information Society.
WTIM	World Telecommunication/ICT Indicators meeting.
xDSL	Any of the various types of digital subscriber line technologies.

Source: The definitions of the terms and abbreviations included in this Annex were adapted from definitions retrieved from BEREC, European Commission, GSMA, ITU, OECD and OFCOM.

ANNEX 4: Classification of information economy activities, ISIC Revision 4

This Annex places the ICT indicators in an industry classification context. The use of an industry classification for defining the scope of indicators is particularly relevant to the employment, revenue and investment indicators, which may be collected in industry surveys conducted by national statistical offices. An industry context may also be relevant to other indicators, especially if the data are collected using an industry-based frame (or list).

Most of the indicators in the Handbook apply to telecommunication service operators, which fall within ISIC Division 61, Telecommunications. However, the television broadcasting indicators (77 to 80) may be collected in respect of entities whose activities place them in either Division 60, Programming and broadcasting activities, or Division 61. Division 60 includes "... the activities of creating content or acquiring the right to distribute content and subsequently broadcasting that content ..." Broadcasting can be of TV, radio or data and "... can be performed using different technologies, over-the-air, via satellite, via a cable network or via Internet." Division 61 includes activities relating to the "The distribution of the complete television programme by third parties, i.e., without any alteration of the content ... This distribution can be done through broadcasting, satellite or cable systems."¹

ISIC, the International Standard Industrial Classification of All Economic Activities, is the global standard for classifying businesses to industries according to their activities. The content of this Annex comes from the United Nations "Alternative aggregation of for the information economy", released as part of ISIC Revision 4.²

The Organisation for Economic Co-operation and Development (OECD) took a leading role in standardizing the definition of the ICT and 'content' sectors. Previously used definitions were reviewed by the Working Party on Indicators for the Information Society (WPIIS) and new recommendations developed using the updated detail available in ISIC, Revision 4. The tables set out below follow the recommendations made by WPIIS.

ICT sector definition

The following general principle is used to identify ICT economic industries:

"The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display."

The industries in the ICT sector can be grouped into ICT manufacturing, ICT trade and ICT services. The ISIC Revision 4 industries that comply with the above general principle are provided in Table 5. Additionally, Table 5 shows the definition of the Telecommunications division and the four groups it includes: Wired telecommunication activities; Wireless telecommunication activities; Satellite telecommunication activities; and Other telecommunication activities.

¹ UNSD (2008), 'International Standard Industrial Classification of All Economic Activities Revision 4', Statistical Papers, Series M No. 4/Rev.4, UN, New York. Available at <http://unstats.un.org/unsd/cr/registry/isic-4.asp>.

² Ibid.

Table 28: Definition of ICT sector based on ISIC Revision 4

ISIC code	Industry
ICT manufacturing industries	
2610	Manufacture of electronic components and boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
2680	Manufacture of magnetic and optical media
ICT trade industries	
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
ICT services industries	
5820	Software publishing
61	Telecommunications
<p>This division includes the activities of providing telecommunications and related service activities, i.e., transmitting voice, data, text, sound and video. The transmission facilities that carry out these activities may be based on a single technology or a combination of technologies. The commonality of activities classified in this division is the transmission of content, without being involved in its creation. The breakdown in this division is based on the type of infrastructure operated.</p> <p>In the case of transmission of television signals this may include the bundling of complete programming channels (produced in division 60, <i>Programming and broadcasting activities</i>) in to programme packages for distribution.</p>	
6110	Wired telecommunications activities
<p>This class includes:</p> <ul style="list-style-type: none"> - operating, maintaining or providing access to facilities for the transmission of voice, data, text, sound and video using a wired telecommunications infrastructure, including: - operating and maintaining switching and transmission facilities to provide point-to-point communications via landlines, microwave or a combination of landlines and satellite linkups - operating of cable distribution systems (e.g., for distribution of data and television signals) - furnishing telegraph and other non-vocal communications using own facilities <p>The transmission facilities that carry out these activities, may be based on a single technology or a combination of technologies.</p> <p>This class also includes:</p> <ul style="list-style-type: none"> - purchasing access and network capacity from owners and operators of networks and providing telecommunications services using this capacity to businesses and households - provision of Internet access by the operator of the wired infrastructure 	

Table 28: Definition of ICT sector based on ISIC Revision 4 (continued)

ISIC code	Industry
6120	Wireless telecommunications activities
<p>This class includes:</p> <ul style="list-style-type: none"> - operating, maintaining or providing access to facilities for the transmission of voice, data, text, sound, and video using a wireless telecommunications infrastructure - maintaining and operating paging as well as cellular and other wireless telecommunications networks <p>The transmission facilities provide omni-directional transmission via airwaves and may be based on a single technology or a combination of technologies.</p> <p>This class also includes:</p> <ul style="list-style-type: none"> - purchasing access and network capacity from owners and operators of networks and providing wireless telecommunications services (except satellite) using this capacity to businesses and households - provision of Internet access by the operator of the wireless infrastructure 	
6130	Satellite telecommunications activities
<p>This class includes:</p> <ul style="list-style-type: none"> - operating, maintaining or providing access to facilities for the transmission of voice, data, text, sound and video using a satellite telecommunications infrastructure - delivery of visual, aural or textual programming received from cable networks, local television stations or radio networks to consumers via direct-to-home satellite systems (The units classified here do not generally originate programming material.) <p>This class also includes:</p> <ul style="list-style-type: none"> - provision of Internet access by the operator of the satellite infrastructure 	
6190	Other telecommunications activities
<p>This class includes:</p> <ul style="list-style-type: none"> - provision of specialized telecommunications applications, such as satellite tracking, communications telemetry, and radar station operations - operation of satellite terminal stations and associated facilities operationally connected with one or more terrestrial communications systems and capable of transmitting telecommunications to or receiving telecommunications from satellite systems - provision of Internet access over networks between the client and the ISP not owned or controlled by the ISP, such as dial-up Internet access etc. - provision of telephone and Internet access in facilities open to the public - provision of telecommunications services over existing telecom connections: - VOIP (Voice Over Internet Protocol) provision - telecommunications resellers (i.e., purchasing and reselling network capacity without providing additional services) 	
62	Computer programming, consultancy and related activities
6201	Computer programming activities
6202	Computer consultancy and computer facilities management activities
6209	Other information technology and computer service activities

Table 28: Definition of ICT sector based on ISIC Revision 4 (continued)

ISIC code	Industry
631	Data processing, hosting and related activities; web portals
6311	Data processing, hosting and related activities
6312	Web portals
951	Repair of computers and communication equipment
9511	Repair of computers and peripheral equipment
9512	Repair of communication equipment

Source: Adapted from UNSD (2008), 'International Standard Industrial Classification of All Economic Activities Revision 4', Statistical Papers, Series M No. 4/Rev.4, UN, New York.

Content and media sector definition

The following general principle is used for the identification of activities in the content and media sector:

"The production (goods and services) of a candidate industry must primarily be intended to inform, educate and/or entertain humans through mass communication media. These industries are engaged in the production, publishing and/or the distribution of content (information, cultural and entertainment products), where content corresponds to an organized message intended for human beings."

The industries in the content and media sector can be grouped into Publishing; Motion picture, video and television programme activities; Programming and broadcasting; and Other information services. The ISIC Revision 4 industries that comply with the above general principle are provided in Table 6, as well as the definitions of the division Programming and broadcasting and the two groups it includes: Radio broadcasting; and Television programming and broadcasting activities.

Table 29: Definition of content and media sector based on ISIC Revision 4

ISIC code	Industry
581	Publishing of books, periodicals and other publishing activities
5811	Book publishing
5812	Publishing of directories and mailing lists
5813	Publishing of newspapers, journals and periodicals
5819	Other publishing activities
591	Motion picture, video and television programme activities
5911	Motion picture, video and television programme production activities
5912	Motion picture, video and television programme post-production activities
5913	Motion picture, video and television programme distribution activities
5914	Motion picture projection activities
592	Sound recording and music publishing activities
60	Programming and broadcasting activities
<p>This division includes the activities of creating content or acquiring the right to distribute content and subsequently broadcasting that content, such as radio, television and data programs of entertainment, news, talk, and the like. Also included is data broadcasting, typically integrated with radio or TV broadcasting. The broadcasting can be performed using different technologies, over-the-air, via satellite, via a cable network or via Internet. This division also includes the production of programs that are typically narrowcast in nature (limited format, such as news, sports, education or youth-oriented programming) on a subscription or fee basis, to a third party, for subsequent broadcasting to the public. This division excludes the distribution of cable and other subscription programming (included in the Telecommunications division).</p>	
6010	Radio broadcasting
<p>This class includes:</p> <ul style="list-style-type: none"> - broadcasting audio signals through radio broadcasting studios and facilities for the transmission of aural programming to the public, to affiliates or to subscribers <p>This class also includes:</p> <ul style="list-style-type: none"> - activities of radio networks, i.e., assembling and transmitting aural programming to the affiliates or subscribers via over-the-air broadcasts, cable or satellite - radio broadcasting activities over the Internet (Internet radio stations) - data broadcasting integrated with radio broadcasting 	

Table 29: Definition of content and media sector based on ISIC Revision 4 (continued)

ISIC code	Industry
6020	Television programming and broadcasting activities
<p>This class includes:</p> <ul style="list-style-type: none"> - creation of a complete television channel programme, from purchased programme components (e.g., movies, documentaries etc.), self produced programme components (e.g., local news, live reports) or a combination thereof <p>This complete television programme can be either broadcast by the producing unit or produced for transmission by third party distributors, such as cable companies or satellite television providers.</p> <p>The programming may be of a general or specialized nature (e.g., limited formats such as news, sports, education or youth oriented programming), may be made freely available to users or may be available only on a subscription basis.</p> <p>This class also includes:</p> <ul style="list-style-type: none"> - programming of video-on-demand channels - data broadcasting integrated with television broadcasting <p>This class excludes:</p> <ul style="list-style-type: none"> - assembly of a package of channels and distribution of that package via cable or satellite to viewers (included in the Telecommunications division) 	
639	Other information service activities
6391	News agency activities
6399	Other information service activities n.e.c.

Source: Adapted from UNSD (2008), 'International Standard Industrial Classification of All Economic Activities Revision 4', Statistical Papers, Series M No. 4/Rev.4, UN, New York.

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