

Measuring digital development Facts and Figures 2023



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Foreword



I am pleased to present you the 2023 edition of *Facts and Figures*, ITU's independent, meticulously researched, and timely snapshot of the state of digital connectivity around the world.

The *Facts and Figures* series is an important record of where we are – and a good motivator to drive us to where we want to be. By mapping important data sets, we have a better understanding of how and where to put our resources and efforts towards achieving our goal of universal and meaningful connectivity.

There are reasons to be optimistic. According to our estimates, just over two-thirds of the world's population are now online, with some 280 million new Internet users in 2023. Connectivity is progressing everywhere, but at different pace. On average, connectivity in the least-connected countries is tending to grow faster than that in other countries, but from an extremely low base. Currently, there is no evidence at the aggregate level of catch up or leapfrogging.

As we strive towards our goal of universal connectivity, we must address digital disparities across and within regions, and among populations. New technology introduction may bring new divides, and this is already proving the case for 5G. Global estimates produced here for the first time show that 89 per cent of the population in high-income countries is covered by 5G. In low-income countries, only one per cent of the population is covered. In fact, 3G – not even 4G – remains by far the most prevalent mobile broadband technology in the poorest countries, where more than 20 per cent of the population remains off the connectivity grid.

Affordability is a significant enabler of connectivity and Internet has become more affordable in all regions and for all income groups. However, in low-income countries, the typical price of an entry-level mobile broadband subscription is equivalent to 9 per cent of average income, a share twenty times higher than in high-income countries. In many countries, fixed-broadband Internet is prohibitively expensive, if it is available at all. Fixed-broadband technology expands our digital capabilities as it is needed for the most data-intensive applications of the Internet.

Indeed, Internet traffic estimates, published here for the first time, reveal that fixed broadband accounts for 83 per cent of the world's traffic, despite the rise of mobile broadband subscriptions and their greater affordability. This highlights the importance of investment in both fixed and mobile broadband infrastructures to meet user needs.

The importance of data collection and analysis are paramount in digital development. Data is relied upon by our Member States, our partners, and all the stakeholders committed to achieving universal and meaningful connectivity. With its robust evidence and global reach, ITU's *Facts and Figures* remains a powerful advocacy tool to accelerate digital uptake worldwide. We can – and must – ensure that the benefits of digital connectivity are shared by all, laying the foundation for a more inclusive and sustainable future.

A handwritten signature in black ink, appearing to read 'Cosmas Luckyson Zavazava'.

Cosmas Luckyson Zavazava
Director, Telecommunication Development Bureau
International Telecommunication Union

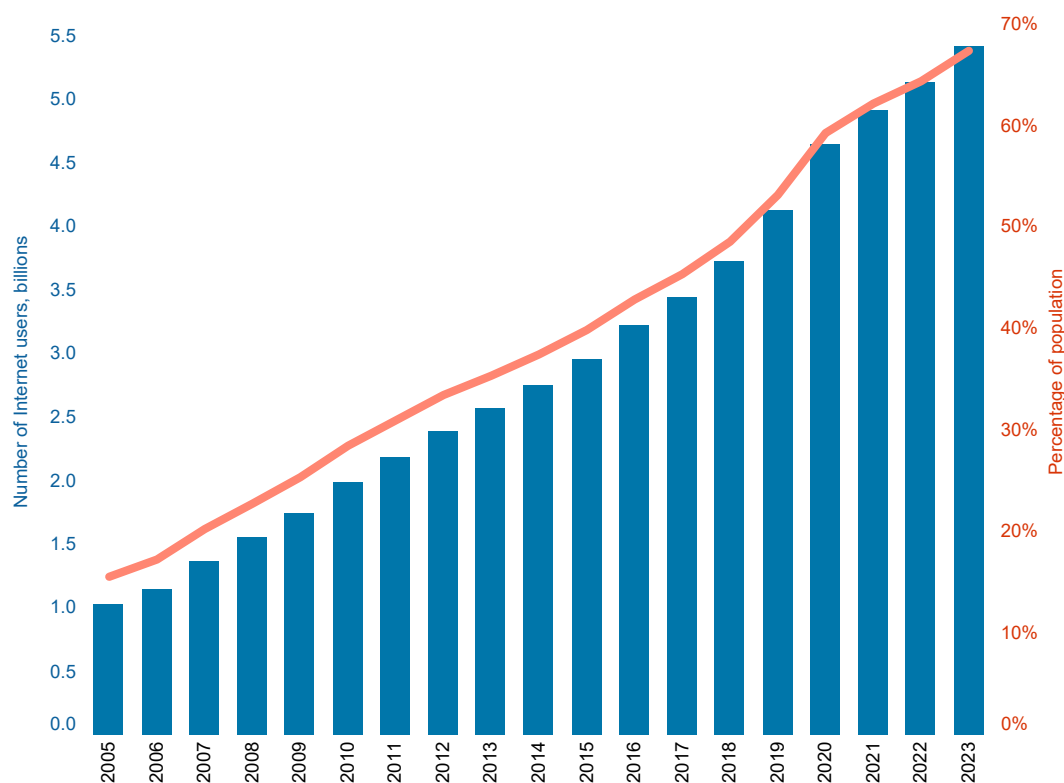
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Internet use

Global offline population steadily declines to 2.6 billion people in 2023

Individuals using the Internet



Source: ITU

Approximately sixty-seven per cent of the world's population, or 5.4 billion people, is now online. This represents a growth of 4.7 per cent since 2022, an increase from the 3.5 per cent recorded from 2021 to 2022. The number of people offline in 2023 decreased to an estimated 2.6 billion people, representing 33 per cent of the global population.

Internet use remains tightly linked to the level of a country's development. In 2020, nine out of ten people in high-income countries used the Internet.¹ In 2023, the share edged up to 93 per cent, getting closer to universality.

¹ In this publication, regions correspond to the ITU regions, whose composition is available at <http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>. The composition of least developed countries (LDCs), landlocked developing countries (LLDCs), and small island developing States (SIDS) is available at <https://www.un.org/ohrills/>. Income groups are according to the World Bank classification: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>.

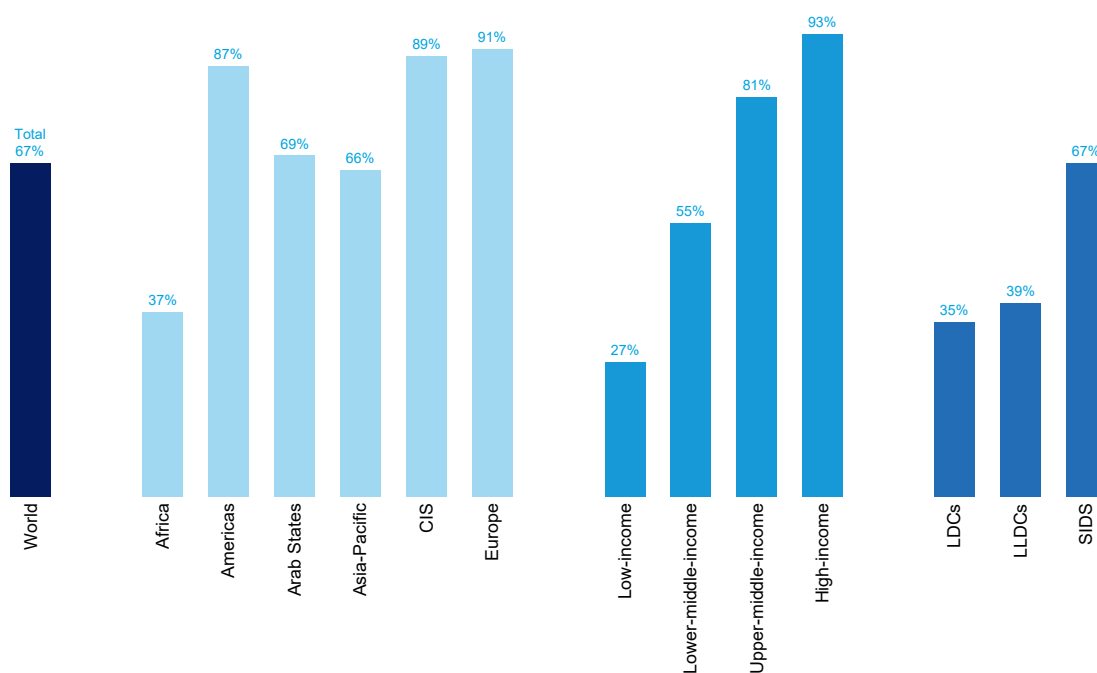
In low-income countries, 27 per cent of the population uses the Internet, up from 24 per cent in 2022. This 66 percentage point gap reflects the width of the digital divide between high-income and low-income countries and regions.

In low-income countries, the number of Internet users has grown by 44.1 per cent since 2020, and by 14.3 per in the past year alone. This is encouraging but it is being measured from a very low initial number of users. By comparison, the number of Internet users in high-income countries has increased by just 1.1 per cent during the same period, although this is to be expected considering that 93 out of every 100 people in this group of countries are already online. It is unlikely that this number will ever reach 100, as some people will never want to connect.

In Europe, the Commonwealth of Independent States (CIS) and the Americas, between 87 and 91 per cent of the population uses the Internet, which is approaching universal use (defined for practical purposes as an Internet penetration rate of at least 95 per cent). Approximately two-thirds of the population in the Arab States and Asia-Pacific regions (69 and 66 per cent, respectively) use the Internet, in line with the global average, while the average for Africa is just 37 per cent of the population.

Universal connectivity also remains a distant prospect in least developed countries (LDCs) and landlocked developing countries (LLDCs), where only 35 and 39 per cent of the population are online, respectively.

Percentage of individuals using the Internet by region (2023)

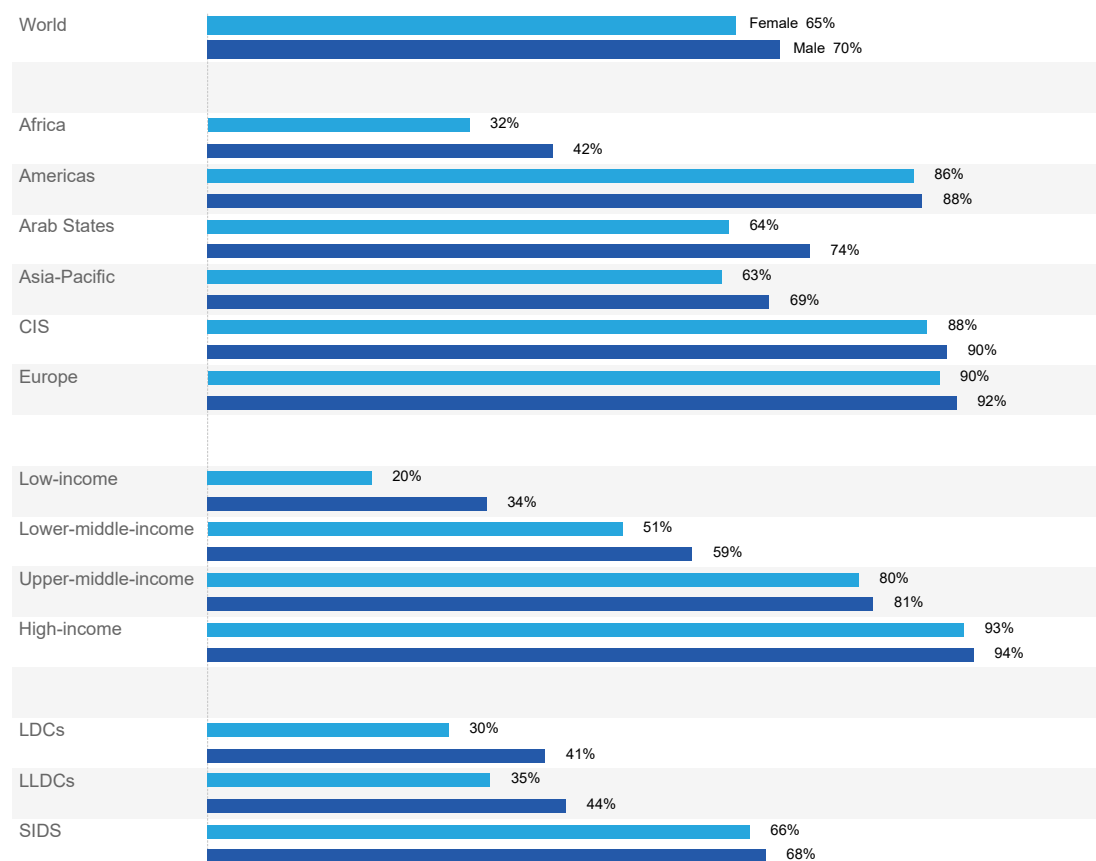


Source: ITU

The gender digital divide

Digital gender parity is still a distant prospect in regions with low Internet use

Percentage of female and male population using the Internet (2023)



Source: ITU

Worldwide, 70 per cent of men are using the Internet, compared with 65 per cent of women. This means that globally, there are 244 million more men than women using the Internet in 2023.

Parity is achieved when the *gender parity score*, defined as the share of women using the Internet divided by the share of men using the Internet, is between 0.98 and 1.02. The world population has been inching gently towards parity, with the score increasing from 0.90 in 2019 to 0.92 in 2023.

The gender parity score, however, provides only a partial picture of the gender divide, because it represents the ratio of two percentages. For example, while women account for roughly half of the population, they account for a disproportionate – and increasing – share of the global offline population: women now outnumber male non-Internet users by 17 per cent, up from 11 per cent in 2019.

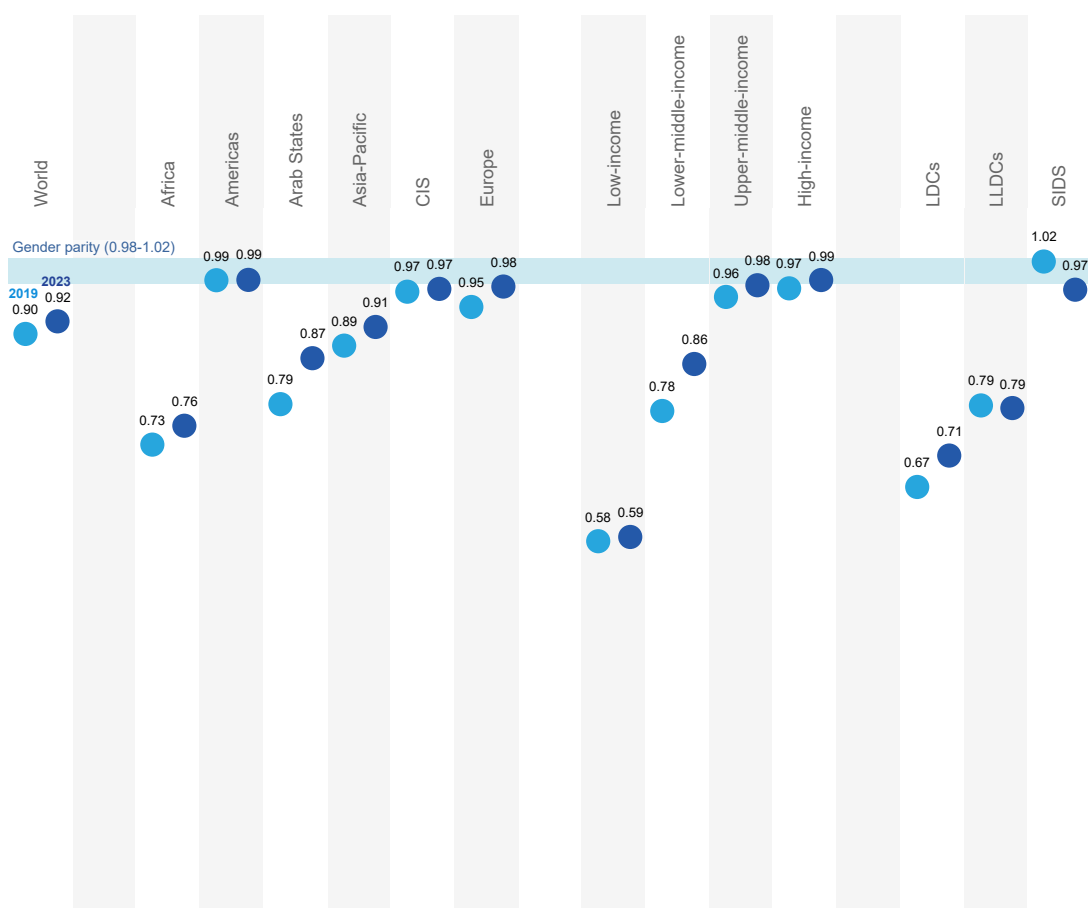
Generally, the regions with the highest Internet use also have the highest gender parity scores. In the Americas, the CIS, and Europe, gender parity has been achieved or almost achieved. The Asia-Pacific score is now above the 0.9 mark. Progression of this score has been the strongest in the Arab States region, where the score improved from 0.79 in 2019, to 0.87 in 2023. The

Africa region continues to lag other regions by a sizeable margin despite some improvement, where roughly four in ten men and three in ten women use the Internet.

Least developed countries continue to exhibit low levels of Internet use and to generate low gender parity scores despite having made noticeable progress in recent years in both usage and gender parity. Landlocked developing countries have shown only limited progress towards gender parity since 2019.

Gender parity scores and Internet penetration rates tend to be correlated. Small island developing States, where two thirds of the population use the Internet, are an exception. Although SIDS are 25 percentage points below the most connected country groups, they are close to gender parity (0.97). In 2019, the share of women using the Internet was *higher* than that of men (score of 1.02).

Internet use gender parity score



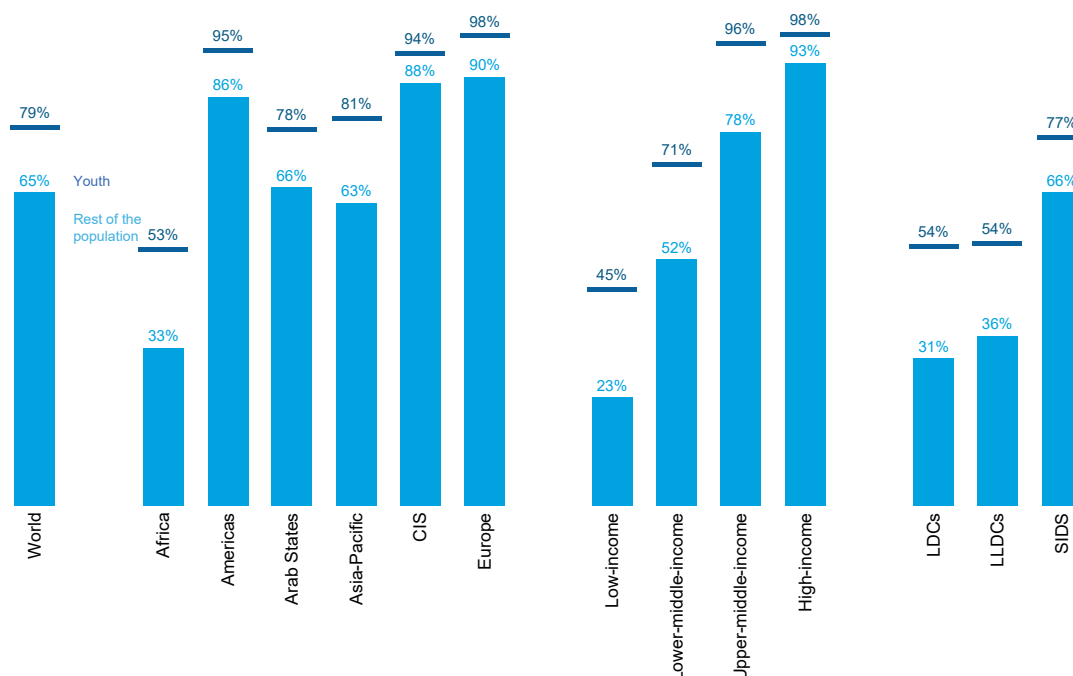
Note: The gender parity score is calculated as the proportion of women who use the Internet divided by the proportion of men. A score of less than one indicates that men are more likely to use the Internet than women, while a score greater than one indicates the opposite. Gender parity is considered to be achieved when the score lies between 0.98 and 1.02.

Source: ITU

Youth Internet use

Almost 80 per cent of people aged between 15 and 24 use the Internet

Percentage of individuals using the Internet by age group (2023)



Note: The term 'youth' in this report refers to people aged between 15 and 24 who use the Internet as a percentage of the total population aged between 15 and 24; 'rest of the population' refers to and includes all people under 15 or over 24 years old.

Source: ITU

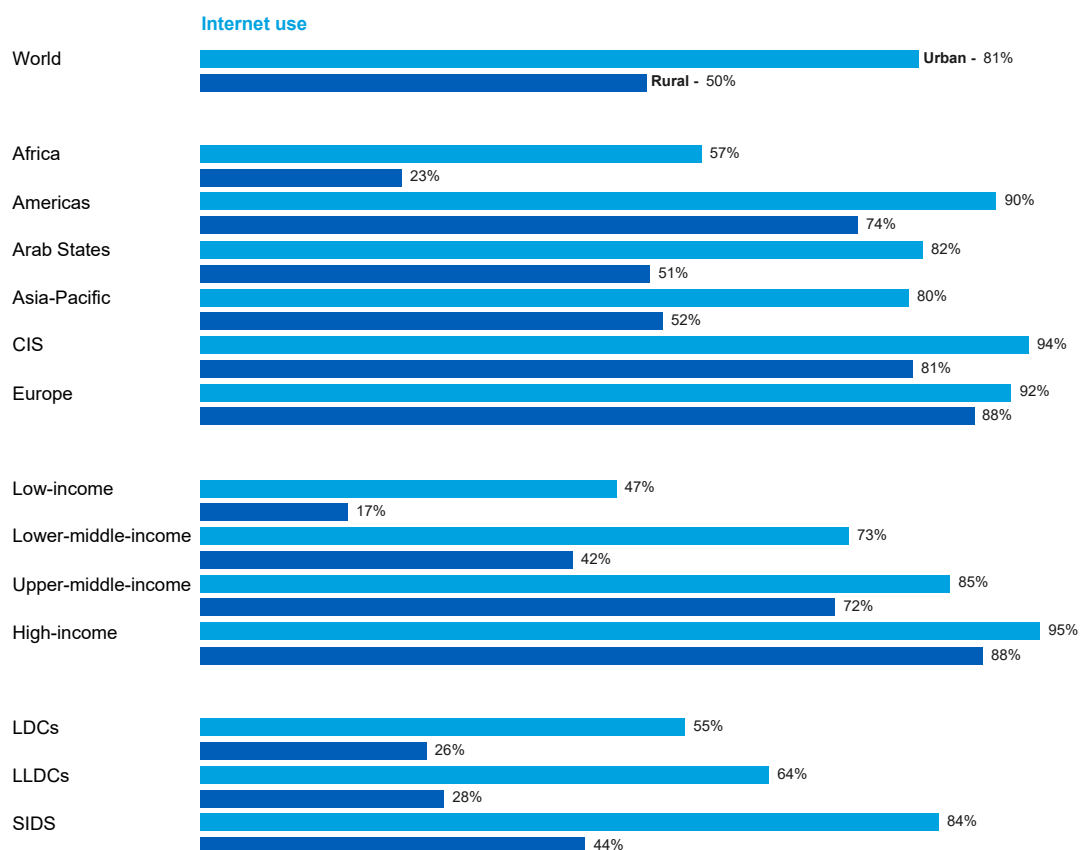
Worldwide, 79 per cent of people aged between 15 and 24 use the Internet, 14 percentage points more than among the rest of the population (65 per cent). This gap between generations has been stable over the last four years and is observed in every region. Universality, deemed achieved when at least 95 per cent of people use the Internet, has already been reached by this age group in high-income and upper-middle-income economies.

In low-income countries, 15- to 24-year-olds are almost twice as likely to use the Internet than other people in those countries, in relative terms. While this is the largest usage gap of any income group, it has shrunk since 2019 when 15- to 24-year-olds were 2.5 times more likely to use the Internet than the rest of the population in low-income countries.

Internet use in urban and rural areas

Wide Internet use gap between rural and urban areas persists in poorest countries

Percentage of individuals using the Internet in urban and rural areas (2023)



Source: ITU

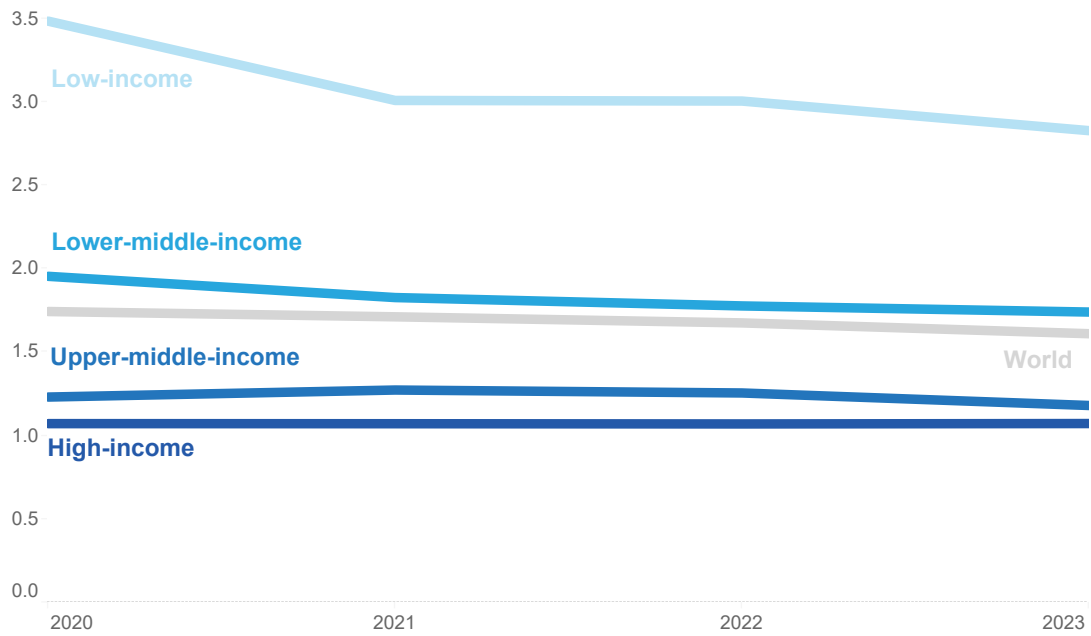
Worldwide, 81 per cent of urban dwellers use the Internet in 2023, compared with only 50 per cent of the population in rural areas. The urban-rural gap, measured as the ratio of the two percentages, has barely improved in recent years, from 1.7 in 2020 to 1.6 in 2023.

Unsurprisingly, the urban-rural gap is the smallest in regions with high penetration: the gap has been almost bridged in Europe. The ratio stands at 1.2 in both the Americas and the CIS regions, at 1.5 in the Asia-Pacific region and 1.6 in the Arab States region. In all these regions, progress has been modest since the start of the decade. In Africa, the gap remains wide: 57 per cent of urban dwellers use the Internet in 2023 compared with just 23 per cent of people in rural areas, reflecting a ratio of 2.5 (2.9 in 2020).

The gap between urban and rural areas varies significantly across income groups. The gap has almost been bridged in high income countries (ratio of 1.1). In contrast, the divide remains deep in low-income countries: less than one in five people (17 per cent) living in rural areas in these countries use the Internet. People living in urban areas are nearly three times more likely to use the Internet. That shows that the digital divide across income groups is magnified

in rural areas. The Internet use gap between urban areas of low-income and urban areas of high-income countries is 48 percentage points. The Internet use gap is 71 percentage points between the rural areas of the two groups.

Ratio of Internet use in urban areas to Internet use in rural areas



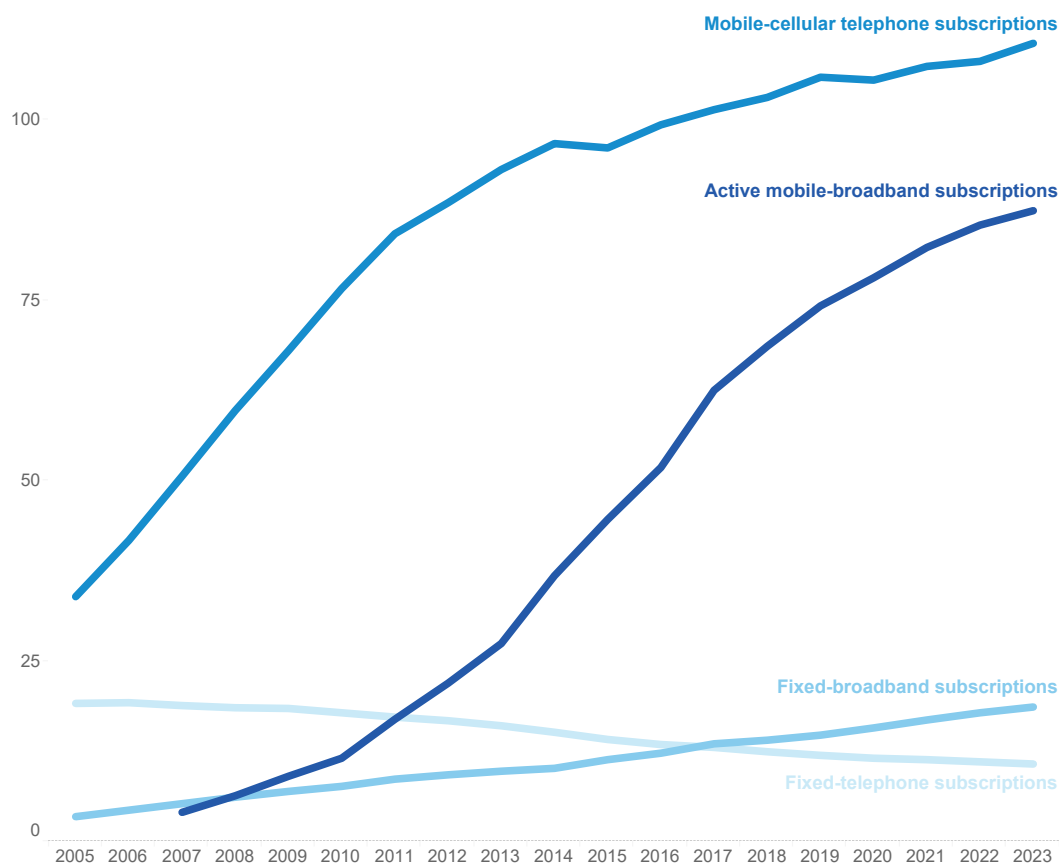
Note: A higher ratio indicates a larger urban-rural gap.

Source: ITU

Subscriptions

Broadband subscriptions continue to grow strongly

Subscriptions per 100 inhabitants worldwide



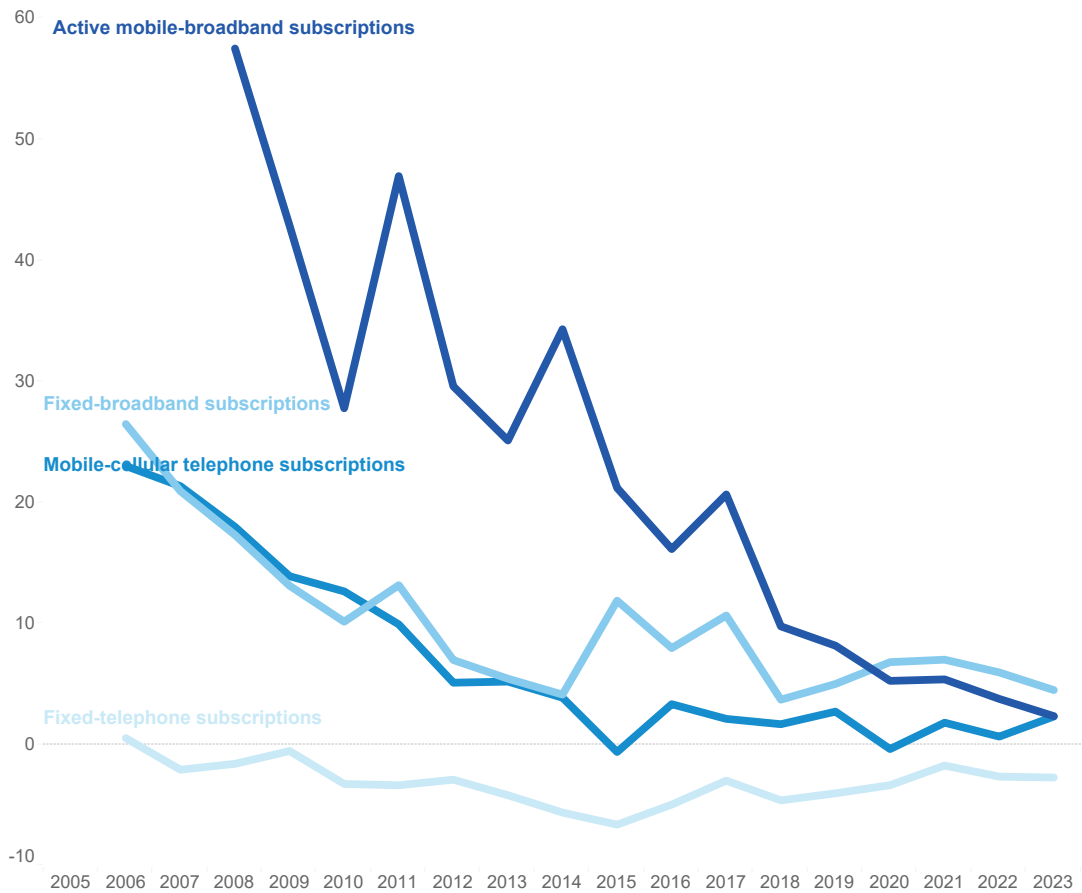
Note: The levels for fixed subscriptions are usually lower than for mobile subscriptions because the former are usually shared within a household, while the latter are normally tied to an individual.

Source: ITU

As of 2023, there are 111 mobile-cellular subscriptions and 87 mobile-broadband subscriptions per 100 inhabitants. In the past five years, mobile-broadband subscriptions grew by 27 per cent, four times the rate for mobile-cellular subscriptions (7 per cent).

Fixed-broadband subscriptions have grown steadily, at an average rate of 6.7 per cent per year. Fixed-telephone subscriptions continue their steady decline. Since 2005, fixed-telephone penetration has dropped by half, from 20 subscriptions to 11 subscriptions per 100 inhabitants.

Annual growth rates in subscriptions as a percentage

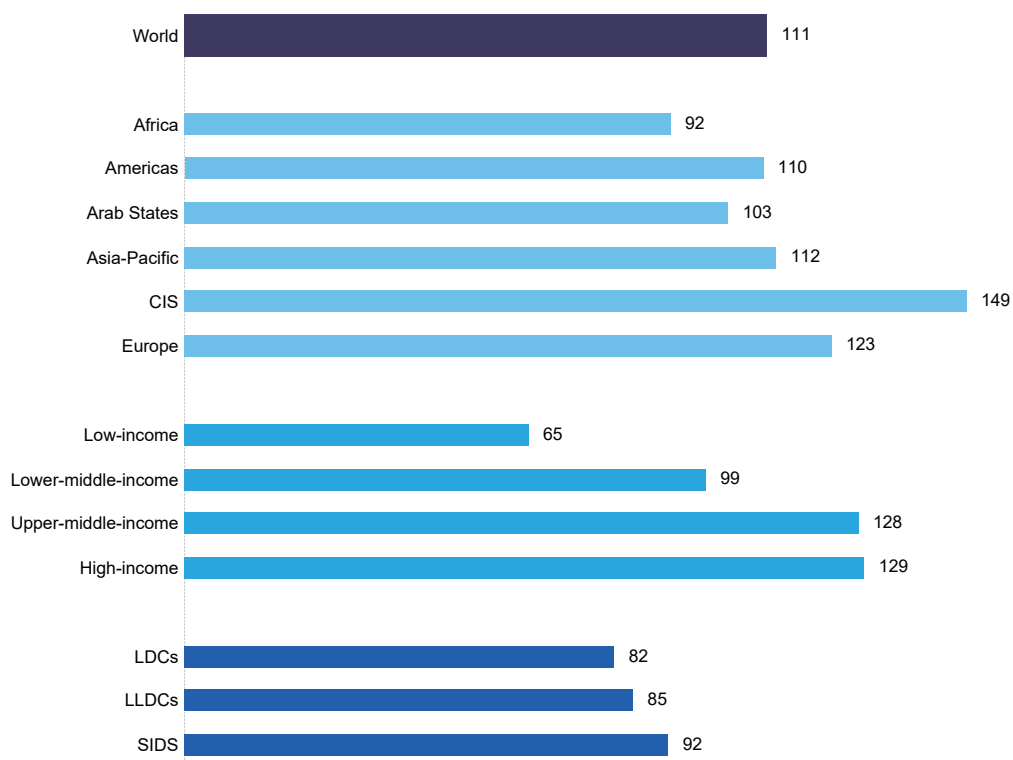


Source: ITU

At 8.9 billion, the number of mobile-cellular subscriptions now exceeds the world population. In high-income and upper-middle-income countries, there are about 130 mobile-cellular subscriptions per 100 inhabitants, twice the level observed in low-income countries (65 subscriptions per 100 inhabitants). Among the regions, CIS boasts the highest penetration, with nearly three subscriptions for every two people (149 per 100 inhabitants), 1.6 times the penetration rate of Africa (92 per 100 inhabitants).

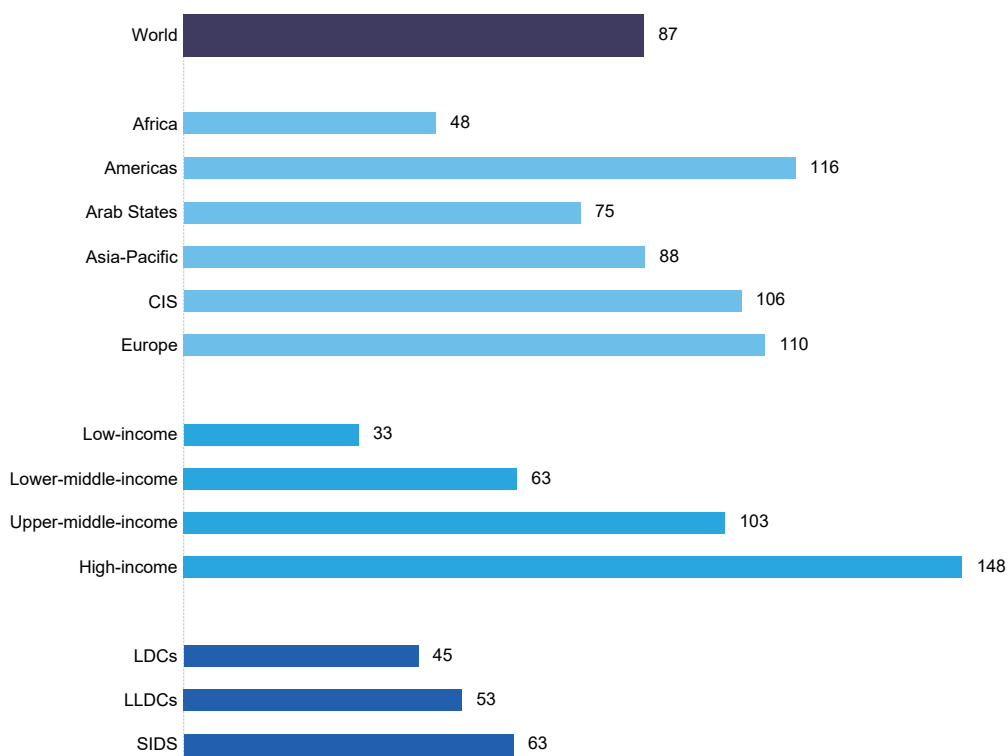
Regional disparities are just as stark for mobile-broadband penetration: the rate of 116 subscriptions per 100 inhabitants in the Americas region is more than twice the rate in Africa (48 per 100 inhabitants).

Mobile-cellular telephone subscriptions per 100 inhabitants by region (2023)



Source: ITU

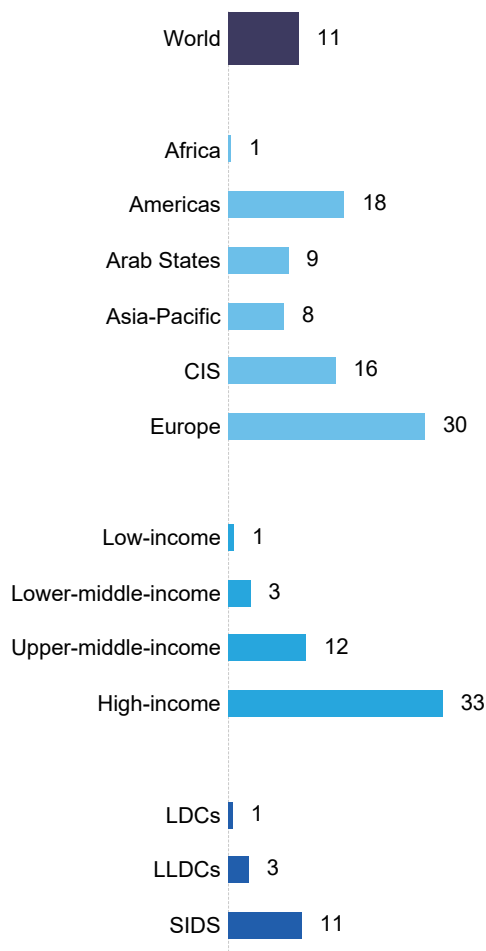
Active mobile-broadband subscriptions per 100 inhabitants by region (2023)



Source: ITU

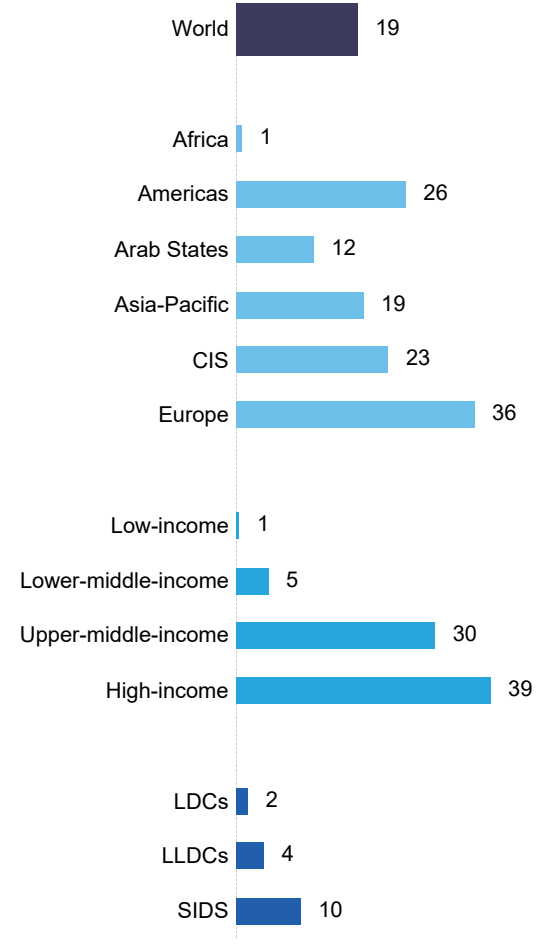
Penetration rates for fixed subscriptions are much lower than for mobile subscriptions, because fixed connections are usually shared by several people in a household. Nonetheless, the inequalities in access to fixed connections across countries are far higher than for mobile connectivity. Fixed connections are common in high-income countries (39 subscriptions per 100 inhabitants), but are almost non-existent in low-income countries, due to high prices and a lack of infrastructure.

Fixed-telephone subscriptions per 100 inhabitants by region (2023)



Source: ITU

Fixed-broadband subscriptions per 100 inhabitants by region (2023)

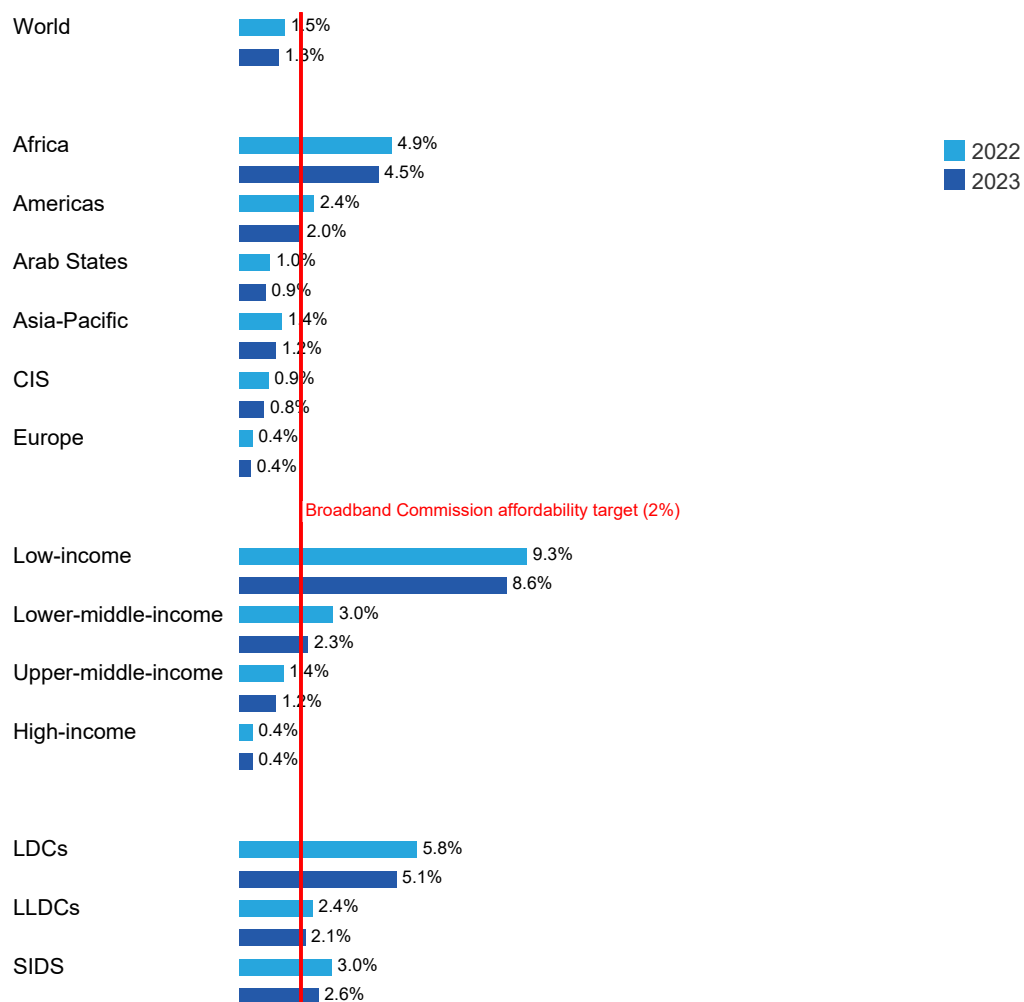


Source: ITU

Affordability of ICT services

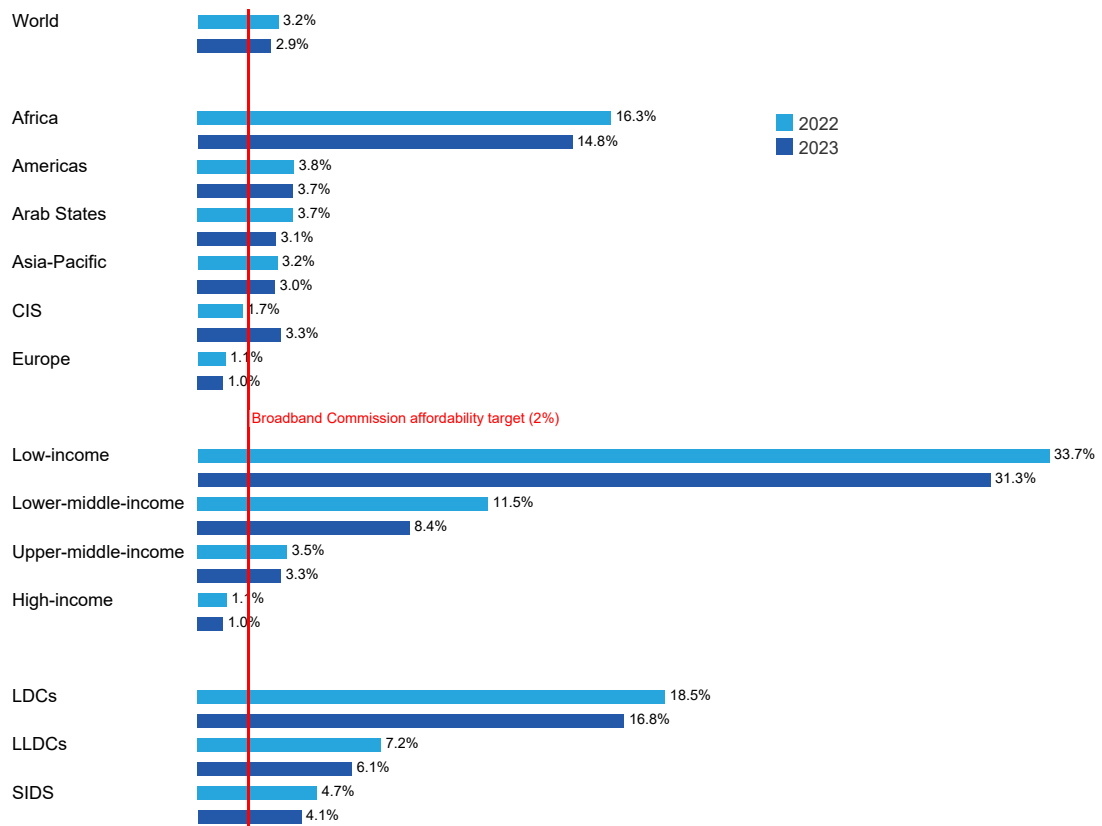
ICT services continue to become more affordable worldwide

Data-only mobile-broadband (2GB) basket prices as a percentage of gross national income per capita



Source: ITU

Fixed-broadband (5GB) basket prices as a percentage of gross national income per capita



Source: ITU

The trend of fixed- and mobile-broadband services becoming more affordable continued in 2023. The two connectivity benchmarks, namely the data-only mobile-broadband basket and the fixed-broadband basket, have become more affordable in all regions of the world and for all income groups. The global median price of the mobile-broadband basket dropped from 1.5 to 1.3 per cent of gross national income (GNI) per capita, while that of the fixed-broadband basket dropped from 3.2 to 2.9 per cent of GNI per capita.

Nonetheless, lack of affordability continues to be a key barrier to Internet access particularly in low-income economies. A wide gap persists between high-income economies and the rest of the world. Compared to prices in high-income economies, the mobile-broadband basket is 5.5 times less affordable in lower-middle-income economies and more than 20 times less affordable in low-income economies, where a fixed-broadband subscription, if available at all, costs the equivalent of a third of the average monthly income.

The United Nations [Broadband Commission for Sustainable Development](#) aims to make broadband in developing countries affordable by 2025, affordability being defined as the availability of broadband access at a price that is less than two per cent of the monthly GNI per capita. Where data are available, 114 economies out of 188 meet the affordability target with respect to the data-only mobile-broadband basket in 2023, 11 more than in 2022. Seventy-one economies out of 178 meet the target with regard to the fixed-broadband basket, the same number as in 2022. Sixty-two of the low- and middle-income economies meet the Broadband Commission affordability target in 2023, with either one of the two baskets. With the majority of the 134 low- and middle-income economies still above it, reaching the target remains a challenge.

Detailed global, regional, and country-level analysis for all five price baskets along with the full country-level dataset of ICT prices in 2023 will be released in early 2024.²

² More information on ICT prices available at <https://www.itu.int/en/ITU-D/Statistics/Pages/ICTprices/default.aspx>.

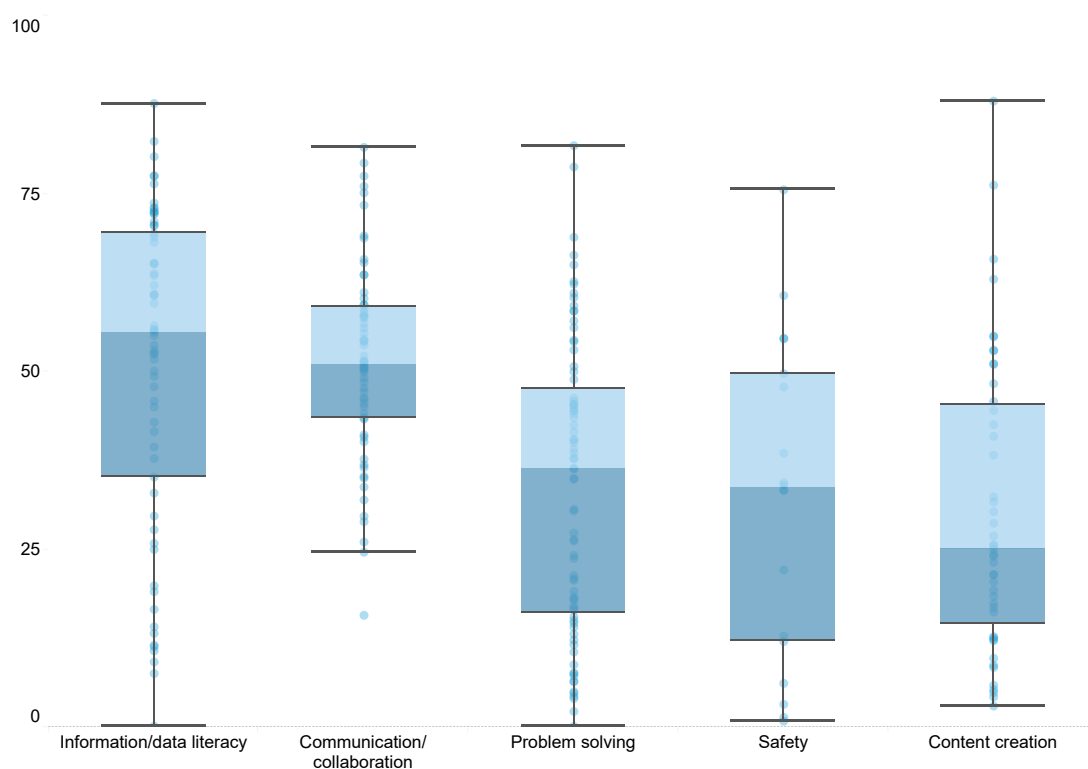
ICT Skills

Lack of data for this critical enabler hampers progress assessment of meaningful connectivity

Self-reporting of ICT skills is subjective. However, ICT skills are measured based on whether an individual has recently performed certain activities that require different types of skill. The assumption is that performing these activities implies that one has a certain level of the required skills. Activities are grouped into five areas of digital skills: communication/collaboration; problem solving; safety; content creation; and information/data literacy.

Despite the importance of digital skills in leveraging ICTs for economic prosperity and social well-being, data remain very scant. Only 83 countries submit data, and rarely for all skill areas. Based on this limited dataset, skills linked to *information/data literacy* are the most prevalent, with a median of 56 per cent and an average that lies between 33 and 69 per cent for most countries. *Communication/collaboration* is the second most prevalent (median of 51). *Problem solving* (36), *safety* (34), and *content creation* (25) follow with much lower medians.

Percentage of individuals with ICT skills, by skill type (2019-2022)



Note: Bars indicate the 25th, median and 75th percentile of all country values. Bottom and top lines indicate minimum and maximum values. *Communication/collaboration* is the average of sending messages (e.g. e-mail, messaging service, SMS) with attached files; making calls over the Internet; participating in social networks; and taking part in consultation or voting via Internet. *Problem solving* is the average of finding, downloading, installing and configuring software; connecting and installing new devices; transferring files or applications between devices; electronic financial transactions; doing an online course; and purchasing or ordering goods or services. *Safety* is the average of changing privacy settings; and setting up effective security measures. *Digital content creation* is the average of using copy and paste tools; creating electronic presentations; using basic arithmetic formula in a spreadsheet; editing online text, spreadsheets, presentations; and uploading self/user-created content. *Information/data literacy* is the average of verifying the reliability of information; getting information about goods or services; reading or downloading newspapers, etc.; and seeking health-related information. Data availability: 64 countries for *communication/collaboration*, 80 countries for *problem solving*, 18 countries for *safety*, 47 countries for *content creation*, and 65 countries for *information/data literacy*. In-scope ages may vary between countries.

Source: ITU

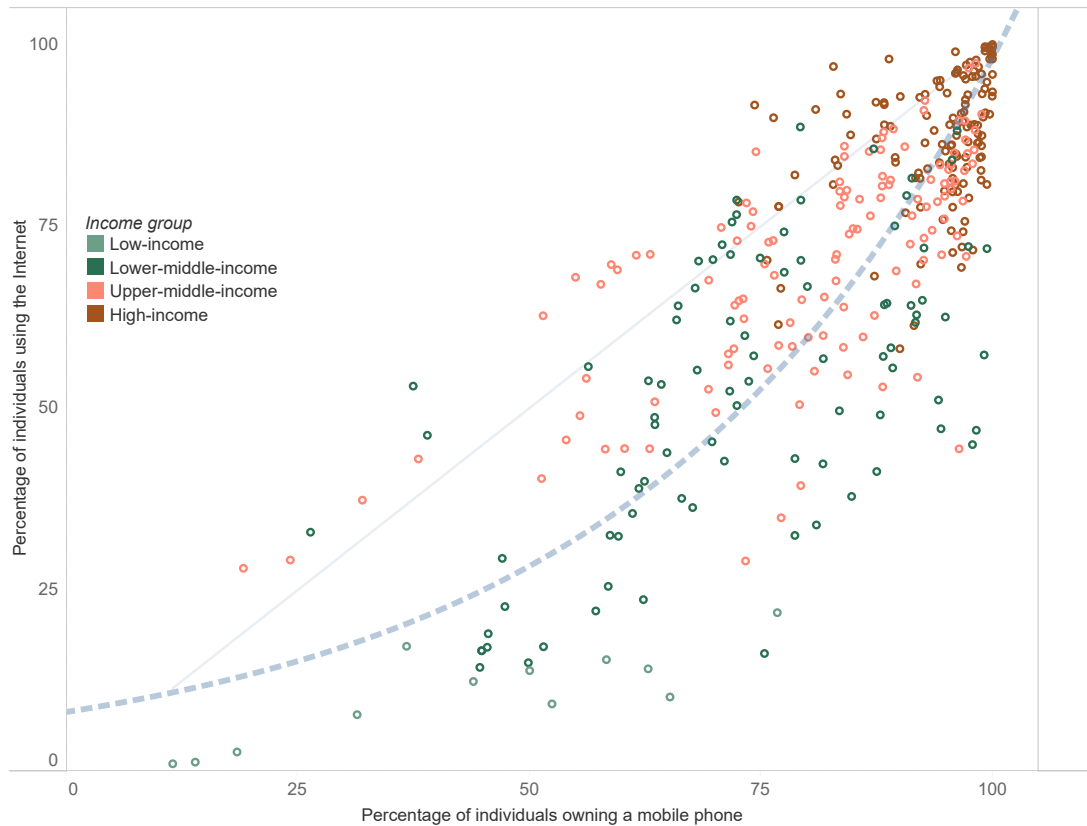
Another way to analyse these data is through the scope of skills reported in different countries. Among the 70 countries that provided data in at least three skill areas, 58 reported averages of at least 25 per cent in multiple areas, 32 reported averages of over 50 per cent in multiple areas and only two reported averages of over 75 per cent in multiple areas.

The relatively low level of skills in countries providing data contrasts with their high median share of overall Internet use, 87 per cent. This gap between individuals using the Internet and those with digital skills demonstrates that many may be using the Internet without being able to fully benefit from it or avoid its dangers.

Mobile phone ownership

More than three-quarters of the world's population own a mobile phone

Percentage of individuals using the Internet vs individuals owning a mobile phone (2013-2022)

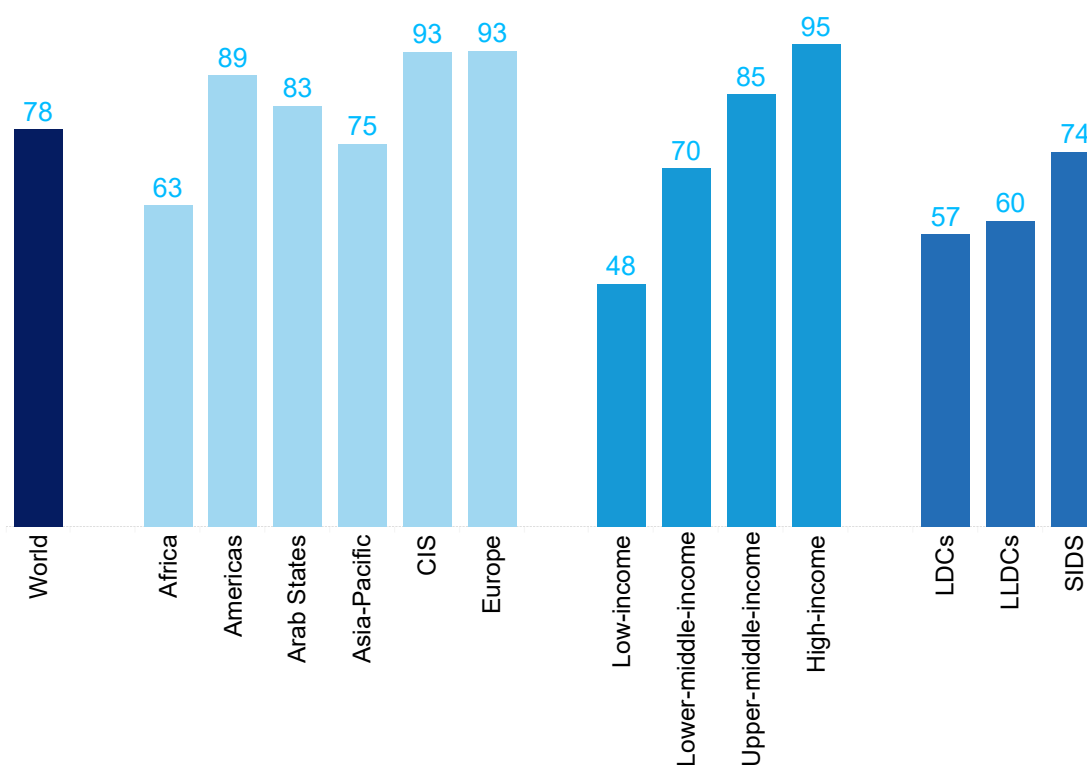


Note: Official data available from 100 countries (380 observations). In-scope ages may vary between countries. Each point refers to one country in one year between 2013 and 2022. Some countries have multiple years and multiple points. The blue dotted line refers to the trend of all countries. The grey diagonal line is a reference line for mobile phone ownership being equal to Internet use.

Source: ITU

Mobile phones are the most common gateway to the Internet and the prevalence of mobile ownership therefore provides a good indication of Internet penetration. This is not a one-to-one correspondence, however, because people other than the owner could use the phone to access the Internet (e.g. children occasionally using the phone of a parent), and some people have feature phones and/or a subscription only allowing calls.

Percentage of individuals owning a mobile phone (2023)



Note: Mobile phone ownership refers to individuals aged 10 or older.

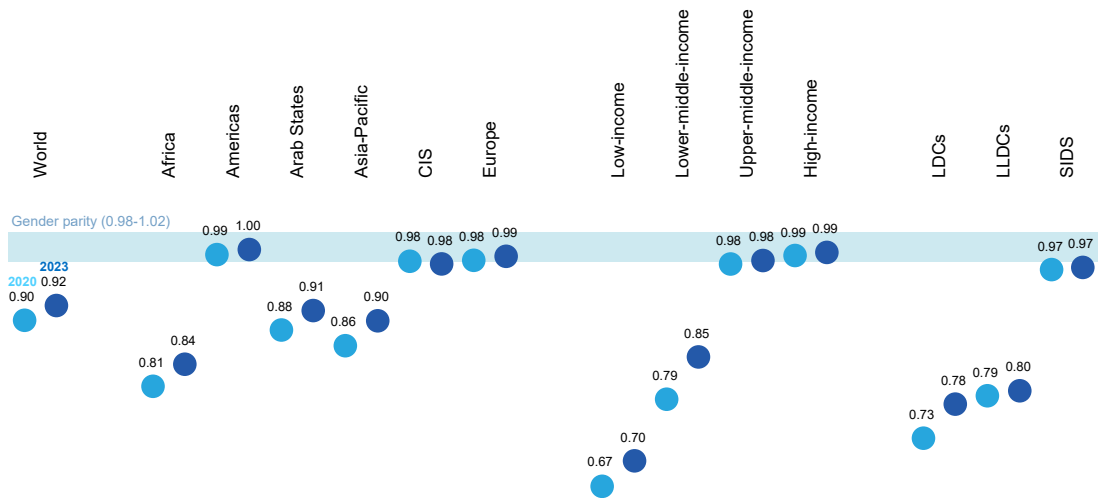
Source: ITU

Data show that, on average, the percentage of individuals owning a mobile phone is higher than the percentage of Internet users, in every region and every income group. Worldwide, 78 per cent of the population aged 10 and over in 2023 own a mobile phone, 11 percentage points higher than the percentage of individuals who use the Internet. This gap is shrinking in all regions, as growth in Internet use has significantly outpaced the growth of mobile phone ownership over the last three years.

In the Americas, CIS and Europe, where Internet penetration exceeds 80 per cent on average, the rate of mobile phone ownership is less than five percentage points higher than Internet use. The gap is 9 percentage points in the Asia-Pacific and 14 percentage points in the Arab States region. In the Africa region, where 63 per cent of the population own a mobile phone but only 37 per cent use the Internet, the gap is 26 percentage points.

The gender parity gap in mobile phone ownership is comparable with that in Internet use. At the global level, the gender parity score for mobile phone ownership is marginally lower (i.e., skewed against women) than it is for Internet use. As with Internet use, progress has been uneven over the past three years. Women are about 8 per cent less likely to own a mobile phone than men, down from 10 per cent in 2020. Among those not owning a mobile phone, women outnumber men by 35 per cent.

The gender parity score for mobile phone ownership



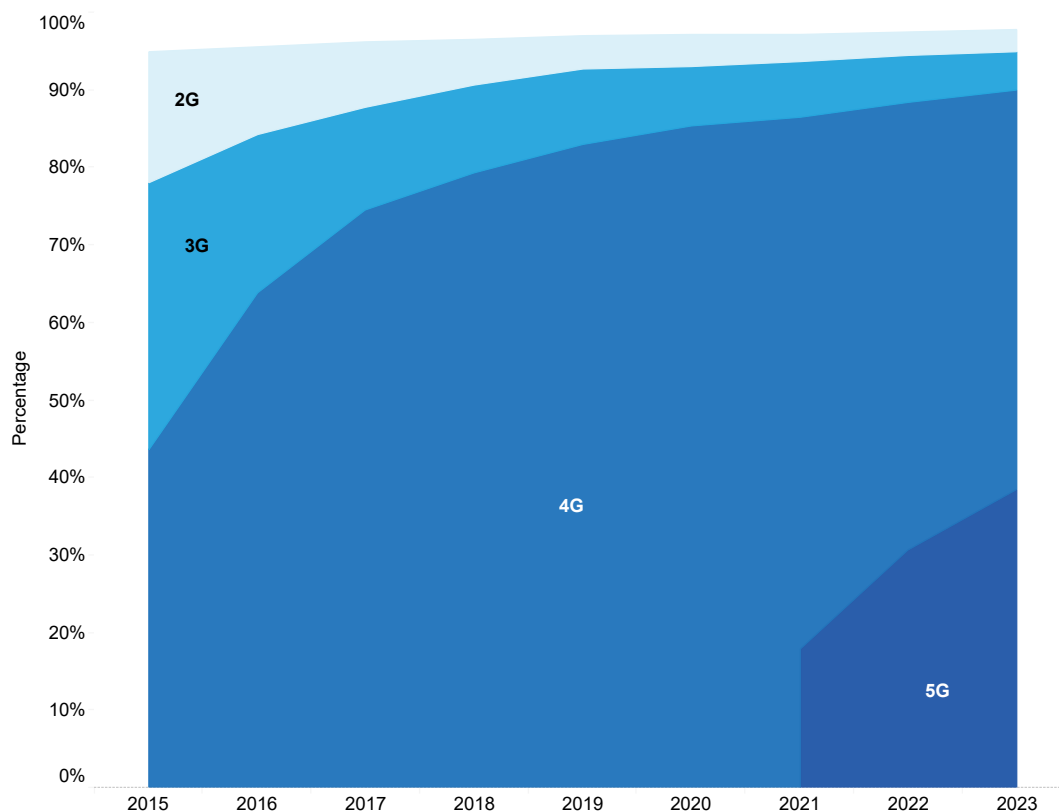
Note: The gender parity score is calculated as the proportion of women who own mobile phones divided by the proportion of men. A score of less than one indicates that men are more likely to own mobile phones than women, while a score greater than one indicates the opposite. Gender parity is achieved if the score lies between 0.98 and 1.02. Mobile phone ownership refers to individuals aged 10 or older.

Source: ITU

Mobile network coverage

Almost 40 per cent of the world's population now covered by 5G

Population coverage by type of mobile network (2015-2023)



Note: The values for 2G, 3G and 4G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. 95 per cent of the world population is covered by a 3G or above network, that is 5 per cent + 52 per cent + 38 per cent in 2023). There are insufficient data to produce estimates for 5G coverage prior to 2021.

Source: ITU

In many countries older-generation mobile networks are being switched-off in favour of new generation networks. 5G enables the development of a digital ecosystem by connecting machines, objects, and devices with ultra-low latency and the potential to improve energy efficiency. This is the case for most European operators that plan to switch off 3G networks by December 2025 and for operators in the Asia-Pacific region. However, in some countries the path is less clear, mainly because 2G and 3G networks retain a significant presence. This is the case notably in lower-income countries, where both technologies remain an important means of communication. In these countries, the main obstacles to 5G deployment and adoption include the high infrastructure costs, device affordability, and regulatory barriers.

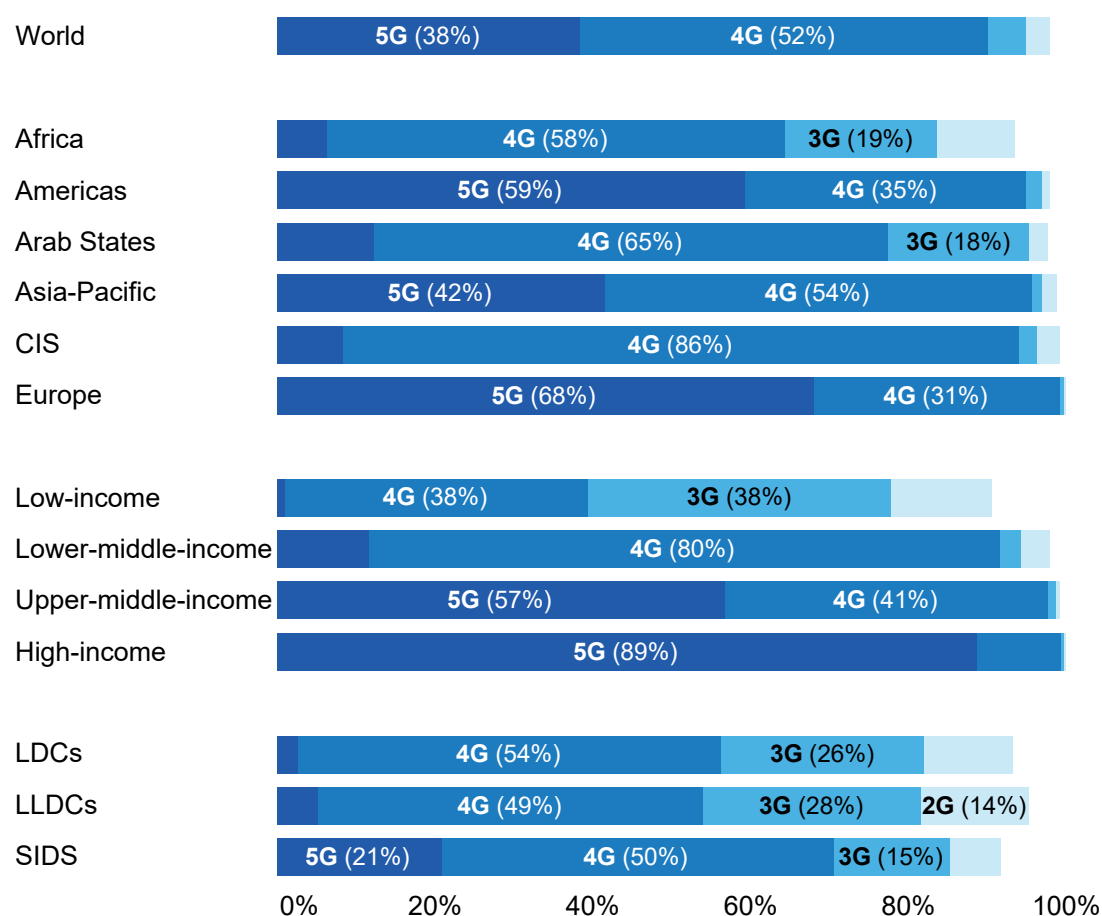
Since commercial deployment began in 2019, 5G coverage has increased to reach 40 per cent of the world population in 2023. Distribution, however, remains very uneven. While 89 per cent of the population in high-income countries is covered by a 5G network, coverage remains limited in low-income countries. Europe boasts the most extensive 5G coverage, with 68 per cent of the population covered, followed by the Americas region (59 per cent) and the Asia-Pacific region (42 per cent). Coverage reaches 12 per cent of the population in the Arab States region and less than 10 per cent in the CIS region (8 per cent) and Africa region (6 per cent).

Ninety per cent of the world population is covered by 4G, and where 5G is not available, this remains a very good alternative. However, 55 per cent of people without access to 4G live in low-income countries. Whereas 95 per cent of the population in high-income and middle-income countries is covered by 4G or above, the proportion drops to 39 per cent in low-income countries, where 3G remains the dominant technology, and often the only technology available to connect to the Internet.

Today, access to a mobile-broadband network is available to 95 per cent of the world population. Bridging the “coverage gap”, that is covering the remaining five per cent still out of reach of a mobile-broadband network, is proving difficult: since crossing the 90 per cent threshold in 2018, global 3G coverage has increased by only four percentage points. In the Africa region, the gap is shrinking but remains relatively high at 16 per cent, predominantly affecting the population of central and western Africa.

Mobile broadband remains out of reach for 18 per cent of the population in LDCs and LLDCs, which are falling short of target 9.c of Sustainable Development Goal 9: to “significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.”

Population coverage by type of mobile network (2023)

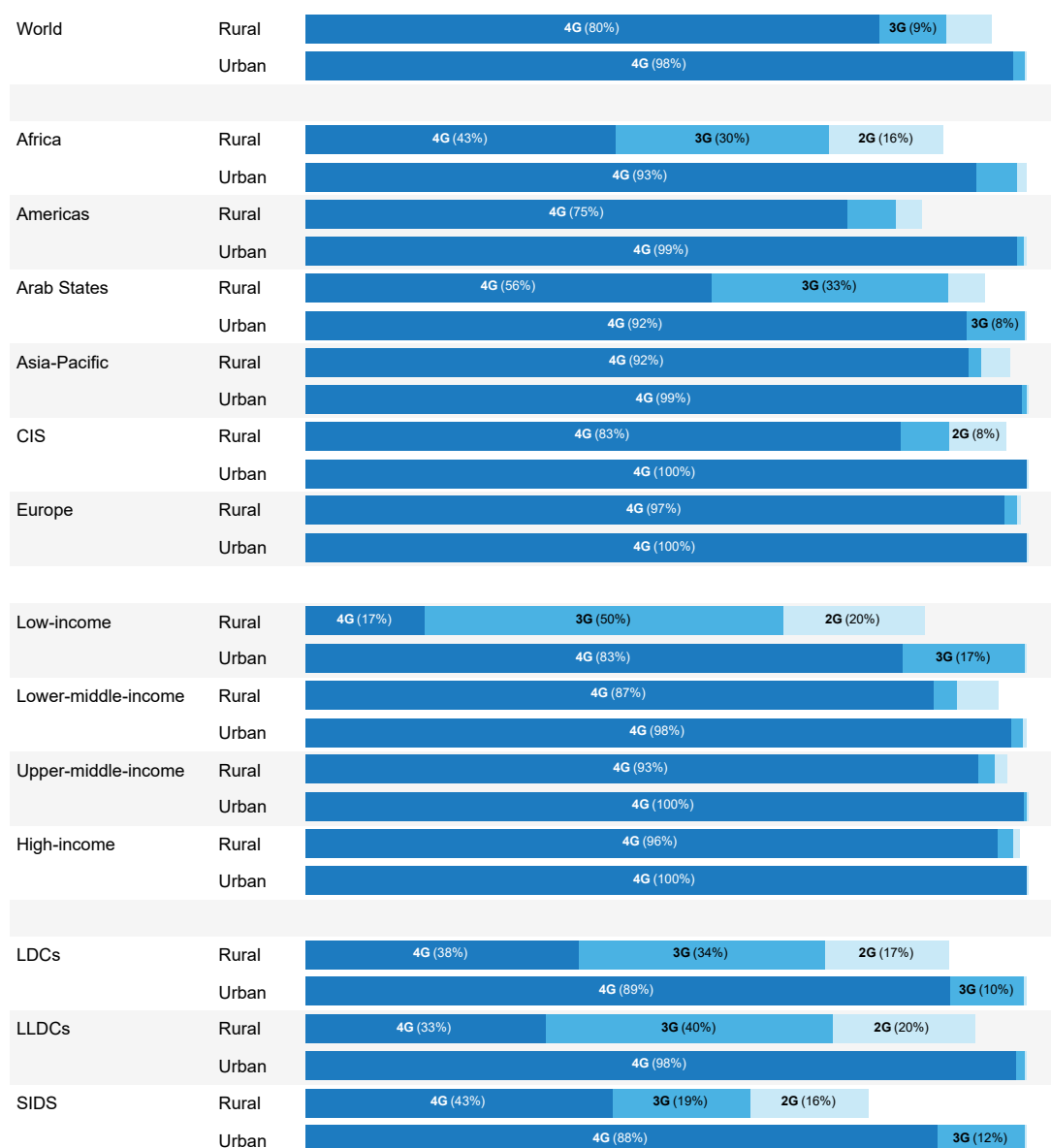


Note: The values for 2G, 3G and 4G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. in 2023, 95 per cent of the world population is covered by a 3G or above network, that is 5 per cent + 52 per cent + 38 per cent).

Source: ITU

Disaggregating the data by location reveals that virtually all urban areas are within range of a mobile-broadband network (note that estimates of 5G coverage by location are not yet available). In addition, 98 per cent of the population living in rural areas of high-income economies are covered. This implies that almost every person without access to a mobile broadband network lives in a rural area of a developing country.

Population coverage by type of mobile network and area (2023)



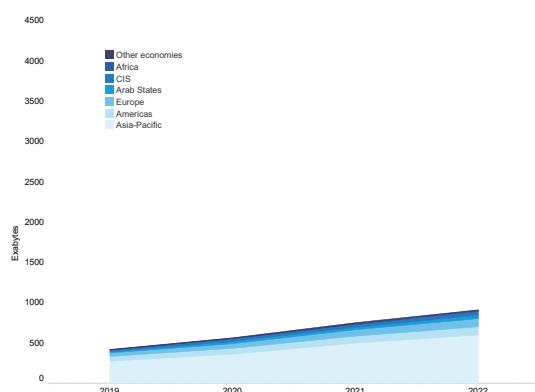
Note: The values for 2G and 3G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. 89 per cent of the world's rural population is covered by a 3G network or above, that is 9 per cent + 80 per cent).

Source: ITU

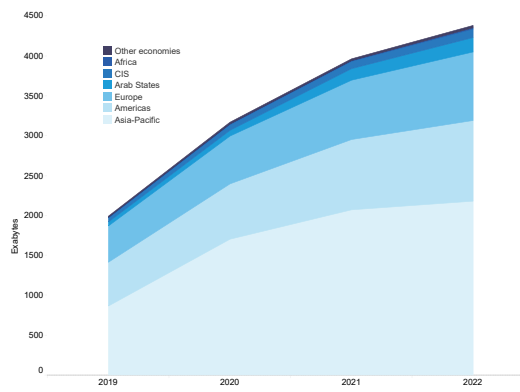
Internet traffic

Despite the rise of mobile broadband, fixed broadband accounts for 83 per cent of all traffic

Mobile-broadband traffic in exabytes (EB)



Fixed-broadband traffic in exabytes (EB)



Note: 1 Exabyte = 10^{12} megabytes. Refers to traffic within the country.

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Source: ITU

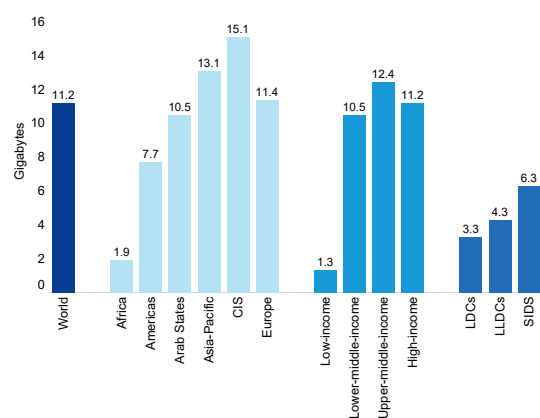
Source: ITU

For 2022, ITU estimated mobile- and fixed-broadband traffic rates to enable the computation of global and regional aggregates. In this context, traffic refers to end user Internet traffic.

Global mobile-broadband traffic rates were estimated to have reached 913 exabytes (EB) in 2022, more than twice the traffic of 2019 (419 EB). Up from just 1 991 in 2019, fixed-broadband traffic rates were estimated to have increased to 4 378 EB in 2022 (nearly five times those of mobile-broadband traffic). Between 2019 and 2023, mobile- and fixed-broadband traffic has had an estimated annual average growth of 30 per cent, with a peak rate of growth at the start of the COVID-19 pandemic in 2020. Post-pandemic traffic growth slowed between 2021 and 2022: mobile-broadband traffic increased by 22 per cent, and fixed broadband increased by 10 per cent.

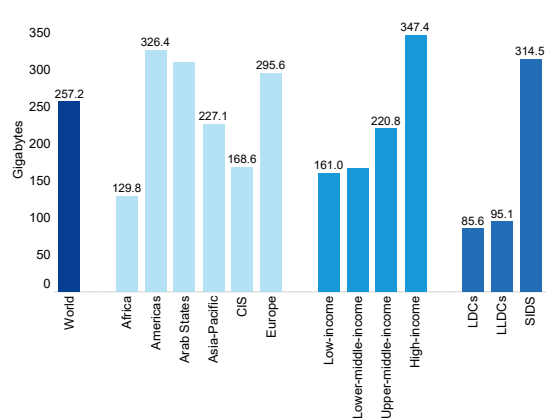
Fixed broadband remains the service of choice for heavy Internet data usage. During the pandemic, a considerable share of mobile traffic was rerouted through fixed networks using home Wi-Fi connections. In 2020, fixed broadband accounted for 96.6 per cent of all Internet traffic. In 2022, the mobile-broadband share of traffic had increased from 3.4 to 4.2 per cent.

Mobile-broadband traffic per subscription per month in gigabytes (2022)



Source: ITU

Fixed-broadband traffic per subscription per month in gigabytes (2022)



Source: ITU

In 2022, the monthly average fixed-broadband traffic per subscription reached 257 gigabytes (GB) worldwide, compared to the mobile-broadband traffic per subscription average of 11 GB. While the average annual increase of fixed-broadband traffic per subscription was 21 per cent over the 2019 to 2022 period, that average showed a remarkable slowdown in growth, increasing by just 3 per cent from 2021 to 2022.

In contrast, following network infrastructure upgrades, the deployment of 5G networks, and increasing demand, mobile-broadband traffic per subscription increased by 26 per cent every year between 2019 and 2021, and with only a relatively minor slowdown, grew by a further 17 per cent between 2021 and 2022.

There are also striking regional differences in mobile- and fixed-broadband traffic per subscription. In the Americas, a fixed-broadband subscription generates 326 GB of traffic per month, compared with 130 GB in Africa. The gap is even wider for mobile broadband traffic. In Africa, the monthly mobile broadband traffic average per subscription reached 1.9 GB, about six times less than the world average (11.2 GB) and eight times less than the CIS region average (15.1 GB).

Gaps in terms of Internet traffic are associated with income levels. Monthly Internet traffic averages per fixed-broadband subscription rise dramatically with increases in income levels, from 161 GB per subscription in low-income economies, to as much as 347 GB per subscription in high-income economies. For mobile broadband, middle- and high-income economies generate very similar traffic averages, from about 10 to 12 GB per month, which represents almost a ten-fold difference with low-income economies (1.3 GB). A possible explanation could be that, in contrast with fixed-broadband services, mobile-broadband plans in middle- and high-income economies typically have a data allowance cap, effectively imposing a supply-side constraint.

Measuring digital development

The average subscription in LDCs stood at merely 33 and 29 per cent of the global average in terms of fixed- and mobile-broadband traffic, respectively. In terms of income and infrastructure, SIDS is a more heterogenous group of States, which includes Singapore's high fixed-broadband penetration rates and LDCs relying at most on mobile services, with above-average fixed-broadband traffic per subscription and below-average mobile-broadband traffic per subscription.

Methodology

For this publication, regional and global aggregates up to 2022 were calculated using data supplied by Member States to ITU, supplemented by ITU estimates. Aggregates can differ from those produced for previous editions of *Facts and Figures*, because of new or revised data submitted by Member States. Except for the price data, all 2023 aggregates are estimates computed by ITU, based on the methodology described below. For more detailed information, please refer to [Estimation methods for selected ICT indicators](#).

Percentage of the population covered by mobile networks: end-2022 estimates

The percentage of the population covered by a mobile signal (2G/3G/4G/5G and above) refers to the percentage of inhabitants who have such coverage, regardless of whether they use the service. The indicator thus measures the availability of mobile cellular services, not the actual level of use or subscriptions. It is differentiated by urban and rural areas.

The data for this indicator are generally provided in aggregate form (urban and rural). As with many indicators, ITU collects the data from telecommunication operators, telecommunication/ICT regulators and national ministries. This information is widely available for both developed and developing countries. To fill the data gaps for countries that do not submit data, two estimation methods are used: estimation using published data, and if this is not successful, estimation using trends.

Estimation using published data

Data on network coverage are sometimes made publicly available in annual reports and publications and/or on the website of regulators and/or operators. This process involves the following steps:

1. **Identifying market players:** It is necessary to determine the number of, and obtain information on, mobile network operators (MNOs) and primary market providers of services in each country.
2. **Annual report analysis:** Once MNOs are identified, it is necessary to find, access, and research their publicly available publications and annual reports.
3. **Alternative sources of annual reports:** If publications and annual reports are not publicly available on operator or regulator websites, information recorded by national stock exchange commissions or international exchange commissions can be consulted. For example, the U.S. Securities and Exchange Commission can be a source of data in the form of Form 20-F and Form 6-F filings, which provide comprehensive information about the company, including subscription data, tariff details, staffing information, and financial data.
4. **Press releases and other media reports:** If no data or only limited data are available from company annual reports or regulator websites, information can be approximated through industry analysis and news articles, including operator press releases, official statements from regulators or ministries, and reputable newspapers within the country. Such resources may include absolute subscription numbers, market shares, penetration rates, growth rates, and population coverage, which can be used to derive estimates for the country.

Based on this information, it may be possible to estimate the total percentage of the population covered by a telecommunication network.

Estimation using trends

When data are not publicly available, estimates may be made by analysing trends from the previous five years. This estimation process is facilitated through the utilization of the Expert Modeller forecasting functionality in SPSS.

Since most countries provide data without differentiating between urban and rural coverage, ITU disaggregates the data by subtracting the urban population from the total population with mobile network access to generate the number of people covered by a mobile network in rural areas. The number of people living in rural areas is published by the World Bank. The percentage of the rural population covered by a mobile network (2G/3G/4G/5G and above) is then obtained by dividing the number of rural inhabitants by the total rural population and multiplying by 100. Aggregate values for regions, income groups and other groupings are calculated based on a weighted average of the values for individual countries.

Internet access and use estimates

Statistics on Internet use and mobile phone ownership can be derived from household surveys. However, relatively few countries administer such surveys, mainly owing to their cost; accordingly, there are large data gaps. In addition, the delay between the collection of household survey data and their publication can be as much as two years or more, limiting their usefulness for ICT statistics given the rapid pace of technological change.

These shortcomings make it necessary to rely on data modelling tools and/or imputation to estimate missing values, and then use forecasting techniques to estimate the figures for 2023. The models used to estimate these missing values are based on a diverse range of widely available national indicators on mobile-broadband subscriptions, ICT affordability, GNI per capita and so on, and accounting for their changes over time. The data used in the models were also weighted to give proportional influence to each region based on its number of countries.

In addition to official data collected by ITU from the membership, other sources were used to obtain data and/or cross-check estimates, in particular the GSM Association (GSMA) and Multiple Indicator Cluster Surveys. Additional data on socio-demographic characteristics were obtained from the World Bank, UNICEF, the International Labour Organization and the United Nations Population Division.

The official data and estimates were used to calculate aggregate values for regions, income groups and other groupings based on a weighted average of the values for individual countries. Internet use aggregates were weighted by the total population of each economy, while mobile phone ownership aggregates were weighted by the size of the population aged 10 years or older.

Disaggregation of overall values was performed separately. For instance, where official country data on the number of Internet users were only available in aggregate form, comparable economies for which disaggregated data for urban and rural populations are available were used to estimate the missing urban/rural ratio for that country. Existing data on the country's population size and urbanization were then used to produce separate estimates of the proportion of the population using the Internet in urban and rural areas. Global and regional figures were calculated by weighting the figures for individual countries by the rural and urban population in each country. A similar procedure was used to estimate Internet use by young people and Internet use and mobile phone ownership by gender.

For 2023, forecasting was used to estimate the proportion of individuals using the Internet and owning mobile phones. Forecasts were made at the country level for overall Internet use based on previous growth and historic growth of countries with similar levels of use. For all other indicators, forecasts were produced for regional and global aggregates only, based on previous growth.

Mobile-cellular, mobile-broadband and fixed-broadband subscription estimates

The data on subscriptions in 2023 were compiled from publicly available data from regulators and ministries, as well as subscription information published by each country's main operators. When the data from the main operator of the country was used, the operator-reported number of subscriptions was divided by its market share to obtain the total number of subscriptions in the country for a particular service. In the absence of annual reports, subscription data were estimated from industry analyses, authoritative news articles and operator press releases.

Data from these sources include the absolute number of subscriptions, market shares, penetration and growth rates, which were used to derive the country estimates using the same method as with operator data. In the case of countries for which data were not available either from the national administration or from annual and industry reports, subscriptions data were estimated using univariate time series analyses applied to the data from the last 10 years.

The univariate time series analyses were done by decomposing the time series of penetration data of a particular service to its trend and residual component so as to obtain the autoregressive integrated moving average (ARIMA) models. The resulting ARIMA models were used to make the 2023 point prediction for each country and service. Aggregate values for regions, income groups and other groupings were calculated based on a weighted average of the values for individual countries.

Fixed- and mobile-broadband Internet traffic estimates

ITU collects Internet traffic statistics on fixed and mobile broadband (inside the country) through its annual World Telecommunication/ICT Indicators short and long questionnaires according to the methodology provided in the *Handbook for the Collection of Administrative Data on Telecommunications/ICT*. Data that are unavailable from the questionnaires are compiled from publicly available sources from regulators and ministries, and from the OECD Broadband statistics. In the absence of such alternative sources, ITU makes estimates relying on modelling tools and imputation to estimate aggregates.

Fixed-broadband Internet traffic estimates are based on the assumption that traffic is a function of technical conditions, moderating factors (quality of connectivity) and economic factors influencing demand. Consequently, models rely on ITU indicators such as fixed-broadband subscriptions (overall and in the speed tier above 100 Mbit/s), the share of individuals and households using the Internet, affordability of the fixed-broadband price basket, average download speeds obtained from Ookla Speedtest data and per capita income obtained from the World Bank.³

³ Ookla Speedtest data. Speedtest by Ookla Global Fixed and Mobile Network Performance Maps was accessed in October 2023 from <https://registry.opendata.aws/speedtest-global-performance>.

The linear model selected for Internet traffic estimates for this report was based on data availability and model fit measures. In cases where data was only missing for some of the years, extrapolations were made with the help of changes in average download speeds or exponential smoothing functions.

Traffic estimates have several limitations. First, mobile operators and Internet service providers do not regularly publish traffic statistics, and statistics provided by ministries and regulators often include estimates. While there are some good practices of publishing quarterly data on Internet traffic, only a few sources provide timely data. In addition, the predictive power of the models estimating traffic are lower than for other indicators. Hence, different from the other indicators discussed in the report, the available information did not permit making forecasts for end of year 2023, which is why data are only published until 2022 year-end.

ICT price statistics

ITU price statistics refer to ICT baskets, which are internationally comparable units of ICT services. The *Affordability* section above presents medians based on the 188 and 178 economies for which price data were available for both 2022 and 2023 for the data-only mobile-broadband and fixed-broadband baskets, respectively. The data-only mobile broadband basket is defined as the cheapest data-only mobile-broadband subscription available domestically, with a 3G technology or above and a minimum monthly data allowance of 2 GB. The fixed broadband basket is defined as the cheapest fixed Internet subscription available domestically, with a minimum of 5 GB monthly data allowance and an advertised download speed of at least 256 kbit/s.

The 2023 ICT prices refer to retail prices for the basket in effect in June 2023. GNI per capita values were obtained from the World Bank World Development Indicators and refer to the latest available year (2022 or 2021), retrieved in October 2023, or if unavailable, from the United Nations DESA National Accounts Main Aggregates Database. More details on ICT service price data collection rules are [available here](#).

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