

Measuring digital development Facts and Figures 2022



Measuring digital development

Facts and Figures

2022



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Foreword



ITU's annual *Facts and Figures* report is unique in offering an independent and rigorously researched snapshot of the state of digital connectivity worldwide.

It serves as a key element in global efforts to “connect the world” and bring universal meaningful connectivity to everyone, everywhere. Accurate data are essential: to be sure our policies and projects are having a real impact on bridging the digital divide, we need to constantly track core connectivity indicators, and drill down into the data to reveal both unexpected sticking points, and surprising successes.

Over the past two years of the COVID-19 pandemic, we reported a “COVID-bump” that brought greater than expected numbers online. While this year’s report indicates that that acceleration in uptake has eased, figures show a generally positive trend overall, but highlight stalled progress in hardest-to-reach communities.

As the world welcomes its 8 billionth inhabitant, an estimated 5.3 billion people – roughly 66 per cent of the global population – are using the Internet. Yet some 2.7 billion people worldwide remain totally offline, with universal connectivity still a distant prospect in least developed countries and landlocked developing countries, where, on average, only 36 per cent of the population is online.

Young people remain the driving force of connectivity globally, with 75 per cent of the 15- to 24-year-old age group now online, compared with 65 per cent for the rest of the world’s population.

And while data show slow but steady growth in fixed-broadband subscriptions, mobile continues to dominate as the platform of choice for online access, particularly in low-income countries where wireline connections can be scarce and costly, notably for those living outside of major urban centres.

In poorly connected countries, two of the biggest barriers to digital uptake remain cost and digital skills. While affordability of entry-level fixed- and mobile-broadband services improved in 2022, the global gap remains far too wide. For an average consumer in a typical low-income economy, the cheapest mobile broadband basket still costs more than 9 per cent of his or her income – over six times the global average. Fixed-broadband service costs over 30 per cent, compared with less than 2 per cent in the world’s high-income countries.

At the same time, lack of digital awareness and skills, combined with other issues such as lack of content in local languages and low literacy levels, are conspiring to prevent many who could connect from doing so.

As platforms and services become ever-more sophisticated, the digital divide is increasingly being defined by people’s ability to make *meaningful* use of connectivity – defined as the

possibility for everyone to enjoy a safe, satisfying, enriching, productive and affordable online experience.

That is why, earlier this year, ITU and the Office of the United Nations Secretary-General's Envoy on Technology announced a set of ambitious new targets for universal and meaningful connectivity to be achieved by 2030.

These 15 aspirational targets, developed in response to the United Nations Secretary-General's Roadmap for Digital Cooperation, provide concrete benchmarks and position sustainable, inclusive and meaningful connectivity as an essential driver of global development.

With the 2030 deadline for delivering on the Sustainable Development Goals fast approaching, identifying new strategies to achieve full digital inclusion has become a matter of utmost urgency if we are to have any hope of meeting our Global Goals.

That means working more collaboratively to solve chronic gaps in rural access, access at home and at school, digital skills training, quality and speed of connection, and equal digital opportunities for marginalized groups including women and girls, as well as striving to ensure that every country meets the affordability target set by the Broadband Commission for Sustainable Development of less than 2 per cent of monthly gross national income per capita.

The ITU Partner2Connect Digital Coalition is one response to this pressing challenge, and has already mobilized an unprecedented USD 29.2 billion for connectivity projects around the world.

As we strive to intensify our efforts, and their impact, the importance of connectivity data has never been greater. That is why I am extremely pleased to note that the vital role we play in gathering and sharing ICT data was recognized at both our World Telecommunication Development Conference in June, and our Plenipotentiary Conference in October/November, with ITU Member States overwhelmingly endorsing ITU's mandate to incubate, collect and disseminate ICT statistics.

ITU data are relied upon, not just by the broader UN system, but by governments, the global technology sector, development financing institutions, and the many grassroots organizations working to promote digital inclusion within their communities.

With its hard evidence and global reach, ITU's *Facts and Figures* remains one of our most powerful advocacy tools to accelerate digital uptake worldwide and ensure that digital development is a key priority on every country's agenda.



Doreen Bogdan-Martin

Director, ITU Telecommunication Development Bureau

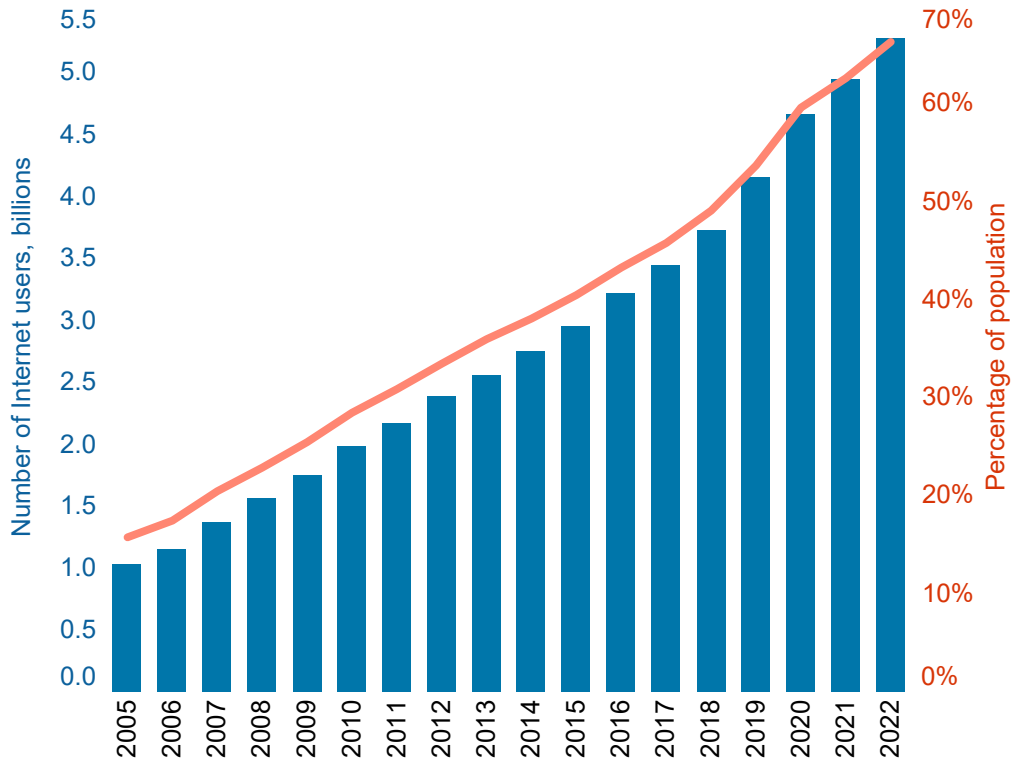
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Internet use

Two-thirds of the world's population uses the Internet, but 2.7 billion people remain offline

Individuals using the Internet



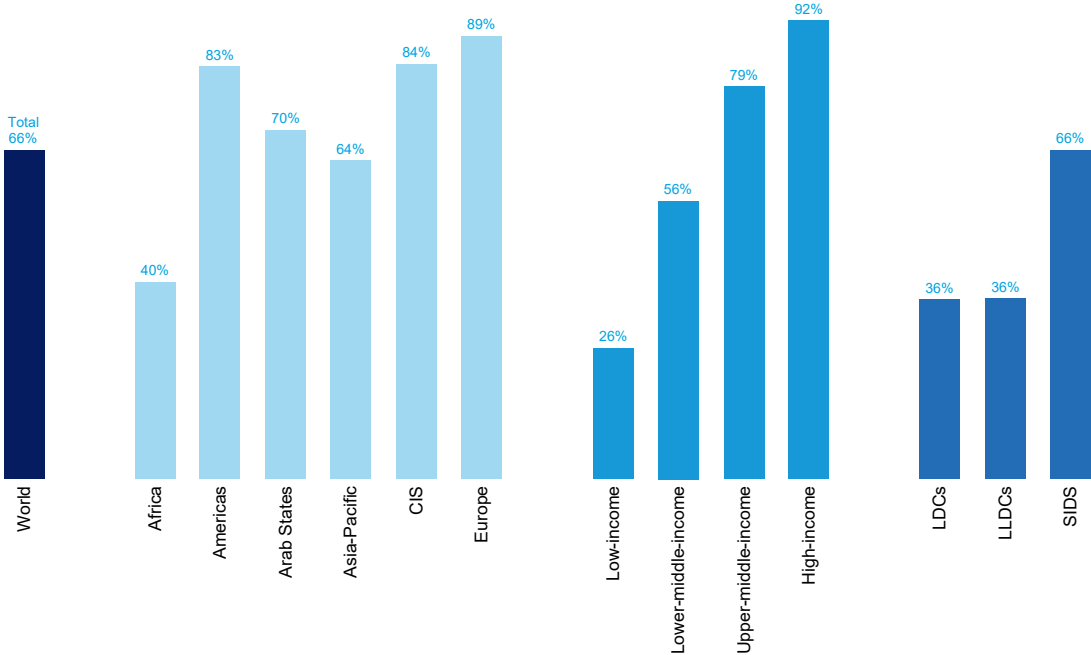
Source: ITU

Today, an estimated 5.3 billion people, or 66 per cent of the world's population, use the Internet. This represents a growth rate of 6.1 per cent over 2021, up from 5.1 per cent for 2020-2021, but pales in comparison with the 11 per cent for 2019-2020 seen at the beginning of the COVID-19 pandemic. That leaves 2.7 billion people offline, showing just how much remains to be done if the target of [universal and meaningful connectivity](#) that the world set itself for 2030 is to be reached.

In the countries of Europe, the Commonwealth of Independent States (CIS) and the Americas, between 80 and 90 per cent of the population uses the Internet, 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 countries (70 and 64 per cent respectively) use the Internet, in line with the global average, while the average for Africa is just 40 per cent of the population.

Universal connectivity also remains a distant prospect in the least developed countries (LDCs) and landlocked developing countries (LLDCs), where only 36 per cent of the population is currently online.

Percentage of individuals using the Internet, by region, 2022

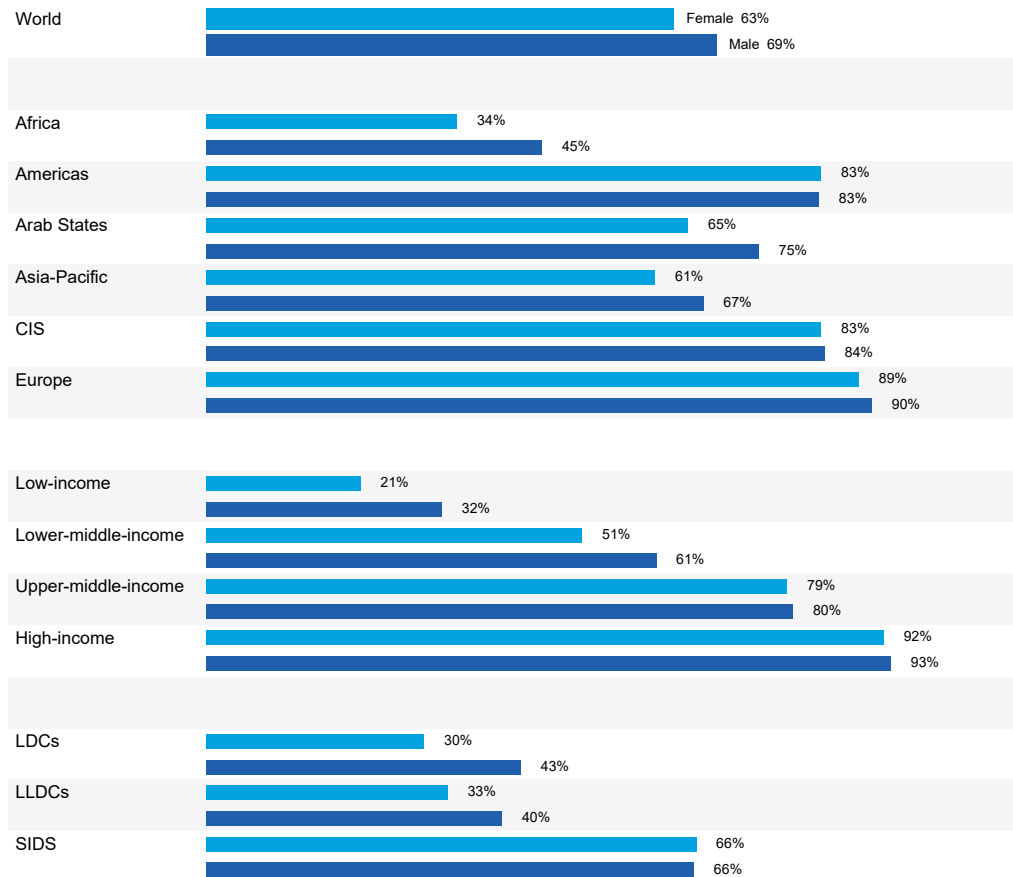


Source: ITU

The gender digital divide

The world takes a small step towards digital gender parity

Percentage of female and male population using the Internet, 2022



Source: ITU

On a global scale, 69 per cent of men are using the Internet, compared with 63 per cent of women. This means there are 259 million more men than women using the Internet in 2022.

Gender parity is deemed achieved when the gender parity score, defined as the female percentage divided by the male percentage, stands between 0.98 and 1.02. Over the last three years, the world has been taking small steps towards gender parity, moving from 0.90 in 2019 to 0.92 in 2022. The gender parity score, however, only provides a partial picture, because it represents the ratio of two percentages. Measured by the absolute difference between the numbers of men and women online, the gender gap actually *increased* by 20 million. Furthermore, 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-users by 18 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. Both the Asia-Pacific and the Arab States have improved their gender parity score, whereas Africa has stalled in the last three years.

LDCs and LLDCs show the same trends as Africa: low Internet use and a low gender parity score, with hardly any progress towards gender parity over the last three years.

The small island developing States (SIDS) are an exception to the correlation between low Internet use and a low gender parity score: while universal connectivity remains elusive, these islands reached full gender parity.

The Internet use gender parity score, 2019 and 2022



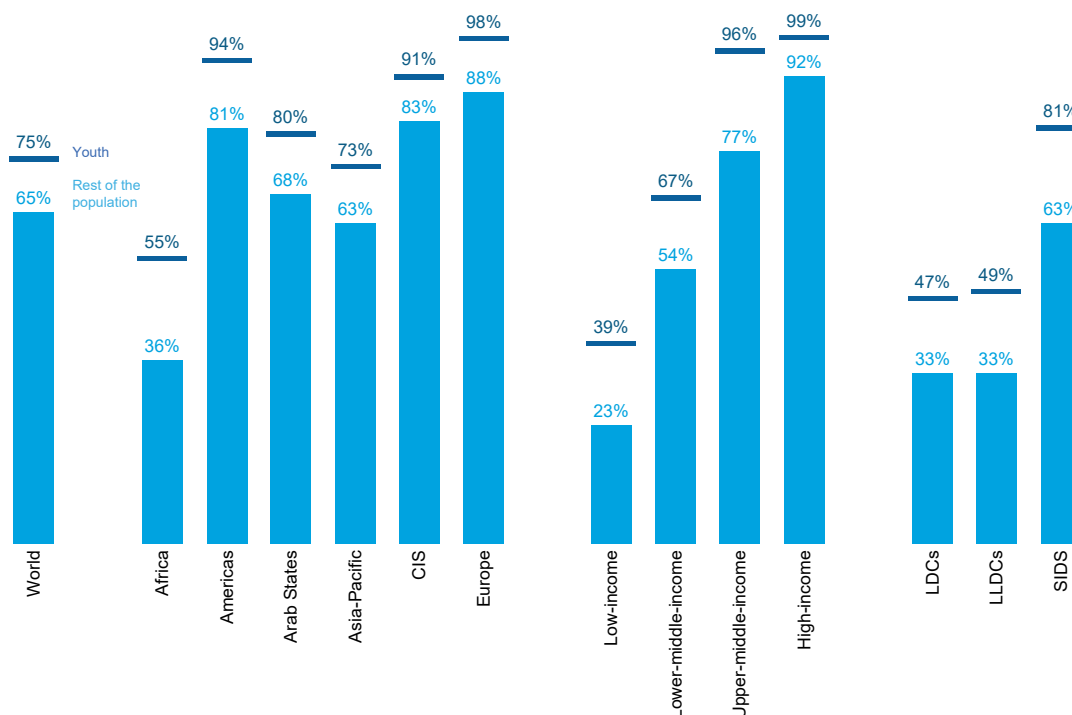
Note: The gender parity score is calculated as the proportion of women who use the Internet divided by the proportion of men. A value less than one indicates that men are more likely to use the Internet than women, while a value greater than one indicates the opposite. Gender parity is considered to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

Source: ITU

Youth Internet use

Three-quarters of 15- to 24-year-olds use the Internet

Percentage of individuals using the Internet, by age group, 2022



Source: ITU

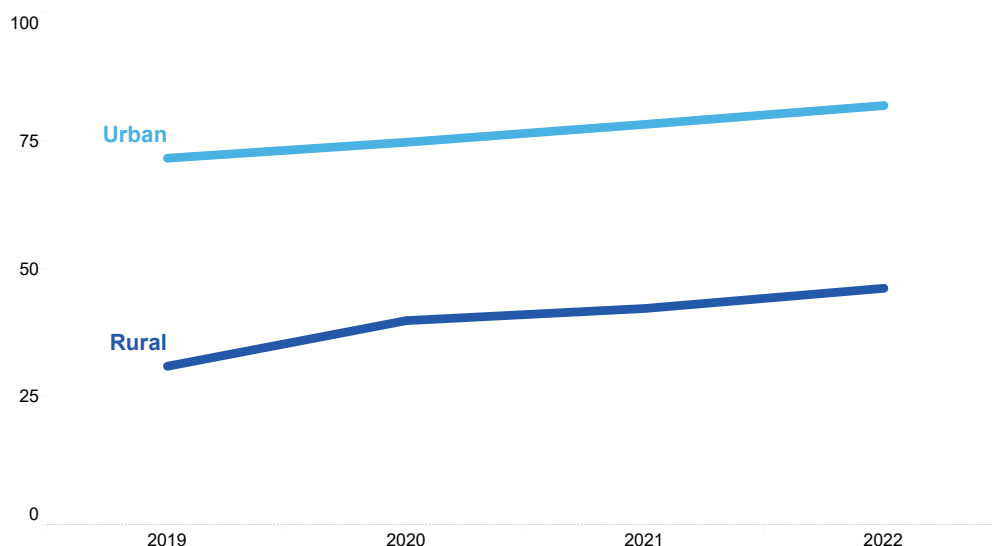
Worldwide, 75 per cent of people aged between 15 and 24 use the Internet in 2022, 10 percentage points more than among the rest of the population (65 per cent). There are signs that the generational gap is shrinking. In 2020, the difference between the penetration rate among young people (71 per cent) and the rest of the population (57 per cent) was 14 percentage points.

In all regions of the world, people aged between 15 and 24 are more connected than people who are older or younger than that. Universality, defined as more than 95 per cent Internet use, has already been reached in this age group in high-income and upper-middle-income economies. The biggest gap in relative terms is observed in low-income economies, where 39 per cent of young people use the Internet, compared with only 23 per cent for the rest of the population.

Internet use in urban and rural areas

Internet use in rural areas is slowly catching up with urban areas

Percentage of individuals using the Internet in urban and rural areas, 2019-2022

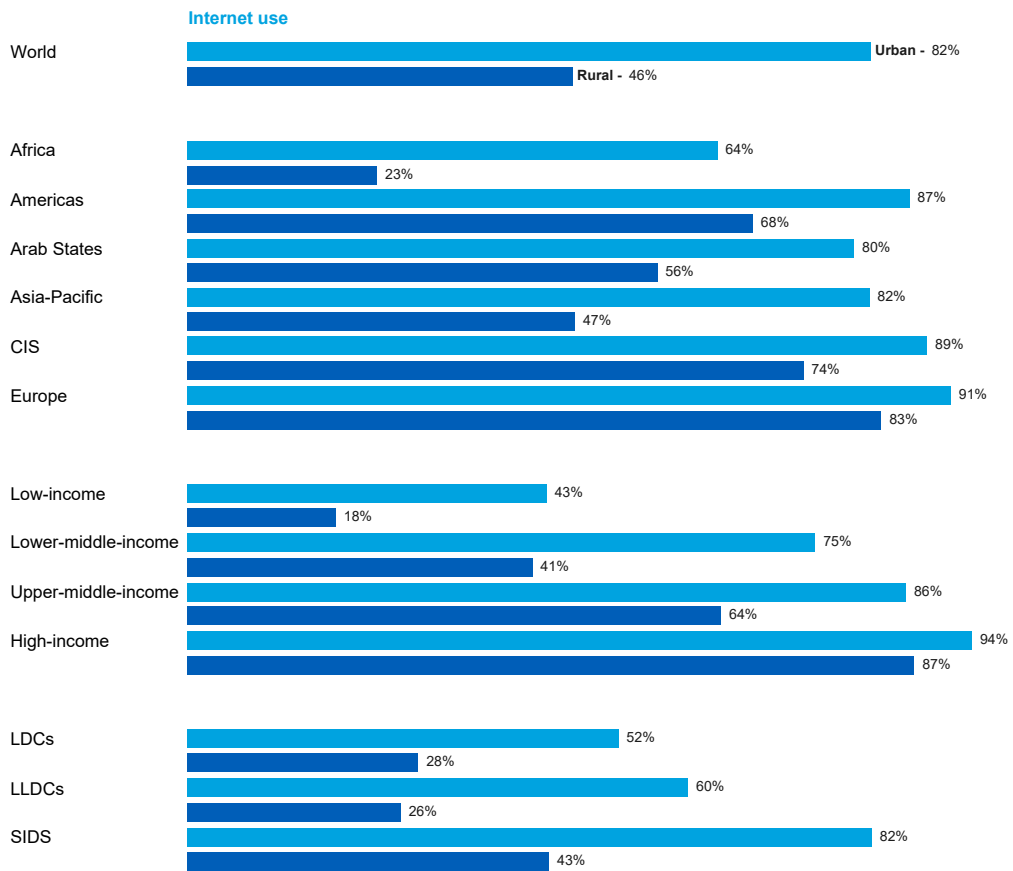


Source: ITU

Worldwide, 82 per cent of urban dwellers are using the Internet in 2022. That percentage is 1.8 times as high as the percentage of Internet users in rural areas. Over the last three years, the ratio has decreased from 2.3 to 1.8, as rural areas gradually catch up.

The urban-rural gap has been essentially bridged in Europe (ratio of 1.1). Elsewhere, it is wide but narrowing. For instance, in Africa, 64 per cent of urban dwellers use the Internet in 2022 compared with 23 per cent of people in rural areas, a ratio of 2.8; but that is down from nearly 4 in 2019. In the Asia-Pacific region, the ratio is 1.8, down from 2.4 three years ago.

Percentage of individuals using the Internet in urban and rural areas, 2022

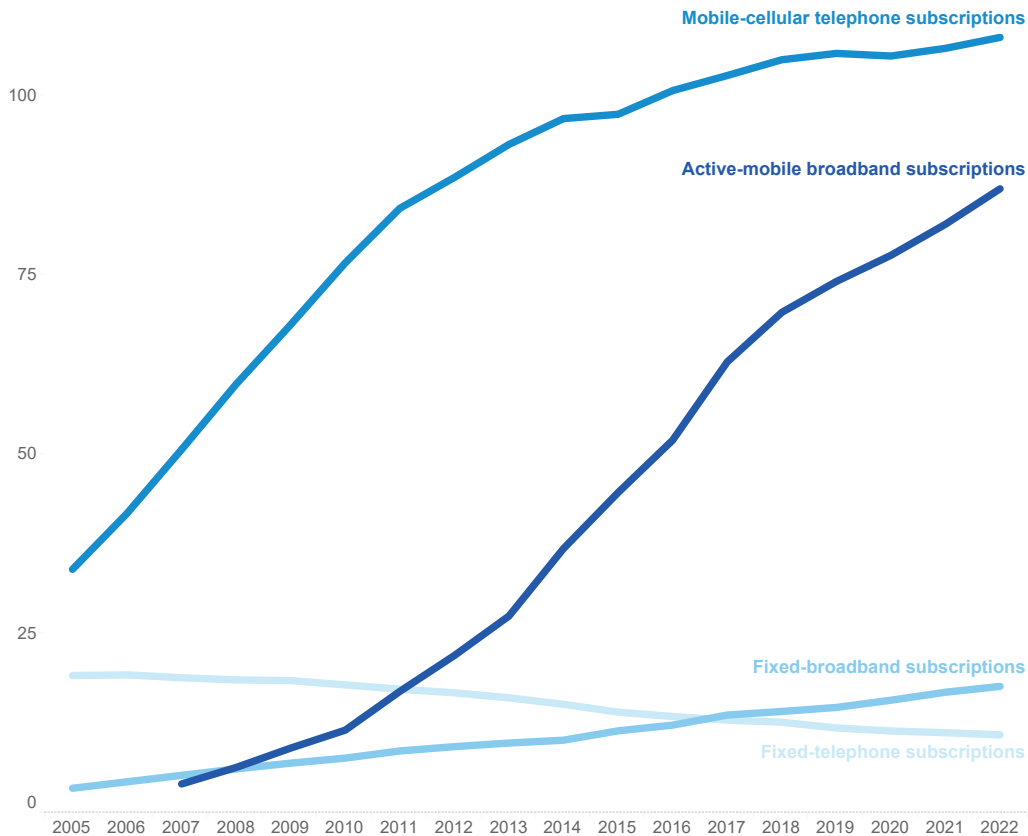


Source: ITU

Subscriptions

Mobile-broadband subscriptions continue to grow strongly

Global subscriptions per 100 inhabitants



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

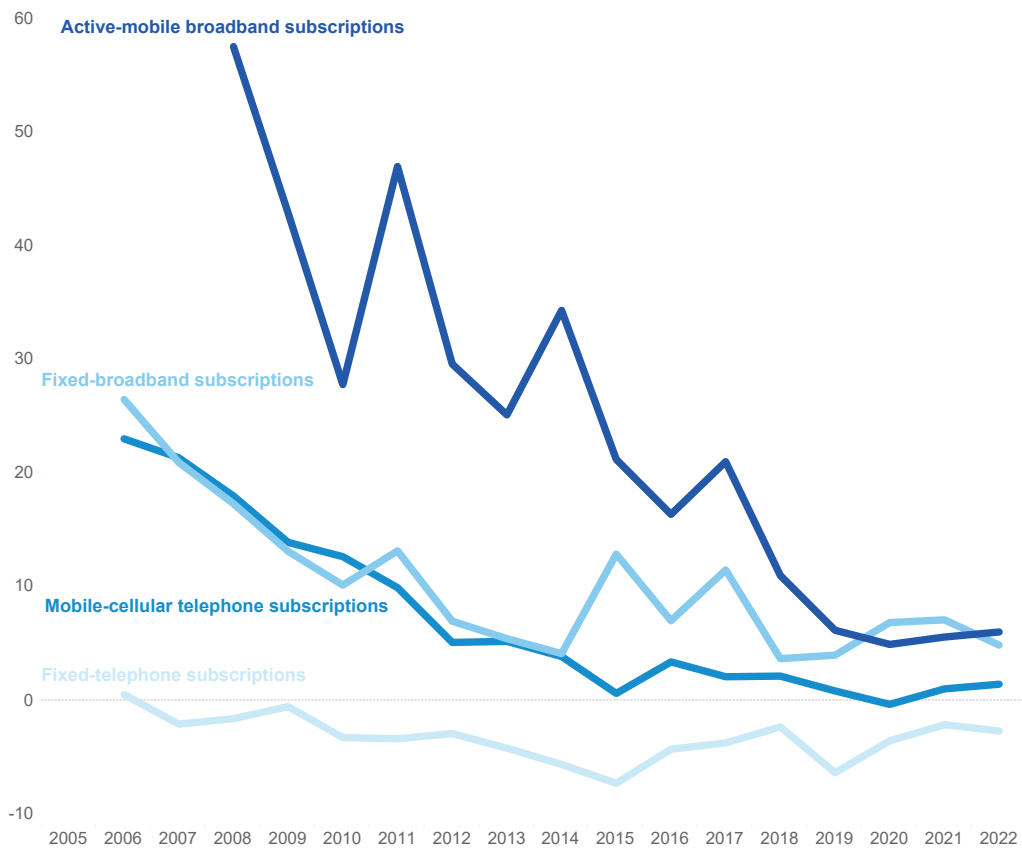
Internet use is becoming as ubiquitous as mobile phones. Accordingly, the number of mobile-broadband subscriptions is rapidly approaching the level of mobile-cellular subscriptions, which is plateauing.

Over the last 10 years, the penetration rate of mobile-broadband subscriptions grew by a massive 14.8 per cent per year on average, against 2 per cent for mobile-cellular subscriptions. However, that growth rate has begun to taper off in the last few years.

Fixed-broadband subscriptions also continue to grow steadily, at an average annual growth rate averaging 6.7 per cent over the last 10 years.

Simultaneously, fixed-telephone subscriptions continue their slow but steady decline, losing an average of 4.2 per cent each year over the last 10 years.

Annual growth rates in subscriptions, %



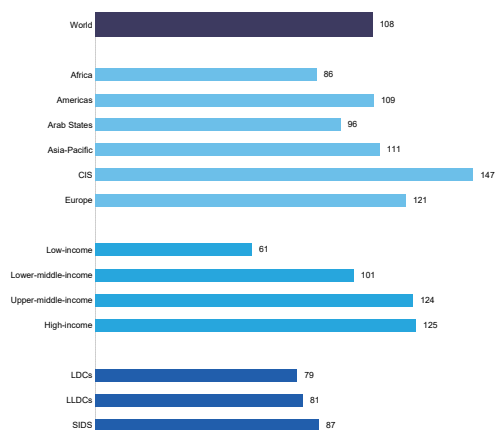
Source: ITU

In 2022, the number of mobile-cellular subscriptions exceeds the total world population. In the CIS region, there are nearly three subscriptions for every two citizens.

In contrast, low-income countries are lagging behind, with mobile-cellular penetration less than half that in the upper-middle-income and high-income countries.

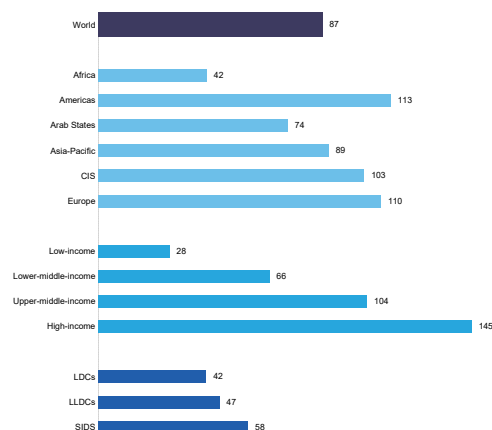
For active mobile-broadband subscriptions, regional disparities are glaring, with nearly three times as many subscriptions per 100 inhabitants in America as in Africa.

Mobile-cellular telephone subscriptions per 100 inhabitants, by region, 2022



Source: ITU

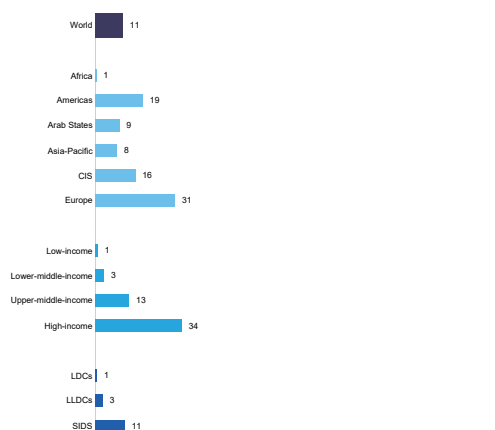
Active mobile-broadband subscriptions per 100 inhabitants, by region, 2022



Source: ITU

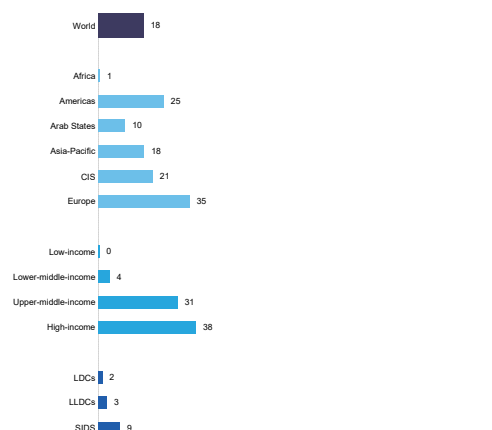
Penetration rates for fixed subscriptions are much lower than for mobile subscriptions, because fixed connections are usually shared by several people in a household. Nonetheless, the inequalities in access to fixed connections across countries are far higher than for mobile connectivity. While fixed connections are common among households in upper-middle-income and high-income countries, they are nearly non-existent in low-income countries, due to high prices and a lack of infrastructure.

Fixed-cellular telephone subscriptions per 100 inhabitants, by region, 2022



Source: ITU

Fixed-broadband subscriptions per 100 inhabitants, by region, 2022

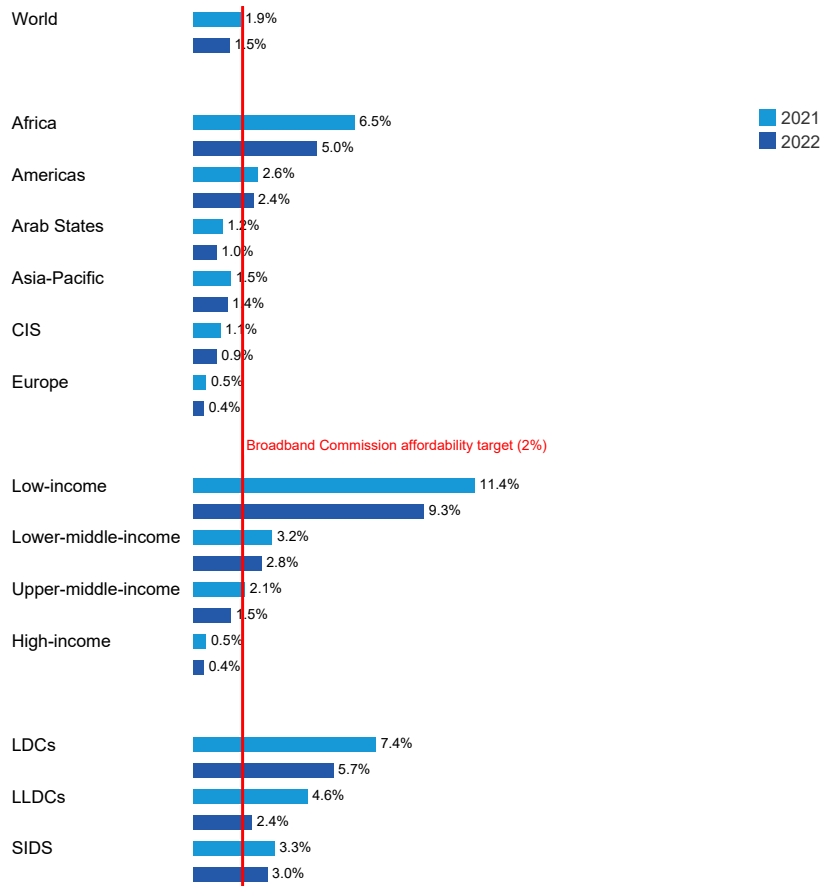


Source: ITU

Affordability of ICT services

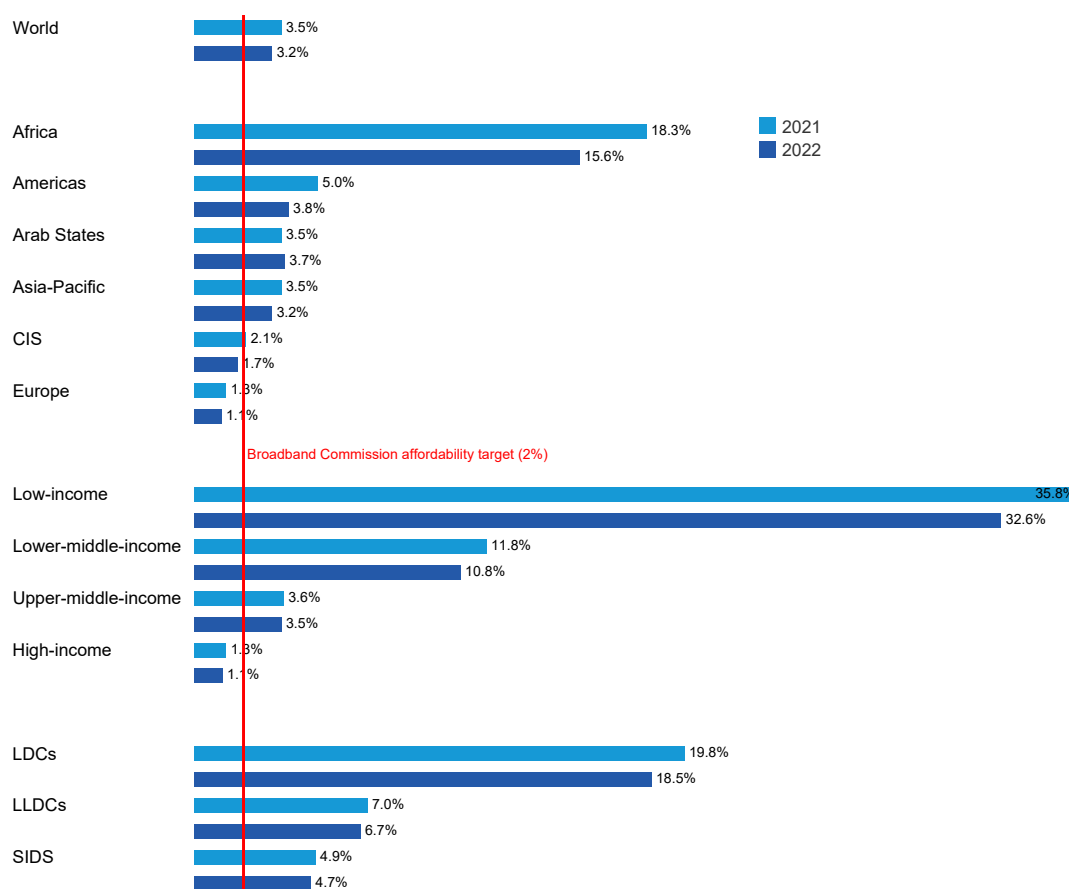
ICT services become more affordable worldwide in 2022

Data-only mobile broadband basket prices as % of gross national income per capita, 2021-2022



Source: ITU

Fixed broadband basket prices as % of gross national income per capita, 2021-2022



Source: ITU

After a brief uptick in 2021, income-adjusted cost of fixed and mobile Internet services resumed its downward trend in 2022. The two connectivity price 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 1.9 to 1.5 per cent of average gross national income (GNI) per capita, while that of the fixed broadband basket dropped from 3.5 to 3.2 per cent of GNI per capita.

Nonetheless, lack of affordability continues to be a key barrier to Internet access particularly in low-income economies, even though this country group witnessed a nearly two-percentage-point drop in the income-adjusted price of mobile broadband services. A wide gap remains between high-income economies and the rest of the world. Compared to median prices that are paid in high-income economies, the basket costs nearly 10 times as much in lower-middle-income economies and nearly 30 times as much as in low-income economies, after adjusting for differences in GNI per capita.

The United Nations [Broadband Commission for Sustainable Development](#) aims to make broadband prices 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 for both 2021 and 2022, more economies met the two per cent affordability target for all five baskets of ICT services in 2022 than did so in 2021. Thus, 103 economies met the target with respect to the data-only mobile broadband basket in 2022 and 71 economies met the target with the fixed broadband basket (in each case 7 more than in 2021).

Detailed global, regional, and country-level analysis for all five price baskets along with the full country-level dataset of ICT prices in 2022 will be released in early 2023.¹

¹ More information on ICT prices available at <https://www.itu.int/en/ITU-D/Statistics/Pages/ICTprices/default.aspx>

ICT skills

Low levels of ICT skills hamper progress to universal and meaningful connectivity

A low level of ICT skills is one of the main barriers to achieving universal and meaningful connectivity.

Because self-reporting of individuals' ICT skills may be subjective, 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 categories of digital skills: communication/collaboration; problem solving; safety; content creation; and information/data literacy.

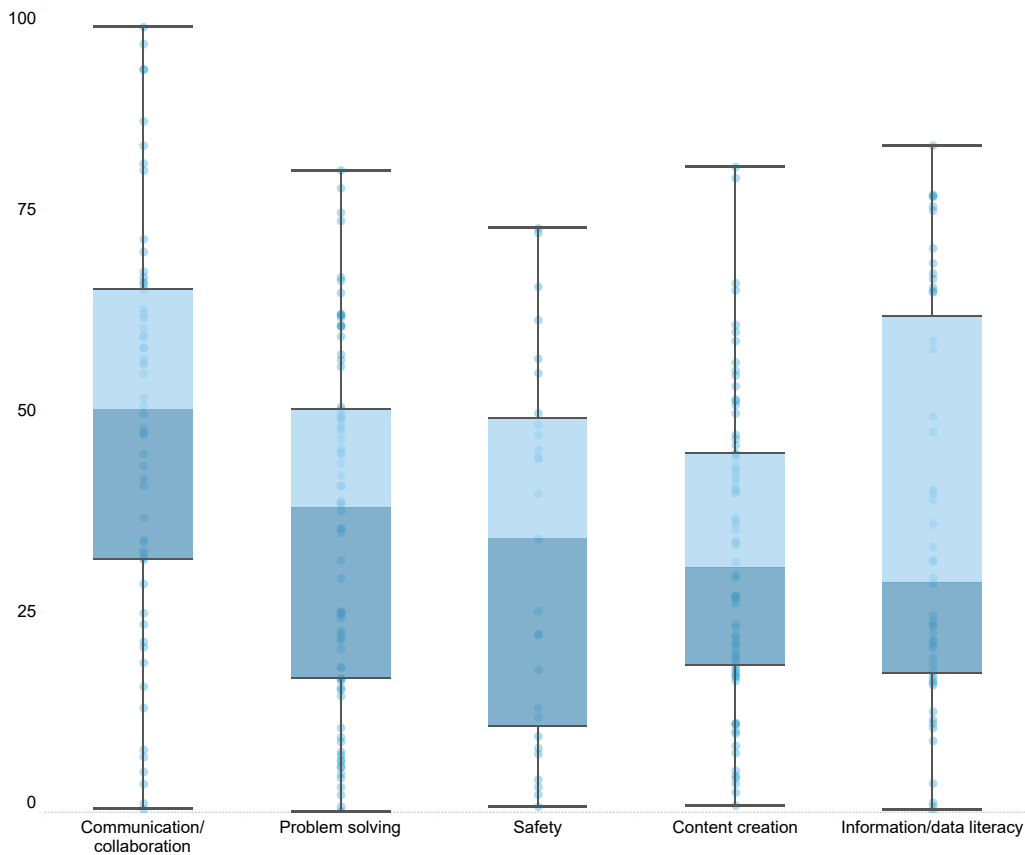
Digital skills are crucially important in leveraging ICTs to boost development. Yet data for such skills remain very scant. Only 78 countries submit data, and rarely for all five categories. Based on this limited dataset, *communication/collaboration skills* appear to be the most prevalent, with a median of 50 per cent and an average that lies between 31 and 65 per cent for most countries.

The category with the second highest median is *problem solving*, followed by *safety* and *content creation*. In the category with the lowest median, *information/data literacy*, there was considerable variation between countries.

Another way to explore these data is through the breadth of skills reported in the different countries. The 74 countries that provided data in at least three skill areas varied widely in this respect. Forty-seven countries reported averages of at least 25 per cent in multiple areas, 22 reported averages of over 50 per cent in multiple areas and only five reported averages of over 75 per cent in multiple areas.

The relatively low level of skills in countries providing data contrasts against their high share of overall Internet use – 86 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.

Percentage of individuals with ICT skills, by type of skill, based on most recent data in the 2019-2021 period



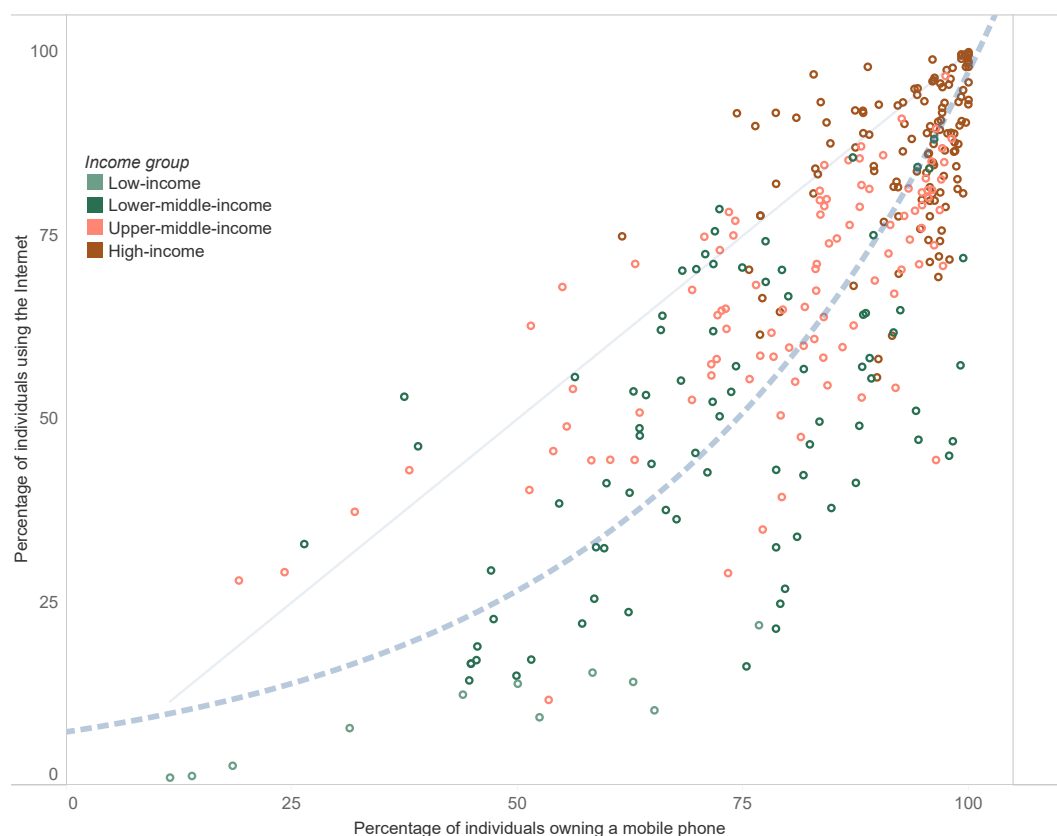
Note: Bars indicate the 25th percentile, median, and 75th percentile of all country values. Bottom and top lines indicate minimum and maximum values. *Communication/collaboration* is the average of sending messages (e.g. e-mail, messaging service, SMS) with attached files; making calls over the Internet; 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 buying 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: 58 countries for *communication/collaboration*, 78 countries for *problem solving*, 27 countries for *safety*, 76 countries for *content creation*, and 51 countries for *information/data literacy*. In-scope ages may vary between countries.

Source: ITU

Mobile phone ownership

Three-quarters of the world's population own a mobile phone

Percentage of individuals using the Internet vs percentage of individuals owning a mobile phone, 2013-2021

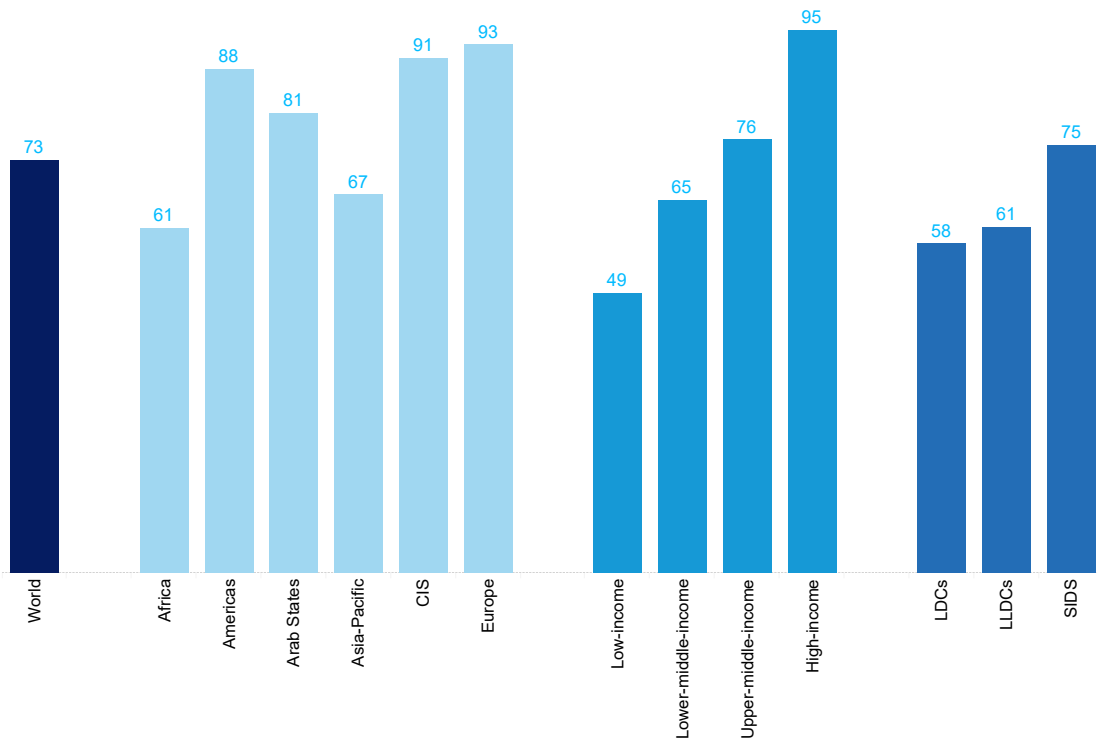


Note: Official data available from 91 countries (327 observations). In-scope ages may vary between countries. Each point refers to one country in one year between 2013 and 2021. Some countries have multiple years and multiple points. The blue dotted line refers to the trend of all countries. The grey diagonal line is a reference line for mobile phone ownership = Internet use.

Source: ITU

Since mobile phones are the most common gateway to the Internet, the percentage of individuals owning a mobile phone is a good indication of Internet penetration. This is not a one-to-one relation, however: on the one hand, people other than the owner could use the phone to access the Internet (e.g. children occasionally using the phone of a parent), and on the other hand, some mobile owners have a calls-only mobile-cellular subscription (i.e. without Internet access), as can be seen from the subscription section above.

Percentage of individuals owning a mobile phone, 2022



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

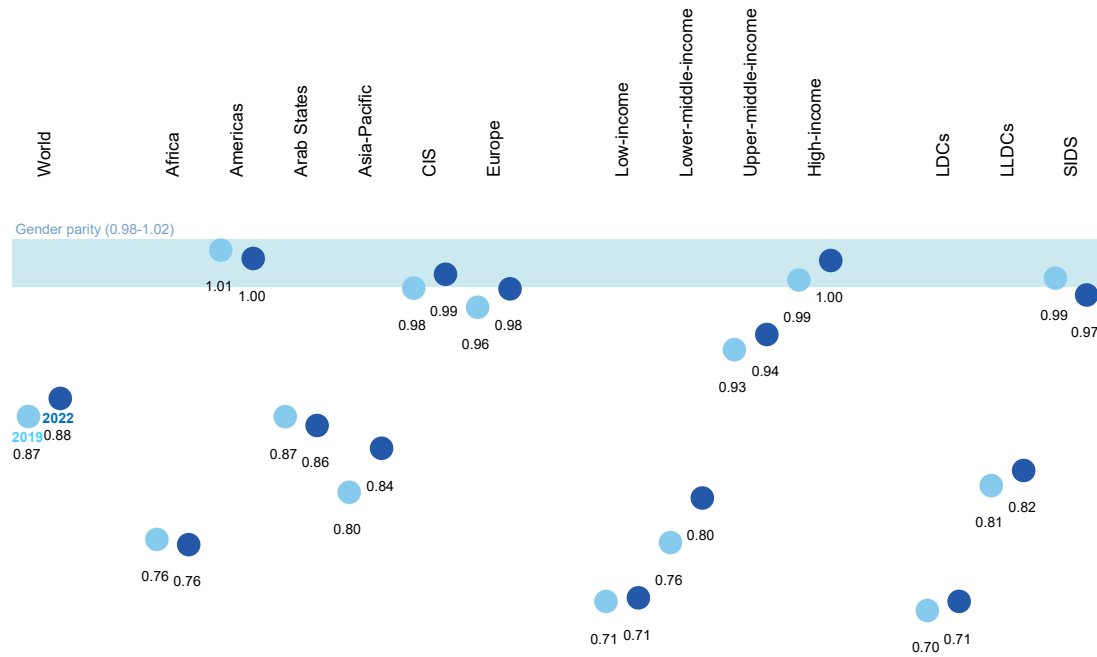
Source: ITU

Data show that, on average, in every region and every income group except the upper-middle-income group, the percentage of individuals owning a mobile phone is higher than the percentage of Internet users. Globally, 73 per cent of the population aged 10 and over own a mobile phone in 2022, seven percentage points higher than the percentage of individuals who use the Internet. This gap is closing 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 only marginally higher than Internet use. Elsewhere, the gap is much wider. Thus, in low-income economies mobile phone ownership is almost twice as prevalent as Internet use.

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 in the past three years. Women are about 12 per cent less likely to own mobile phones than men - virtually unchanged from 2019. Among those not owning mobile phones, women outnumbered men by 39 per cent in 2022.

The gender parity score for mobile phone ownership, 2019 and 2022



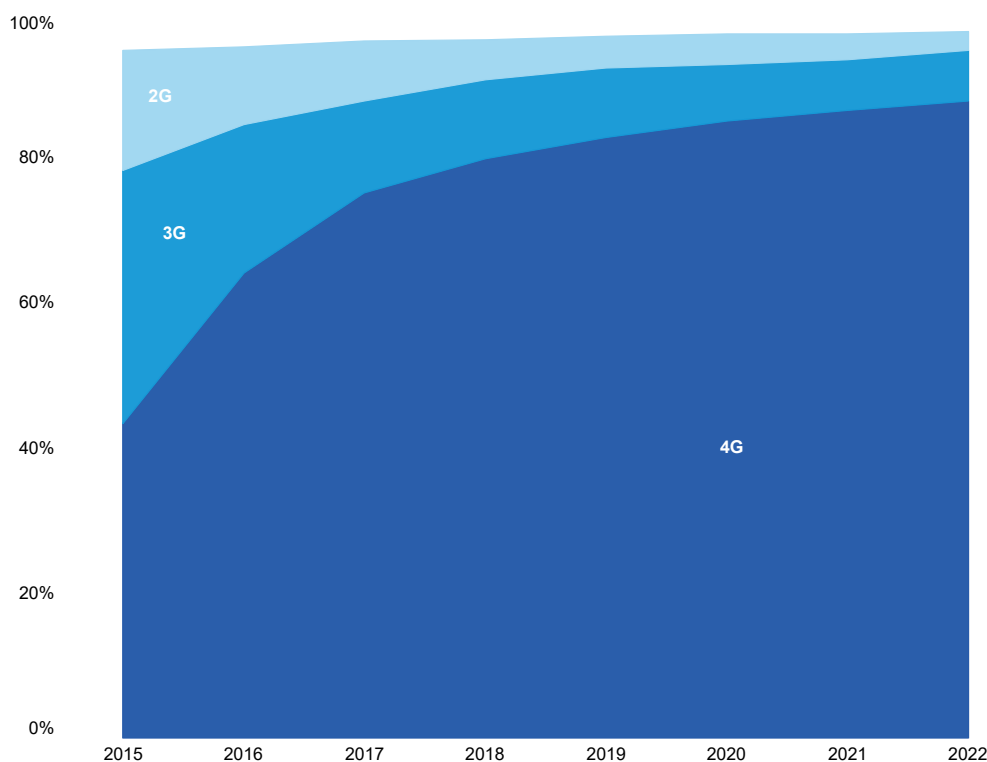
Note: The gender parity score is calculated as the proportion of women who own a mobile phone divided by the proportion of men. A value less than one indicates that men are more likely to own a mobile phone than women, while a value greater than one indicates the opposite. Gender parity is considered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

Source: ITU

Mobile network coverage

The coverage gap persists at five per cent

Population coverage by type of mobile network, 2015-2022



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. in 2022, 95 per cent of the world population is covered by a 3G or above network, that is 7 per cent + 88 per cent).

Source: ITU

In most developing countries, mobile broadband (3G or above) is the main way – and often the only way – to connect to the Internet.

This kind of access is available to 95 per cent of the world population. Bridging the “coverage gap”, that is, connecting the remaining five per cent still off the grid is proving difficult: since crossing the 90 per cent threshold in 2018, global 3G coverage has increased only by four percentage points. In Africa, the gap constitutes 18 per cent, predominantly affecting the population of central and western Africa.

The coverage gap is almost the same in LDCs and LLDCs, 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.”

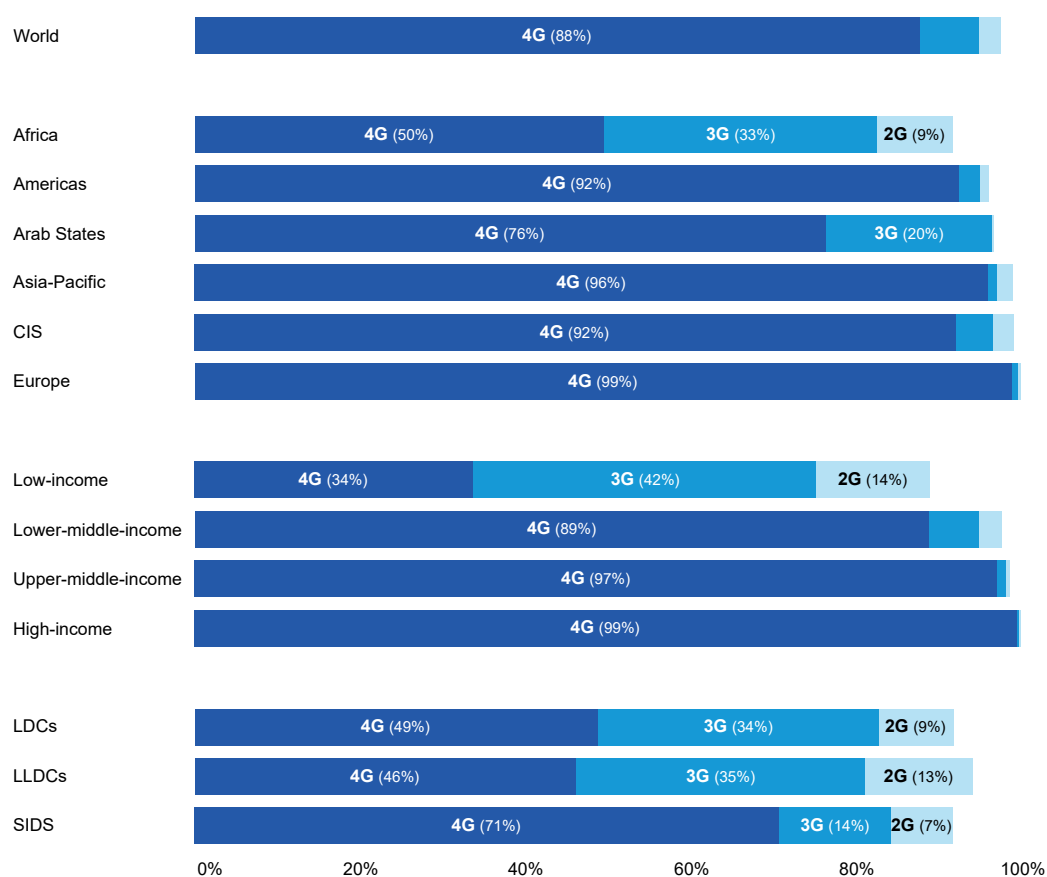
Between 2015 and 2022, 4G network coverage doubled to reach 88 per cent of the world’s population; but, as for previous technologies, growth is slowing down.

4G technology is now available to more than 90 per cent of the population in the Americas, the Asia-Pacific, the CIS and Europe. In the Arab States, one-quarter of the population still cannot access a 4G network, while in Africa that is true for half the population.

In many countries older-generation networks are being switched off in favour of networks that are more efficient and allow the development of a digital ecosystem compatible with 5G. This is particularly the case for 3G, which is often shut down so that the freed-up spectrum can be re-used for 5G, while keeping 2G for older legacy devices. This is the case for most European operators, who are planning to have their 3G networks switched off by December 2025, and for the Asia-Pacific region. However, in other regions of the world 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 are an important means of communication. In those countries, the main obstacles to 5G deployment include high infrastructure costs, device affordability, and regulatory and adoption barriers.

Preliminary data show that 19 per cent of the global population was covered by a 5G network in 2021. The highest roll-out was in Europe at 52 per cent, followed by the Americas (38 per cent) and the Asia-Pacific region (16 per cent).

Population coverage by type of mobile network, 2022



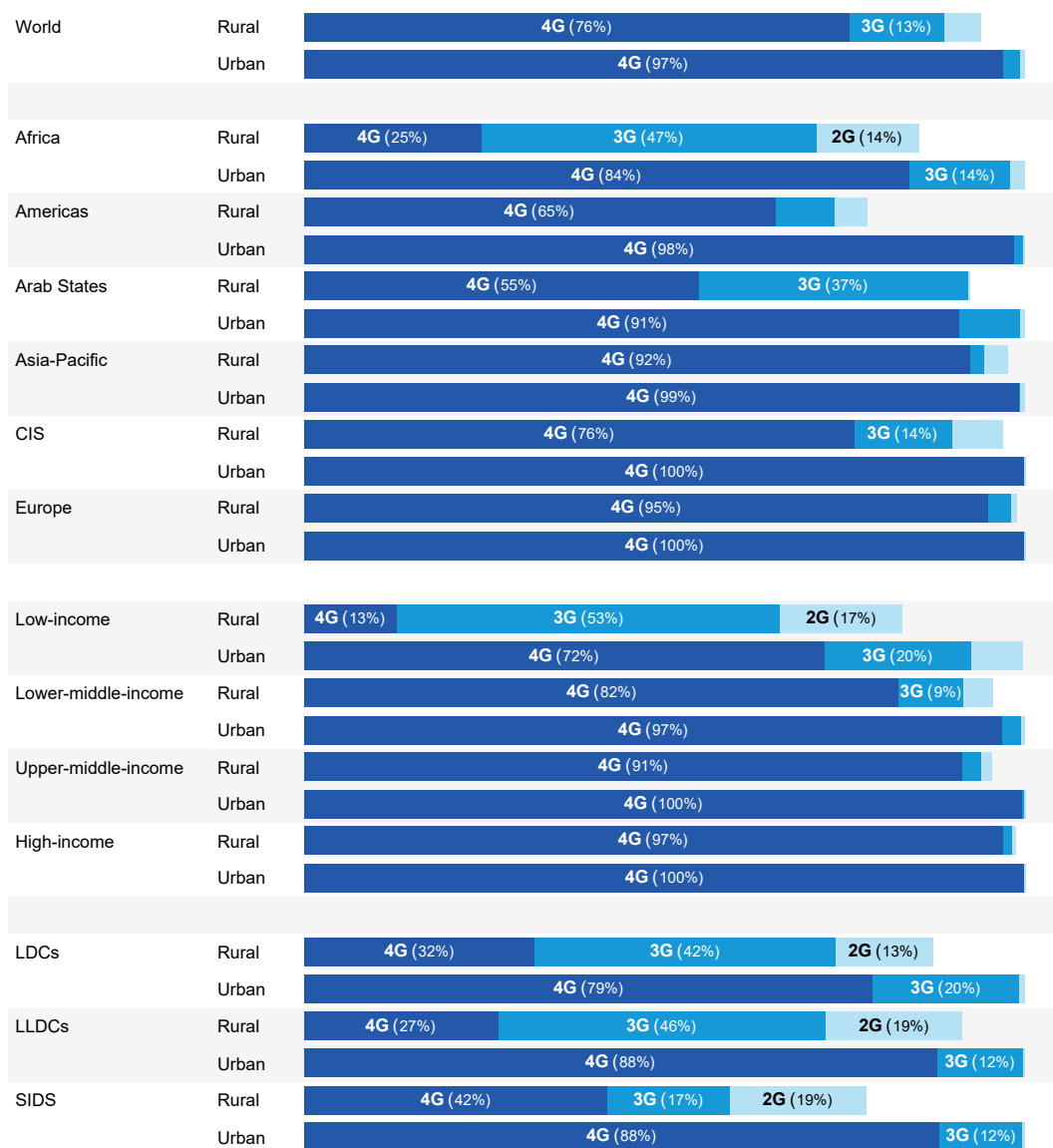
Note: The values for 2G and 3G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. 95 per cent of the world population is covered by a 3G or above network, that is 7 per cent + 88 per cent).

Source: ITU

While virtually all urban areas in the world are covered by a mobile broadband network, many gaps persist in rural areas.

In the Americas, 22 per cent of the rural population is not covered by any mobile signal at all, while an additional 5 per cent only have access to a 2G network, meaning that 27 per cent are unable to access the Internet. In Africa, those figures are 15 per cent (no coverage whatsoever), and 14 per cent (2G only).

Population coverage by type of mobile network and area, 2022



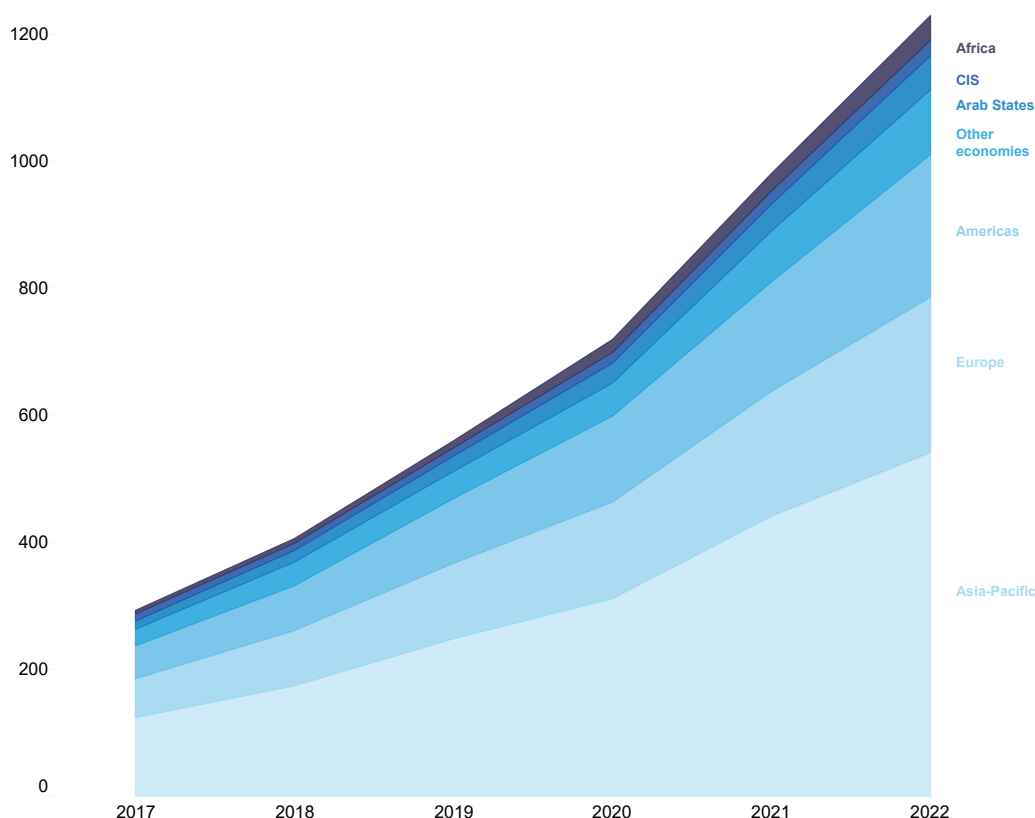
Note: The values for 2G and 3G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. 89 per cent of the world’s rural population is covered by a 3G and above network, that is 76 per cent + 13 per cent).

Source: ITU

International bandwidth usage

Unrelenting global consumption of Internet data continues to drive demand for international bandwidth usage

International bandwidth usage by region, Tbit/s*



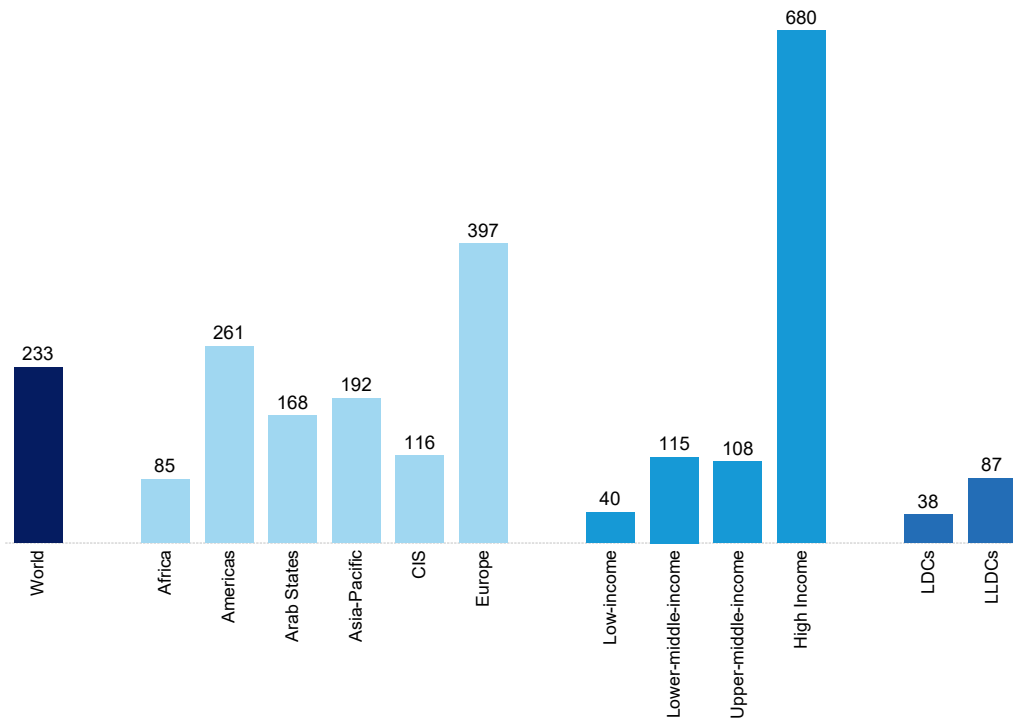
* 1 terabit = 1'000'000 megabits
Source: ITU

Unrelenting appetite for Internet data continues to drive demand for international data and therefore bandwidth usage. That said, the 25 per cent growth in bandwidth usage in 2022 is more modest than in recent years, which were marked by the effects of COVID-19.

At 17 per cent, the increase in bandwidth usage per Internet user was also lower in 2022 than in the previous year. The compound average growth rate over the past five years is 33 per cent for overall international bandwidth usage and 22 per cent for usage per Internet user.

In Africa, international bandwidth usage shows the fastest growth (37 per cent), while the fastest growing region in terms of bandwidth usage per Internet user is the Americas (26 per cent).

International bandwidth per Internet user, kbit/s, 2022



Source: ITU

Methodology

For this publication, regional and global aggregates up to 2021 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 2022 aggregates are estimates computed by ITU, based on the methodology described below.

Mobile population coverage

The percentage of the population covered by a mobile signal (2G/3G/4G and above/5G) 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.

Since most countries provide data without differentiating between urban and rural coverage, it is necessary to perform disaggregation. It is known that mobile cellular coverage is virtually ubiquitous in urban areas. Furthermore, country data on the proportion of the population that lives in rural areas is published by the World Bank. Subtracting the urban population from the total population with mobile cellular coverage therefore gives the number of rural inhabitants who have such coverage in rural areas.

The percentage of the rural population covered by a mobile cellular signal (2G/3G/4G and above) is then obtained by dividing the number of such 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 2022. 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 2022, 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 2022 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 2022 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.

International bandwidth usage estimates

The basic assumption is that international bandwidth usage is a function of demand for total bandwidth capacity in a country, which can be obtained by multiplying the number of Internet users by their average bandwidth use. Since very few countries publish monthly or quarterly statistics on international bandwidth usage and given the fast pace at which data traffic is increasing, estimates were performed using proxy indicators.

ITU statistics on fixed-broadband subscriptions were combined with crowd-sourced statistics on average download speeds obtained from Ookla Speedtest data² for over 180 economies. Smoothed speed change ratios from the third quarter of 2021 to the second quarter of 2022 served as the basis for extrapolating growth rates for 2022. Estimates were validated against reports by submarine cable operators.

For economies with missing or unreliable fixed broadband download speed data, 2022 values were estimated with exponential smoothing relying on historical figures since 2016. It should be noted that, due to variations in the quality of speed statistics, the explanatory power of the model is stronger in countries where fixed broadband Internet is dominant, and in middle income economies in general. Results are potentially sensitive to significant changes in broadband subscriptions during the year.

ICT price statistics

ITU price statistics refer to ICT baskets, which are internationally comparable units of ICT services. The *Affordability of ICT services* section above presents medians based on the 188 and 177 economies for which price data were available for both 2021 and 2022 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 2022 ICT prices refer to retail prices in effect in May 2022. GNI per capita values were obtained from the World Bank World Development Indicators and refer to the latest available year (2021 or 2020), retrieved in October 2022. Further details on ICT service price data collection rules [are available here](#).

² Ookla Speedtest data. Speedtest by Ookla Global Fixed and Mobile Network Performance Maps was accessed in July 2022 from <https://registry.opendata.aws/speedtest-global-performance>.

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