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Global Connectivity Report 2025

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Global Connectivity Report 2025

Foreword

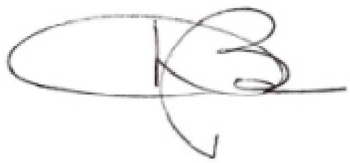
Connectivity has become the defining infrastructure of our time. It underpins how we learn, work and participate in society. It drives innovation, strengthens economies and serves people, businesses and institutions around the world. As we reach the midpoint of the Decade of Action, connectivity remains critical to harnessing the opportunities of artificial intelligence and other emerging technologies.

For connectivity to be meaningful, it must extend far beyond basic access to the Internet. Without reliable, affordable and secure networks, the benefits of technological progress will be limited to only a few, deepening divides instead of bridging them. This makes universal and meaningful connectivity more than a policy goal; it is a prerequisite for inclusive and responsible digital development.

The *Global Connectivity Report 2025* takes stock of the current state of connectivity worldwide and highlights persistent divides between and within countries. It offers insights on how global stakeholders can accelerate progress towards universal and meaningful connectivity and sustainable digital transformation. The findings underline how far the world has come – and how much remains to be done – to ensure that everyone can benefit safely and effectively from the many opportunities of the digital era.

At the same time, connectivity brings new challenges. The same networks that empower can also amplify inequality, carry misinformation and strain the natural environment. Our shared responsibility – championed by ITU and reaffirmed through the Global Digital Compact – is to ensure that digital transformation becomes a net positive force for all people and our planet.

I am deeply grateful to the entire ITU community – our Member States, Sector Members, Academia, partners, and staff – for their unwavering dedication to connecting the world meaningfully.



Doreen Bogdan-Martin
Secretary-General
International Telecommunication Union

Preface

It is my pleasure to present *ITU's Global Connectivity Report 2025*.

This year's report comes at an important juncture for global digital cooperation, as the World Telecommunication Development Conference 2025 (WTDC-25), held in Baku, Azerbaijan, in November, marks over three decades of collective efforts by Member States, partners and communities to close connectivity gaps since the first WTDC in 1994. Over this period, connectivity has expanded dramatically and transformed economies and societies – yet many people are still not benefiting from it. At the same time, the very nature of connectivity has evolved, creating new needs and challenges that require renewed attention and action.

The *Global Connectivity Report 2025* assesses the state of global connectivity and the progress towards meeting universal and meaningful connectivity (UMC). The findings point to sustained momentum, with Internet use expanding and divides between many socio-economic groups narrowing. Universal access is now within reach for most of the world's population. Policy priorities must therefore gradually shift from basic access to improving the quality, reliability and affordability of connectivity so that everyone can participate fully in the digital society.

Building on this assessment, the report examines the factors that make connectivity meaningful. It analyses key enablers – regulation, infrastructure, affordability and digital skills – and proposes recommendations, including for improving data ecosystems to support evidence-based policymaking.

The Telecommunication Development Bureau (BDT) helps countries address digital divides and pursue inclusive digital transformation. Among these efforts, the project Promoting and Measuring Universal and Meaningful Connectivity, financed by the European Union, promotes UMC as a policy imperative, improves the availability and quality of connectivity data, and identifies effective policies to advance progress towards UMC. This report, supported by the project, contributes directly to those outcomes. I wish to thank the European Union for its continued partnership.

As we look ahead to the implementation of the Baku Action Plan, we remain fully committed to strengthening our work with our Member States, partners and stakeholders to promote meaningful connectivity and digital transformation and ensure that no one is left behind.

Dr Cosmas Luckyson Zavazava
Director of the Telecommunication Development Bureau
International Telecommunication Union

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Chapter 1: The connectivity journey

Connectivity has undergone a profound transformation over the last thirty years, evolving from a scarce resource to an essential pillar of daily life. In 1994, at the time of the first World Telecommunication Development Conference (WTDC), discussions centred on expanding telephone networks, with fewer than one per cent of the global population using the Internet. By 2025, some 6 billion people are online, representing approximately three-quarters of the population.

This expansion has been fuelled by major technological advances, including a near 30-million-fold increase in computing power over three decades. These capabilities enabled breakthroughs in areas like artificial intelligence (AI), big data analytics, and cloud computing.

Connectivity is now a defining feature of the global economy and a major driver of human development. Empirical evidence suggests a strong link between expanding connectivity and improved socioeconomic outcomes. The digital sector has become one of the most dynamic parts of the global economy, with roughly one-third of the world's 100 largest companies operating in information technology or communication services industries in 2025.

Despite this progress, the report highlights a connectivity paradox: while connectivity offers immense benefits, it also introduces new challenges and vulnerabilities. Unequal access, uneven quality, high costs, and limited digital skills leave billions unable to participate fully, and these digital divides often compound pre-existing "analogue" socioeconomic inequalities.

To address the limitations of simple access, the concept of universal and meaningful connectivity (UMC) has emerged as a policy imperative. UMC is defined as a situation where everyone can access the Internet in optimal conditions, affordably, whenever and wherever needed. The framework underpinning the UMC concept is built upon six interdependent enablers: quality, availability, affordability, devices, skills, and security. UMC has gained significant momentum in recent years. Through its Telecommunication Development Bureau (BDT), ITU supports UMC advancement across all dimensions, including infrastructure deployment, digital skills, policy design, data measurement, and cybersecurity.

The adverse effects of connectivity are increasingly evident. Unstructured or excessive use of digital tools is linked to hindering learning outcomes and adverse effects on well-being, such as increased anxiety and depression among heavy screen users. Children and youth, as the first fully digital generation, are particularly exposed to online risks. Connectivity has also amplified global risks, including the concentration of digital value, creating dependencies and widening gaps. Furthermore, it facilitates the rapid spread of misinformation and disinformation, intensifying polarization and eroding trust. The environmental costs of digitalization are substantial, too. Data centres already consume about 1.5 per cent of global electricity. The world produced 62 million tonnes of e-waste in 2022, with only 22 per cent recycled.

Despite enormous progress in connecting the world, the connectivity challenge is arguably greater than ever. Connectivity must be not only universal but also meaningful and sustainable. Ensuring that it becomes a force for good requires a holistic strategy guided by the UMC framework, supported by sustained international cooperation and reliable data.

Chapter 2: Assessing progress toward universal and meaningful connectivity

This chapter assesses global progress toward Universal and Meaningful Connectivity (UMC) by leveraging the UMC framework and updated data against the 2030 aspirational targets.

As of 2025, an estimated 74 per cent of individuals use the Internet globally, reflecting one of the fastest technology adoptions in history. However, the pace of progress is slowing, and regional differences remain stark: Europe and the Commonwealth of Independent States (CIS) are nearing the 95 per cent universality target, while Internet use in Africa stands at just over one in three. For those who are online, frequency is high, with the Internet having become a routine part of daily life for most users.

There are persistent connectivity divides that reflect broader socioeconomic inequalities. The income divide is paramount, showing a clear positive correlation between a country's GDP per capita and its Internet adoption rate; most low-income countries remain below 50 per cent penetration.

The gender divide persists, with a global parity score, i.e. the ratio between the proportions of women and men using the Internet, of 0.92, though progress has stalled. The gap is most significant in low- and lower-middle-income countries, especially in Africa and South Asia, where women are far less likely to be online. At the same time, some regions and groups – such as small island developing States (SIDS)– have achieved gender parity.

The age divide shows 82 per cent of youth (15-24) use the Internet, compared to 72 per cent of the rest of the population, though this gap has slowly narrowed and has been almost closed in the CIS and in Europe. Older adults, particularly those aged 75 and above, are the least connected.

The urban-rural divide is substantial: 85 per cent of urban residents use the Internet compared to 58 per cent of rural residents globally. In low-income countries, only 14 per cent of rural residents are online, about one-third of the urban rate. By contrast, the divide has narrowed markedly in the CIS and Europe regions, where it is below 10 percentage points.

The education divide is also strong. Nearly all individuals with tertiary education use the Internet, while the gap between the most and least educated can exceed 60 percentage points in some countries. Similarly, participation in the labour force and engagement in non-manual professions correlate positively with higher Internet use.

Analysis of barriers to adoption shows that the three most consistently cited reasons for not using the Internet are the lack of need, lack of skills, and high cost of service. Device affordability remains a hurdle, cited as the main reason for lacking a mobile phone by 68 per cent of adults in low-income countries in 2024 in the World Bank *Global Findex Database*.

Strengthening the six UMC enablers is necessary to overcome these barriers. In terms of Availability and Quality, mobile networks are the primary mode of access. As of 2025, 5G coverage reaches 55 per cent of the global population, but its expansion is uneven, lagging significantly (8-13 per cent coverage) in many regions outside of Europe, Asia-Pacific, and the Americas. Fixed broadband penetration has doubled over the past decade, with 96 per cent of connections offering speeds above 10 Mbit/s. Global average download speeds reached 92 Mbit/s for mobile and 118 Mbit/s for fixed broadband in early 2025, but low-income economies experience speeds only 20-30 per cent of those found in high-income economies.

Regarding Affordability, entry-level mobile broadband prices closely follow income levels, with low-income countries facing the highest costs relative to income. Encouragingly, affordability improved between 2022 and 2025.

For Devices, 82 per cent of individuals aged 10 or older own a mobile phone globally, but ownership drops to just over half in low-income economies. Mobile phones are the dominant access device, but computer access remains limited in most developing countries.

In the Skills dimension, data is limited in availability, but indicates that communication and collaboration skills are the most common among Internet users. However, there is a wide range in overall basic skills proficiency among users across countries.

Finally, for Safety and Security, the Global Cybersecurity Index (GCI) average score rose to 66 out of 100 in 2024, reflecting strengthened national commitments, although data on the prevalence and cost of cybercrime remain limited. Progress across all six enablers will determine the speed of the journey toward UMC.

Chapter 3: Infrastructure for universal and meaningful connectivity

Telecommunication infrastructure forms the foundation and technical backbone necessary for universal and meaningful connectivity (UMC). However, the performance of this infrastructure depends not only on its physical existence but also on the institutional environment and governance that regulate, protect, and manage it. Stable, transparent, and predictable institutions are vital for reducing risk and encouraging sustained, long-term investment in specialized, high-cost infrastructure assets.

The report references seven key policy measures that accelerate progress toward UMC by translating institutional stability into effective regulation: national digital transformation strategies, converged licensing regimes, mandatory infrastructure sharing, spectrum trading, technology-neutral frameworks, sustained competition in basic services, and regulatory spaces for experimentation. Countries that adopt all these measures significantly outperform those that do not, with 5G coverage, for instance, being 40 percentage points higher in conducive regulatory environments.

The ITU G5 Benchmark tool confirms that mature, coordinated governance systems (Leading or Advanced tier) correlate strongly with better infrastructure outcomes.

Globally, two infrastructure components occupy a strategic position: submarine cables and satellites. They form complementary layers of the connectivity fabric, extending reach, strengthening resilience, and linking national networks.

Submarine cables are the hidden backbone, carrying over 99 per cent of international data flows. Investment surged from USD 0.8 billion in 2015 to USD 9.7 billion in 2025, with hyperscale technology companies now playing a leading role in financing new infrastructure. The global network comprises over 500 operational systems (1.4 million kilometres), and demand is accelerating, with bandwidth growing 22 per cent annually since 2021.

The critical nature of these cables exposes them to risk: 86 per cent of faults result from human activities like fishing and anchoring. Repair delays can last weeks or months due to complex factors, including lengthy permitting procedures, customs clearance hurdles, and restrictive cabotage laws. In 2024, ITU and the International Cable Protection Committee (ICPC) launched the International Advisory Body on Submarine Cable Resilience to address these systemic coordination challenges.

Satellites have transformed from specialized solutions into strategic tools for extending reach and resilience, particularly in remote, mountainous, and insular areas where terrestrial networks are impractical, and during emergencies. Growth accelerated markedly in

2024, driven by the deployment of multi-orbit networks (GEO, MEO, LEO). This is likely to continue with further technological advances like steerable beams and Non-Terrestrial Network (NTN) integration into 5G and 6G ecosystems. Despite this growth, satellite penetration remains extremely low – less than one subscription per 1 000 inhabitants globally. The rapid growth in satellite constellations, however, poses significant risks to space sustainability, including collisions and debris generation, threatening the long-term viability of orbital resources. ITU addresses these concerns through spectrum coordination and the ITU Space Sustainability Forum.

In conclusion, accelerating UMC requires recognizing that infrastructure effectiveness is tied to governance. Governments must promote a multi-technology infrastructure stack (fibre, mobile, satellite) and advance resilience and sustainability through global frameworks for cable protection and responsible orbital management. Strengthening institutional capacity and embedding evidence-based policy-making are paramount to directing private investment toward closing access gaps.

Chapter 4: Making connectivity affordable for all

Affordability plays a decisive role of in achieving universal and meaningful connectivity (UMC); digital poverty leads to exclusion from essential digital opportunities. High costs for both ICT services and devices are commonly cited barriers to Internet use, particularly among low-income households.

Data shows a negative correlation between Internet use and price. In economies where the price of mobile broadband amounts to a significant share of the monthly Gross National Income (GNI) per capita, not only is the share of Internet users lower, but the data usage per subscription is also more limited than elsewhere. By contrast, economies meeting the Broadband Commission's aspirational target (entry-level broadband services costing less than 2 per cent of monthly GNI per capita) have the highest shares of Internet users in the population, and experience significantly higher data traffic

Households differ considerably in terms of expenditure on ICT services, and there are considerable gaps both between countries as well as within countries. In the richest countries, ICT services account for 2–3 per cent of household expenditure, while in lower-income economies, this share varies widely, ranging up to nearly 9 per cent. Rural populations often spend a higher share of their income for connectivity than urban populations, typically receiving lower-quality services due to higher deployment costs outside urban areas.

Global trends show marked improvement in affordability between 2013 and 2025: the median price level of entry-level mobile broadband dropped by about 50 per cent (in PPP USD, adjusted for inflation), and affordability as a share of GNI per capita improved by approximately 40 per cent, reaching 1.4 per cent globally.

Despite these gains, major affordability divides persist between income groups. In low-income economies, in nine out of ten countries, a 5 GB mobile broadband basket costs more than 10 per cent of the average monthly income, far exceeding the 2 per cent target.

Crucially, affordability gaps within countries are severe for the lowest earners. For the bottom 40 per cent of earners in Least Developed Countries (LDCs) and low-income economies, the cost burden rises to about 20 per cent of their GNI per capita, effectively doubling the affordability challenge compared to the national average.

Cross-country price differences stem from structural factors, policy choices, and market dynamics. Structural challenges include high network deployment costs in countries with challenging geographies and unfavourable macroeconomic conditions. A key external driver of high costs in regions like Sub-Saharan Africa is the weakness of electricity infrastructure; reliance on diesel generators significantly raises operating costs.

Policy levers are essential to improving affordability. The degree of competition in the telecommunication market is a critical driver, with higher competition generally leading to lower consumer prices. Furthermore, a coherent digital regulatory framework is paramount. Broadband services tend to be more affordable in countries where digital governance mechanisms are mature and well-established.

Closing the affordability gap requires continued monitoring, comprehensive policies addressing supply and demand sides, enhanced competition, and targeted efforts addressing potential inter-regional affordability divides within countries as well as focusing on the lowest-income populations.

Chapter 5: Developing digital skills and opportunities for all

Digital skills are critical to achieving universal and meaningful connectivity (UMC), ensuring that individuals can fully harness digital benefits and mitigate associated risks. Limited digital skills pose a major barrier to closing connectivity gaps, risking the reinforcement of existing inequalities. Digital skills are addressed under two UMC dimensions: Digital Skills (encompassing information/data literacy, communication/collaboration, digital content creation, and problem solving) and Safety/Security (focused on safety practices). This importance is recognized internationally, notably in the Global Digital Compact (GDC) and SDG 4.

ICT skills are measured through self-reported activities (20 activities categorized into five skill areas) carried out on digital devices in the last three months, a methodology aligned with the EU Digital Competence Framework for Citizens (DigComp). Individuals are categorized as having at least basic digital skills if they perform at least one relevant activity in a given area, and above basic skills if they perform two or more activities. Overall skills require meeting the threshold across all five skill areas.

Analysis of available data, though limited, reveals significant trends and disparities. Gender divides in ICT skills among Internet users are not apparent in countries reporting data, suggesting that where women are connected, their skill levels tend to match men's. However, stark differences emerge in the urban-rural divide among Internet users. While communication and collaboration skills are nearly universal for both groups, rural users lag significantly in digital content creation and problem solving.

The strongest predictor of digital skills is educational attainment. Internet users with tertiary education show high proficiency across most skill areas. However, divides in skills like digital content creation and problem solving are substantial between the most and least educated. In the essential area of online safety, low skill levels among those with lower levels of education indicate that they are often more vulnerable to scams and digital hoaxes.

Data on ICT skill levels highlight substantial variation across countries and skill areas. The relationship between national income (GDP per capita) and the digital skills of Internet users is weak for communication and collaboration skills – such skills are near-universal regardless of a country's income level. For other skill areas, the compounding nature of digital divides is clearer: low-income countries often have both lower Internet penetration *and* lower ICT skills among those who are connected.

To address these gaps, governments need comprehensive, evidence-based national digital skills strategies that set concrete targets across all skill areas. Programmes must be tailored and targeted to all population segments, including older individuals, women and girls, and rural populations. Crucially, strengthening digital safety skills must be a priority due to the urgency of cyber-enabled crime and misinformation. The measurement of ICT skills must be integrated into national development plans, with National Statistical Offices (NSOs) systematically conducting household surveys using international standards updated by groups like the ITU Expert Group on ICT Household Indicators (EGH).

Chapter 6: Measuring what matters: Strengthening national data ecosystems

A robust system for statistical measurement of digital development is fundamental for designing effective, evidence-based policies necessary to achieve universal and meaningful connectivity (UMC). Global initiatives like the Global Digital Compact (GDC) and the G20 Digital Economy Working Group (DEWG) have underscored the need to strengthen national statistical systems and harmonize indicators related to digital inclusion.

This report uses a UMC measurement framework that adopts a multidimensional perspective, covering six core dimensions: Connection quality, Availability for use, Affordability, Devices, Digital skills, and Safety and security. This framework is complemented by demographic, economic, and location indicators necessary for granular, disaggregated analysis. The framework, however, often needs adaptation for specific groups, such as children, whose online lives require specialized measurement methodologies and ethical protocols.

A significant challenge is strengthening national statistical capacity. ICT statistics are a relatively new domain in official statistics, and technical capacity often correlates with economic development: countries with lower GNI per capita generally have weaker statistical systems (as shown by the World Bank Statistical Performance Index, SPI). Consequently, high-income countries report ICT data more frequently (approximately every two years), while lower-income countries often report only every five years or less regularly. The Africa region lags severely, reporting on average only one indicator on household Internet access or Internet use by individuals per year, often with significant delays.

Strengthening statistical capacity requires a robust institutional foundation. This includes establishing legislation for the regular and systematic collection and dissemination of ICT statistics by National Statistical Offices (NSOs) and regulators, aligning with the UN Fundamental Principles of Official Statistics. Formalized dialogue between data users and producers is essential to promote a data-driven culture, which is often lacking among policy-makers.

The main constraint, particularly for demand-side data, is financing. Conducting a nationally representative digital inclusion household survey for 15 000 households is estimated to cost approximately USD 2 to 2.5 million per country. Statistical systems rely on domestic sources, such as ordinary government budgets sometimes supplemented by international assistance. Various sustainable financing models exist, including leveraging revenues from national digital resources (such as country-code top-level domains) or using Universal Service Funds. Currently, there is no dedicated pooled financing mechanism to support the regular implementation of digital inclusion surveys across countries, leading to fragmented and irregular data collection.

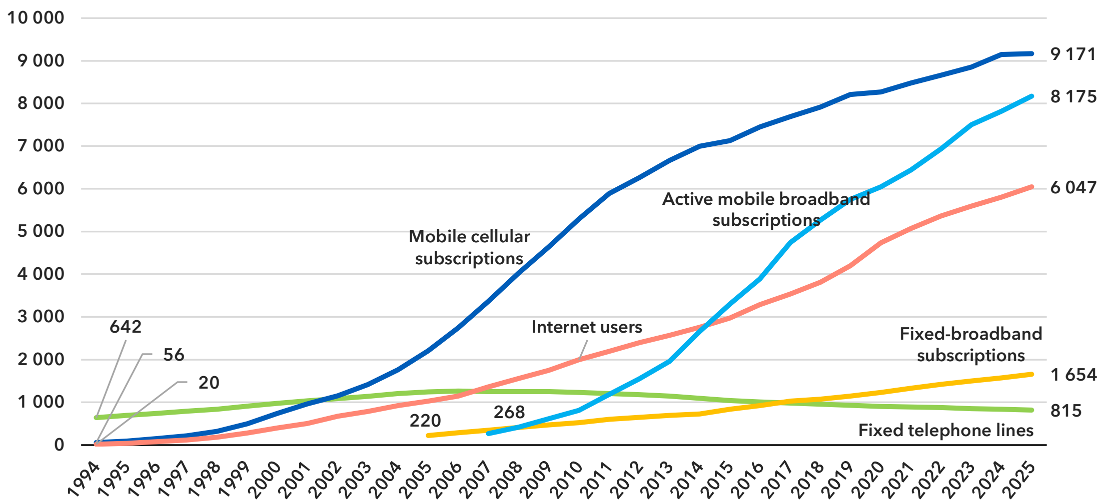
To gain efficiencies, international collaboration and innovation is encouraged. NSOs can cut costs and improve comparability by using international survey tools (e.g., World Bank Survey Solutions, UNICEF MICS toolkit) and by integrating ICT modules into existing social surveys. ITU's Expert Groups (EGH and EGTI) play a vital role in setting and maintaining harmonized methodological standards.

Furthermore, NSOs are increasingly exploring new data sources and methods to complement traditional surveys, offering timelier and more granular insights. Key examples include Mobile Phone Data (MPD), which provides near real-time, geographically detailed insights into connectivity, and geospatial technologies like satellite imagery. ITU is actively supporting the adoption of MPD, including a joint programme with the World Bank to assist at least 30 countries by 2030. The road ahead requires treating ICT statistics as a strategic public good, establishing a coordinated financing facility, and continued investment in data science skills and international standardization.

Chapter 1: The connectivity journey

Over the past thirty years, connectivity has evolved from a scarce resource into an essential part of daily life. When the first World Telecommunication Development Conference (WTDC) convened in 1994, fewer than one per cent of the world's population used the Internet, and global discussions focused largely on expanding telephone networks (see Figure 1.1). The vision set out at that first WTDC was clear: to extend the reach of telecommunications so that more people, especially in developing countries, could benefit from the opportunities of connectivity. Three decades later, more than 6 billion people are online, and digital technologies have become deeply embedded in how societies communicate, learn, trade and govern.

Figure 1.1: Evolution in selected connectivity indicators (millions)



Source: ITU

This transformation has been driven by extraordinary advances in computing power, network capacity, and data storage. Processing speeds have multiplied by orders of magnitude, as shown by the evolution of the world's fastest supercomputers (see Table 1.1). Over the past three decades, computing power has increased nearly 30 million-fold, corresponding to a doubling approximately every nine months. These leaps in capability have enabled breakthroughs in artificial intelligence, big data analytics, and cloud computing, which in turn have fuelled the expansion of digital services and platforms across all sectors.

These and other remarkable advances in information and communication technologies have fundamentally transformed what it means to be connected and have vastly expanded the realm of possibilities. Successive waves of deployment and adoption have reinforced one another in a virtuous cycle of supply, demand and innovation. Had connectivity remained what it was in 1994 and been simply more widespread but technologically unchanged, it would never have generated the profound economic and social effects observed today.

However, unequal access, uneven quality, and limited digital skills continue to leave billions of people unable to participate fully in the digital economy and the expanding opportunities it offers. These divides often compound and reinforce pre-existing social and economic inequalities, instead of reducing them. At the same time, growing evidence points to negative consequences associated with excessive or unsafe connectivity.

The challenge for policy-makers today is therefore twofold: to ensure that everyone can harness the potential of connectivity, while at the same time mitigating its adverse effects and ensuring that digital transformation contributes to inclusive, safe, and sustainable development.

1.1 Connectivity as a global force

Connectivity has become a defining feature of the twenty-first-century economy and a major driver of human development. Empirical evidence from multiple settings supports this link. In the Republic of Senegal, the expansion of 3G coverage has been associated with a 14 per cent increase in household consumption and a 10 per cent reduction in extreme poverty (IZA, 2020). Across 180 countries, mobile broadband has been shown to improve health and education outcomes in developing economies, while in high-income countries gains stem from increased Internet bandwidth (Bala, 2024). In the Africa region, the arrival of faster Internet via submarine cables led to rising employment across skill levels through enhanced business creation, productivity, and exports (Hjort & Poulsen, 2019). Across lower-income nations, broadband deployment correlates with improvements in social indicators including gender equality, health, and broader aspects of well-being beyond income (Rotondi *et al.*, 2020). A multiregional analysis further reveals that ICT infrastructure helps reduce inequality and poverty, particularly when combined with investments in energy access and human-capital development (Calderon and Cantu, 2021).

As connectivity expanded and its benefits multiplied, it also transformed the structure of economies. New industries emerged, companies reorganized around digital value chains, and data itself became a key source of competitiveness and growth.

Table 1.1: Selected milestones in supercomputing

Year	Performance	Units	Numeric FLOPS	Indexed (CM-5 = 1)	System
1993	59.7	gigaflops	5.97×10^{10}	1	CM-5 (Thinking machines), Los Alamos National Laboratory (USA)
1997	1.1	teraflops	1.07×10^{12}	18	ASCI Red, Sandia National Laboratories (USA)
2008	1.0	petaflops	1.03×10^{15}	17’186	Roadrunner, Los Alamos National Laboratory (USA)
2022	1.1	exaflops	1.10×10^{18}	18’458’961	Frontier, Oak Ridge National Laboratory (USA)
2024	1.7	exaflops	1.74×10^{18}	29’179’229	El Capitan, Lawrence Livermore National Laboratory (USA)

Note: FLOPS = floating-point operations per second.

Source: Top500.org (2025)

The spread of networks has powered innovation, created new industries and reshaped how people live and work. The ICT sector has become one of the most dynamic parts of the global economy, generating trillions of dollars in revenues and millions of jobs. Some of the world's most valuable companies are entirely built on, or are fully dependent upon connectivity. In 2025, the three largest companies by market capitalization belonged to the information technology sector, and roughly one third of the world's 100 largest companies operated in either information technology or the communication services industries (PwC 2025). This rapid rise of the digital sector reflects the pervasive role of connectivity across the economy and society.

Over the past three decades, the expansion of communication networks and digital services has also reshaped how people access information, education, employment and public services. These shifts blur the boundaries between economic and social life, accelerate globalization, and redefine civic participation.

The diffusion of digital technologies has yielded broad development gains across income, employment, health, and education, yet these benefits are not automatic. Realizing them depends on complementary policies that ensure affordable access, adequate skills, and effective competition. While richer countries tend to be more connected, evidence from multiple regions shows that digitalization contributes meaningfully to economic and social progress.

However, this mutual relationship also helps explain why the digital divide so often mirrors, and in many cases magnifies, the long-standing "analogue" divides of income, education and geography. As the range of connectivity applications expands, the risk of these divides growing even more pronounced increases. If connectivity enables people and economies to do more, those without connectivity fall proportionally further behind.

The gap between the connected and the unconnected therefore risks widening both across and within countries, between those who can afford and effectively use high-quality Internet connectivity and those who cannot.

The policy implications of these dynamics are profound. In developing countries especially, connectivity deserves special attention if they are to escape the vicious cycle of low development and low connectivity. But the challenge extends well beyond that. As connectivity evolves, the capabilities and resources needed to leverage it to its full potential have also increased, thus making universal, affordable and meaningful access a more complex and demanding goal for all countries.

1.2 Universal and meaningful connectivity

An estimated 96 per cent of the world's population is covered by a mobile broadband network, and three quarters of people are now online (ITU 2025b). These figures might suggest that the connectivity challenge has been largely met. However, they offer only a partial and potentially misleading picture of global connectivity.

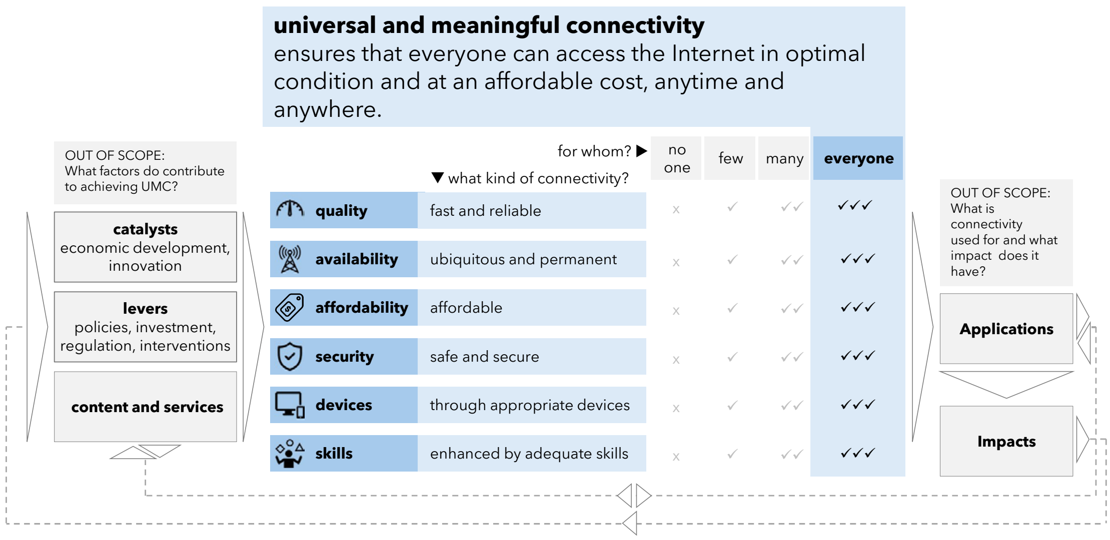
The widening digital divides and the growing complexity of leveraging connectivity for development make clear that simple access is no longer enough. Ensuring that everyone can connect, afford to stay connected, and benefit fully from the digital world requires a broader and more ambitious goal. This is the essence of universal and meaningful connectivity (UMC): a situation in which everyone can access the Internet in optimal conditions, at an affordable cost, whenever and wherever needed.

UMC embodies the idea that connectivity must enable people to realise their potential in the digital world. It builds on decades of progress in extending communication networks while recognising that the value of being online depends on the quality, affordability, and relevance of that connection.

UMC is defined through six interdependent dimensions (see Figure 1.2): Quality of the connection; Availability for use; Affordability; Devices; Skills; and Security. Strength in one dimension cannot compensate for weakness in another. Achieving UMC therefore requires holistic strategies that extend beyond infrastructure to include affordability, skills, and safety.

The concept of universal and meaningful connectivity is gaining momentum. ITU has integrated it into its Strategic Plan 2023–2027, and through its activities on the ground contributes directly to advancing this objective (see Box 1.1). In 2023, ITU and the European Union launched a major initiative to promote and measure UMC. In 2024, the Global Digital Compact recognised UMC as pivotal to inclusive digital transformation. The G20, under the Federative Republic of Brazil's 2024 presidency (G20 DEWEG, 2024), acknowledged its central role, and under the Republic of South Africa's 2025 presidency reaffirmed this commitment.

Figure 1.2: Universal and meaningful connectivity framework



Source: ITU

Box 1.1: ITU efforts to advance universal and meaningful connectivity

Through the Telecommunication Development Bureau (BDT), ITU supports countries in advancing universal and meaningful connectivity through a broad portfolio of technical assistance, capacity development, and partnership initiatives. The activities of ITU span all regions and cover the full spectrum of the digital development agenda, from access and affordability to innovation and sustainability.

- **Access and infrastructure**: ITU helps extend broadband, mobile and satellite connectivity to unserved and underserved areas, supports spectrum management and planning, and strengthens the resilience of networks and services.
- **Digital skills and inclusion**: ITU develops national strategies and training programmes that promote digital literacy, gender equality, youth engagement, and accessibility for persons with disabilities and other disadvantaged groups.
- **Policy, regulation and governance**: ITU assists countries in designing effective policy frameworks, modern regulatory tools, cybersecurity strategies, and data-governance mechanisms that enable safe and inclusive digital development.
- **Digital transformation and innovation**: ITU fosters the uptake of digital government platforms, supports innovation ecosystems and entrepreneurship, and strengthens institutional capacity through initiatives such as GovStack and the Digital Transformation Centres network.
- **Data and measurement**: ITU improves national ICT data systems, indicator frameworks, and mapping tools to support evidence-based policy-making and to monitor progress towards universal and meaningful connectivity.
- **Resilience and cybersecurity**: ITU promotes early-warning systems, emergency telecommunications, and national and regional cyber-preparedness through training, simulation exercises, and technical support.
- **Environmental sustainability**: ITU supports countries in managing e-waste, improving energy efficiency, and adopting green digital transformation practices.
- **Partnerships and knowledge sharing**: ITU connects governments, regulators, industry, academia, and international organizations to exchange experience, coordinate action, and scale up impact.

A repository of impact stories across these areas is available at: www.itu.int/itu-d/sites/digital-impact-unlocked/.

Ensuring that connectivity is both universal and meaningful is not only about empowering individuals but is also about shaping the broader trajectory of development, and will determine who benefits from emerging technologies such as artificial intelligence (see Box 1.2). Without UMC, countries risk complete exclusion, facing consequences even more severe than those witnessed in earlier phases of the digital revolution.

Box 1.2: Connectivity in the era of AI

Artificial intelligence (AI) systems rely on vast amounts of data and computational resources, both of which are intrinsically linked to connectivity. High-speed Internet is essential for transferring and processing the extensive datasets that AI models require for training and operation. Moreover, advanced AI applications, such as natural language processing, image recognition, and predictive analytics, depend on cloud computing infrastructure, which itself relies on high-quality, reliable connectivity.

Beyond development, connectivity underpins the practical deployment of AI in ways that can enhance lives. Telemedicine platforms use AI to diagnose illnesses remotely, requiring secure and robust connections to transmit sensitive medical data. Farmers in rural areas access AI-driven tools for crop management and weather forecasting, relying on mobile networks to receive timely insights. Education systems use AI-powered applications to personalize learning.

The current state of connectivity, characterized by deep divides, risks creating a "multi-speed" digital world. In such a scenario, a privileged few, equipped with the necessary infrastructure, skills, and resources, dominate AI innovation and reap the rewards. At the same time, marginalized communities struggle with limited or no access to the tools needed to participate in this new digital era. In the AI era, without universal and meaningful connectivity, the divides of the analogue world risk of being magnified.

Source: adapted from ITU, 2025a.

1.3 Connectivity duplicity: Adverse effects and challenges

Connectivity is a double-edged force. While it has enabled extraordinary progress in innovation, education and inclusion, it has also introduced new dependencies and vulnerabilities. The same networks that empower individuals and institutions have become critical infrastructures whose disruption can paralyse economies within minutes. The digital transformation of society therefore carries both promise and peril.

Growing evidence points to the effects of excessive or unbalanced digital use on well-being. Today's youth are both the most connected and the most vulnerable. As the first fully digital generation, young people spend a significant share of their time online, leaving them particularly exposed to the risks of the connected world (see Box 1.3), with potential serious adverse effects on cognitive development and well-being. In schools, PISA data indicate that unstructured or excessive use of digital tools can hinder learning outcomes rather than improve them, suggesting that even educational use requires careful guidance and balance (OECD, 2023, and OECD, 2024).

A study across four European countries found that children using social media for more than three hours a day were 12 percentage points more likely to report feeling depressed than those who did not use it (OECD, 2023). Similar patterns link heavy screen time with anxiety, sleep disturbance, and lower life satisfaction. In the United States of America, a survey carried out between 2021 and 2023 found that half of adolescents aged 12-17 reported at least four hours of daily screen time, while another 23 per cent reported about three hours of daily screen time (Zablotsky *et al.*, 2024). Among those reporting four hours or more, one in four showed symptoms of anxiety or depression during the two weeks preceding the survey. Online spaces have also amplified misinformation, harassment, and polarisation, eroding trust and social cohesion in some contexts.

Box 1.3: Online risks encountered by children: research and policy responses

Children's lives are increasingly shaped by the digital environment, which offers opportunities but also exposes them to risks. Despite the challenges of measurement (see Chapter 6, Box 6.2), recent studies reveal widespread and diverse adverse experiences online. In 2024, a study in the Federative Republic of Brazil, found that 29 per cent of 9-17-year-olds had experienced something online that upset or bothered them (Cetic.br 2025), while 12 per cent had been treated offensively, and 42 per cent had witnessed discrimination. In the Argentine Republic, a 2025 survey reported even higher figures with 21 per cent reported having been treated offensively, and 55 per cent had seen discrimination based on skin colour, country of origin, or religion. The same study introduced a new indicator on gambling revealing that 24 per cent of adolescents aged 12-17 reported having gambled money online at least once (UNICEF & UNESCO, 2025).

Evidence on sexual risks is equally concerning. Data from the Disrupting Harm project in Eastern and Southern Africa indicate that one third of 12-17-year-olds had unexpectedly encountered sexual images or videos online, and one fifth had received unwanted sexual images (UNICEF Innocenti, 2023).

These findings are informing action. In Brazil, the 2024 data supported legislative efforts on child-online protection. In Argentina, results shaped public-awareness campaigns led by educational, paediatric, and child-safety organizations. Internationally, data on sexual risks have guided cross-border initiatives against technology-facilitated child sexual exploitation and abuse, including legal, regulatory, educational, and rehabilitative measures.

General Comment No. 25 of the United Nations Committee on the Rights of the Child (CRC) sets out government and business obligations in the digital environment: to respect, protect and fulfil children's rights to provision, protection, and participation online (United Nations, 2021). Survey data also underline the dual nature of digital access. For connected children, risks include exposure to harmful content, offensive treatment, discrimination and online gambling, while for those unconnected, risks include the disadvantages associated with exclusion from learning and participation. Addressing both of these issues requires coordinated action across governments, businesses, educators, civil society, law enforcement, clinicians, parents, and caregivers.

ITU's Child Online Protection (COP) Initiative, launched in 2008, is a global multi-stakeholder effort to make digital environments safer and more empowering for children. It supports countries in developing legal, technical and educational frameworks, and works with industry, schools, parents and civil society to raise awareness and build capacity. COP also issues guidelines that promote digital literacy, age-appropriate safeguards and inclusion of vulnerable groups, while upholding children's rights to protection, provision and participation online.

Connectivity has also reshaped the global economy and the balance of power. Digital platforms and cloud infrastructures are dominated by a handful of firms and countries, creating dependencies that affect competition, data sovereignty, and resilience. The concentration of digital value has widened gaps between regions and contributed to concerns about the fair distribution of the gains from digitalization. At the same time, cyberattacks and data breaches have become major sources of economic and security risk (see Box 1.4).

Box 1.4: Cybercrime in Mexico

In 2024, in Mexico the National Institute of Statistics and Geography (INEGI) implemented the Cyberbullying Module (MOCIBA) to assess the prevalence and nature of online harassment among people aged 12 and older. The module defines cyberbullying as deliberate and repeated aggression online that can cause emotional, reputational, or economic harm.

According to MOCIBA 2023, 84 per cent of Mexicans aged 12 and above, about 90 million people, used the Internet in the three months preceding the survey. Among them, 21 per cent (18.9 million) reported experiencing at least one form of cyberbullying, with women slightly more affected than men (22 and 20 per cent, respectively). The most frequent forms were being contacted through fake identities (36 per cent), receiving offensive messages (34 per cent), and offensive calls (23 per cent). Forty per cent of victims reported harassment via WhatsApp, 40 per cent on Facebook, and 29 per cent through mobile calls.

Most victims (59 per cent) felt anger, 37 per cent distrust, and 30 per cent insecurity. On average, victims spent 5.5 hours online daily, or nearly one hour more than the national average for Internet users, suggesting a possible link between exposure and vulnerability. These findings highlight the need for strong digital-safety frameworks and awareness campaigns to ensure that connectivity contributes to well-being.

Source: https://en.www.inegi.org.mx/programas/mociba/2023/

Connectivity has widened access to information and created new channels for civic participation. At the same time, it has facilitated the rapid spread of misinformation and disinformation, intensified polarization, and enabled the manipulation of public opinion. Social media platforms can amplify harmful content and erode trust in institutions, while the integrity of democratic processes has come under pressure, with online campaigns and digital interference influencing political outcomes in many countries.[1]

The rapid expansion of connectivity and its applications also entail environmental impacts. Digital technologies rely on vast data centres, energy-intensive networks, and the extraction of critical minerals such as lithium, cobalt, and rare earths. Data centres already consume about 1.5 per cent of global electricity, and their electricity use rose by 12 per cent annually between 2017 and 2023 (IEA 2024). Boosted by cloud computing and artificial intelligence, global electricity demand for data centres is projected to grow four times faster than other sectors from 2024 to 2030 and reach about 3 per cent of total electricity use (IEA, 2024). A survey of 166 large digital companies found they were responsible for 0.8 per cent of global energy-related emissions, with the ten largest emitters accounting for 53 per cent of the total (ITU and WBA, 2025). The world also produced a record 62 million tonnes of e-waste in 2022, yet only 22 per cent was formally recycled, leading to the loss of valuable resources and the release of pollutants (ITU and UNITAR, 2024).

Harnessing the benefits of connectivity while mitigating its downsides is a defining policy challenge. Achieving universal and meaningful connectivity must go hand in hand with ensuring that connectivity is safe, inclusive, and sustainable. The goal is not only to connect everyone, but to ensure that connectivity supports well-being, equality, and sustainability.

[1] See World Economic Forum (2025) for a discussion of how digitalization contributes to rising misinformation, disinformation and societal polarization.

1.4 The road ahead

Connectivity has become a defining feature of modern life. It underpins how people learn, work, and interact, and how economies and institutions function. Yet the benefits of digital transformation remain uneven. Billions of people remain offline, and many more struggle with slow, costly or unreliable access that limits what they can do online. Meanwhile, new risks have emerged as societies become increasingly dependent on digital technologies.

The challenge ahead is to expand connectivity while improving its quality and impact. This means ensuring that every connection is affordable, reliable and secure, and that it enables people to participate fully in the digital world. It also means addressing the growing environmental and societal costs of digitalization, from energy use and e-waste to disinformation and cybercrime.

Achieving this balance calls for a renewed policy focus and sustained international cooperation. Universal and meaningful connectivity provides a framework for this effort. Progress depends on coherent action across these dimensions, guided by reliable data and evidence.

The remainder of this report is organised as follows: Drawing on the rich dataset of ITU and applying the UMC framework, Chapter 2 presents the current state of global connectivity and assesses progress. Chapter 3 considers promising infrastructure solutions and policy options for accelerating UMC. Chapter 4 examines affordability as a key enabler and explores measures to make connectivity more affordable. Chapter 5 focuses on digital skills, another essential dimension of UMC. Chapter 6 highlights the role of measurement, identifies persisting data gaps, and proposes ways to improve granularity, timeliness, quality, and scope, including new mechanisms for financing national data ecosystems.

References

Bala, P. 2024. "The impact of mobile broadband and Internet bandwidth on human development: A comparative analysis of developing and developed countries." *Journal of the Knowledge Economy*, 15, 16419–16453. https://doi.org/10.1007/s13132-023-01711-0

Calderon, C., & Cantu, C. 2021. *The impact of digital infrastructure on African development* (Policy Research Working Paper No. 9853). World Bank, Washington, DC. http://hdl.handle.net/10986/36629

Cetic.br. 2025. *Survey on Internet use by children in Brazil: ICT Kids Online Brazil 2024*. Regional Center for Studies on the Development of the Information Society (Cetic.br), São Paulo.

G20 Digital Economy Working Group (DEWG). 2024. *G20 Maceió Ministerial Declaration on Digital Inclusion for All* (Maceió, 13 September 2024). Government of Brazil. https://www.gov.br/g20/pt-br/trilhas/trilha-de-sherpas/economia-digital/g20dewgmaceioministerialdeclaration.pdf/@@download/file

Hjort, J., & Poulsen, J. 2019. "The arrival of fast Internet and employment in Africa." *American Economic Review*, 109(3), 1032–1079.

International Energy Agency (IEA). 2024. *Electricity 2024: Analysis and Forecast to 2026*. Paris.

International Telecommunication Union (ITU). 2025a. "Universal and meaningful connectivity and artificial intelligence." In *Human Development Report 2025*. United Nations Development Programme (UNDP), New York, NY.

International Telecommunication Union (ITU). 2025b. *Measuring digital development: Facts and figures 2025*. Geneva.

International Telecommunication Union (ITU) & United Nations. 2022. *Achieving universal and meaningful digital connectivity: Setting a baseline and targets for 2030*. Geneva and New York.

International Telecommunication Union (ITU) & World Benchmarking Alliance (WBA). 2025. *Greening Digital Companies 2025*. Geneva.

International Telecommunication Union (ITU) & United Nations Institute for Training and Research (UNITAR). 2024. *The Global E-waste Monitor 2024*. Geneva and Bonn.

IZA Institute of Labor Economics. 2020. *Broadband Internet and household welfare in Senegal* (IZA Discussion Paper). Bonn.

Organisation for Economic Co-operation and Development (OECD). 2023. *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing, Paris. https://doi.org/10.1787/53f23881-en

Organisation for Economic Co-operation and Development (OECD). 2024. *Students, digital devices and success* (OECD Education Policy Perspectives, No. 102). OECD Publishing, Paris. https://doi.org/10.1787/9e4c0624-en

PricewaterhouseCoopers (PwC). 2025. *Global Top 100 Companies*. London.

Rotondi, V., Kashyap, R., Pesando, L. M., Spinelli, S., & Billari, F. C. 2020. "Leveraging mobile phones to attain sustainable development." *Proceedings of the National Academy of Sciences (USA)*, 117(24), 13413–13420. https://doi.org/10.1073/pnas.1909326117

Top500.org. 2025. *Celebrating 25 years of TOP500*. https://www.top500.org/25years/ (accessed September 2025).

UNICEF & UNESCO. 2025. *Niñas, niños y adolescentes conectados – Informe general de resultados: Encuesta Kids Online Argentina*. UNICEF Argentina, Buenos Aires.

UNICEF Innocenti. 2023. *Online risk and harm for children in Eastern and Southern Africa*. Florence. https://www.unicef.org/innocenti/media/3841/file/Online-Risks-Harm-Children-ESA-2023.pdf

United Nations. 2021. *General comment No. 25 (2021) on children's rights in relation to the digital environment* (CRC/C/GC/25). Committee on the Rights of the Child, March. Geneva.

United Nations Environment Programme (UNEP). 2024. *Global Resources Outlook 2024*. Nairobi.

World Economic Forum. 2025. *The Global Risks Report 2025*. Geneva.

Zablotsky B, Arockiaraj B, Haile G, Ng AE. *Daily screen time among teenagers: United States, July 2021–December 2023*. NCHS Data Brief, no 513. Hyattsville, MD: National Center for Health Statistics. 2024. DOI: https://dx.doi.org/10.15620/cdc/168509

Chapter 2: Assessing progress toward universal and meaningful connectivity

This chapter examines global progress toward achieving universal and meaningful connectivity (UMC), where everyone can access the Internet in optimal conditions, at an affordable cost, whenever and wherever needed. Building on the UMC framework introduced in Chapter 1, this chapter provides an updated assessment of progress against the 2030 aspirational targets and analyses how people use connectivity, where divides persist, and what enablers are driving or hindering progress.

The UMC targets were introduced in 2022 as part of the implementation of the United Nations Secretary-General's Roadmap for Digital Cooperation (ITU, 2022a). The UMC targets serve to guide collective action, monitor advancement, and mobilize efforts toward UMC. The *Global Connectivity Report 2022* (ITU, 2022b) provided an initial progress assessment. This chapter updates that assessment with the latest available data.[2]

Table 2.1 presents the status for each target, while Box 2.1 summarises methodological refinements and updates made since the first assessment. The subsequent sections review the main dimensions of progress: usage of connectivity, persisting divides, and the key enablers that can accelerate the transition toward universal and meaningful connectivity by 2030.

[2] The UMC Dashboard on the ITU DataHub is regularly updated with the latest available data.

Table 2.1: Assessment of progress toward the UMC targets for 2030

Indicator	Target	Current situation globally	Number of economies meeting the target[a]
Internet users (% of population)			
Aged 15 and above[b]	At least 95%	74%	26/183
Gender parity score[c]	[0.98-1.02]	0.92	49/93
Households with Internet access (%)	At least 95%	n.a.[d]	22/96
Schools connected to the Internet (%)	100%	49% (primary)	47/103
		61% (lower sec.)	52/100
		72% (upper sec.)	60/105
Businesses using the Internet (%)			
0 employees or more	100%	n.a.	n.a.
> 10 employees	100%	n.a.	30/48
Mobile network coverage (% of population)			
3G	100% for the most advanced technology already present in the country with minimum coverage of 40%	96%	0/13[e]
4G		93%	36/114[f]
5G		55%	21/68
Fixed-broadband speed (% of subscriptions)			
>10 Mbit/s	100%	96%	55/164
School connectivity			
Min. download speed (Mbit/s per school)	20	n.a.	n.a.
Min. download speed (kbit/s per student)	50	n.a.	n.a.
Minimum data allowance (GB)	200	n.a.	n.a.
Entry-level broadband subscription price			
% of gross national income per capita	2%	1.4% (mobile)	118/192
		2.5% (fixed)	80/182
% of average income of bottom 40% of earners	2%	3.1% (mobile)	54/107
		5.3% (fixed)	31/101
Individuals using a mobile phone			
Gender parity score[c]	[0.98-1.02]	n.a.	37/51
Individuals owning a mobile phone (% of population)			
Aged 15 and above[g]	100%	82%	46/180
Gender parity score[c]	[0.98-1.02]	0.90	29/50
Population with at least basic digital skills (%)	70%	n.a.	n.a.
Gender parity score[c]	[0.98-1.02]	n.a.	n.a.
Population with above digital skills (%)	50%	n.a.	n.a.
Gender parity score[c]	[0.98-1.02]	n.a.	n.a.

Notes: n.a. = not available (global situation cannot be assessed due to limited data coverage).

a: Among economies for which data is available. *x/y* means that in *x* out of *y* economies for which data is available the target has been achieved (see text for details). Data are either for 2025 (for global aggregates), 2024 (for country-level data), or the latest year available in the last four years. For overall Internet use, mobile network coverage and mobile phone ownership, data include ITU estimates. Economies considered are the 194 ITU Member States; Hong Kong, Special Administrative Region of China, China; Macao, Special Administrative Region of China, China; and the State of Palestine.[3]

b: For the global indicator: *Percentage of total population* instead of *Percentage of population aged 15 and above*. For country-level data the age cut-off depends on the national surveys.

c: Ratio between the proportions of women and men for a given indicator. Values below 1 indicate higher male proportions; values above 1 indicate higher female proportions.

d: Not available for lack of a harmonised data source for the number households.

e: Number of economies where coverage of 4G has not reached 40 per cent of the population.

f: Number of economies where coverage of 5G has not reached 40 per cent of the population.

g: For the global indicator: *Percentage of population aged 10 and above* instead of *Percentage of population aged 15 and above*. For country-level data the age cut-off depends on the national surveys.

Sources: ITU; UNCTAD (retrieved July 2025); UNESCO-UIS database (retrieved July 2025).

3 The State of Palestine is not an ITU Member State; the status of the State of Palestine in ITU is the subject of Resolution 99 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference.

Box 2.1: Refining the UMC targets

As emphasized in the UMC background paper (ITU, 2022c), some individuals may choose not to use the Internet, even when it is accessible and affordable. Consequently, targets for indicators expressed as a share of population have been adjusted to reflect a threshold of 95 per cent. For indicators initially set with a nominal target of 100 per cent, a practical benchmark of at least 98 per cent is considered sufficient to deem the target achieved.

In the case of gender parity, while the formal target remains a perfect ratio of 1, parity will be considered effectively achieved for any value between 0.98 and 1.02.

For affordability, the data allowance of the entry-level mobile broadband basket was increased from 2 GB to 5 GB in 2025, aligning with the methodology established by the Expert Group on telecommunication/ICT indicators (EGTI) in 2024 (ITU, 2025a).

For ICT skills, a revised methodology has been introduced to better capture the range of digital activities individuals report performing on digital devices. This adjustment renders the original targets obsolete. Under the new approach (ITU, 2025b) based on the European Union Digital Competence Framework for Citizens (Vuorikari et al, 2022), ICT skill activities are grouped into the following five skill areas:

- information and data literacy;
- communication and collaboration;
- digital content creation;
- safety;
- problem-solving.

An individual is considered to have basic digital skills in a given area if they report having performed at least one relevant activity within the last three months. Those who report completing two or more activities in a given area are considered to have above-basic digital skills. For an overall assessment of digital competence, an individual is deemed to possess at least basic digital skills if they demonstrate basic skills (having done at least one activity) in each of the five skill areas. Similarly, individuals who exhibit above-basic skills in each of the five areas are classified as having above-basic digital skills.

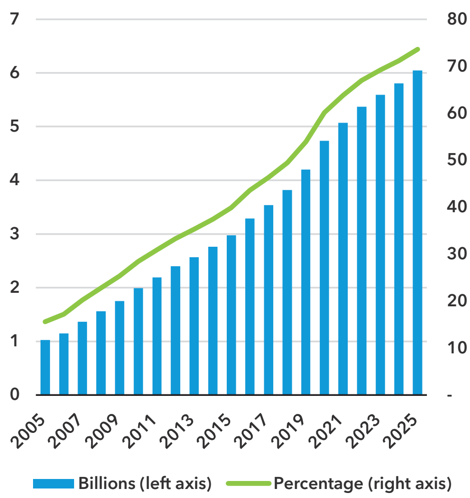
The revised targets, which align with these updated methodologies, aim for 70 per cent of the population to possess at least basic digital skills and 50 per cent to demonstrate above-basic digital skills. For further insights into ICT skills and their measurement, see Chapter 5.

2.1 Usage of connectivity

As of 2025, an estimated 74 per cent of individuals are using the Internet (see Figure 2.1). Two decades ago, only one in six people were online; today, that figure has risen to three in four. This expansion represents one of the fastest global technology adoptions in history and a major step toward universal and meaningful connectivity. Yet the pace of progress has slowed in recent years as markets mature, and the remaining offline population continue to face multiple barriers that remain hard to overcome.

Regional disparities remain stark (see Figure 2.2). Among the six ITU regions, the Europe region and the Commonwealth of Independent States (CIS) region are approaching the UMC universality target of 95 per cent, while the Africa region lags behind, with just over one in three individuals using the Internet.[4] These contrasts underline how economic development, infrastructure availability, and affordability continue to shape connectivity outcomes.

Figure 2.1: Individuals using the Internet



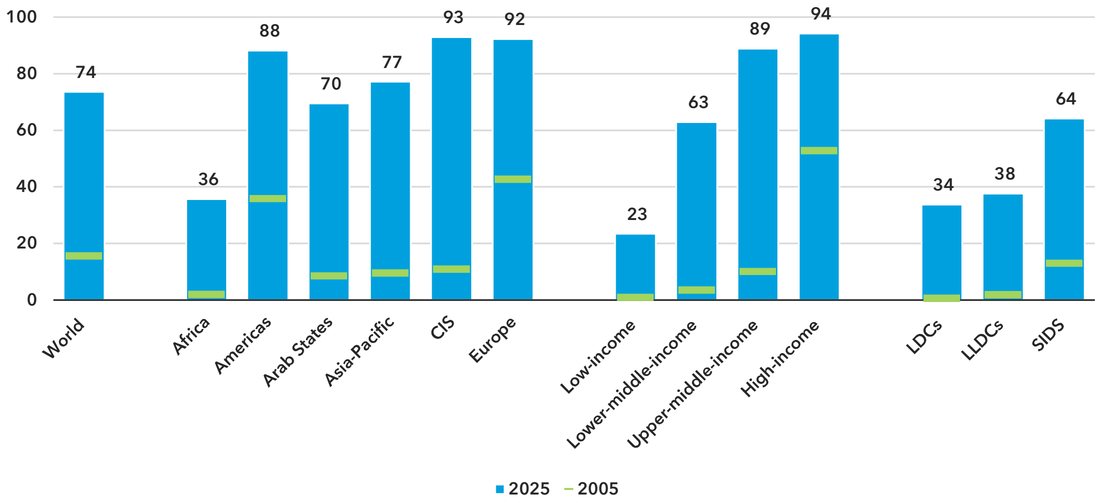
Note: Includes ITU estimates.
Source: ITU

Beyond basic access, the frequency of Internet use provides a deeper insight into how individuals experience connectivity. The UMC framework envisions and targets a world where everyone who is online can use the Internet whenever they need or wish to, and in practice, this means daily. In most countries, this target is largely realized, and most users already go online every day (see Figure 2.3). Even in lower-income economies, more than 50 per cent, and often close to 90 per cent, of Internet users connecting daily. The Internet has thus become a routine part of life. However, as highlighted in Chapter 1, growing intensity of use is increasingly associated with excessive or problematic consumption and adverse effects, particularly on educational outcomes and well-being.

As Internet adoption approaches saturation in many economies, further progress toward UMC increasingly depends on enabling existing users to connect more effectively and productively, by enhancing the quality, affordability, safety and value of use.

[4] See the latest edition of Facts and Figures for additional regional and income group estimates.

Figure 2.2: Percentage of individuals using the Internet by region and special groups, 2005 and 2025



Note: Includes ITU estimates.

Source: ITU

2.2 The many divides of connectivity

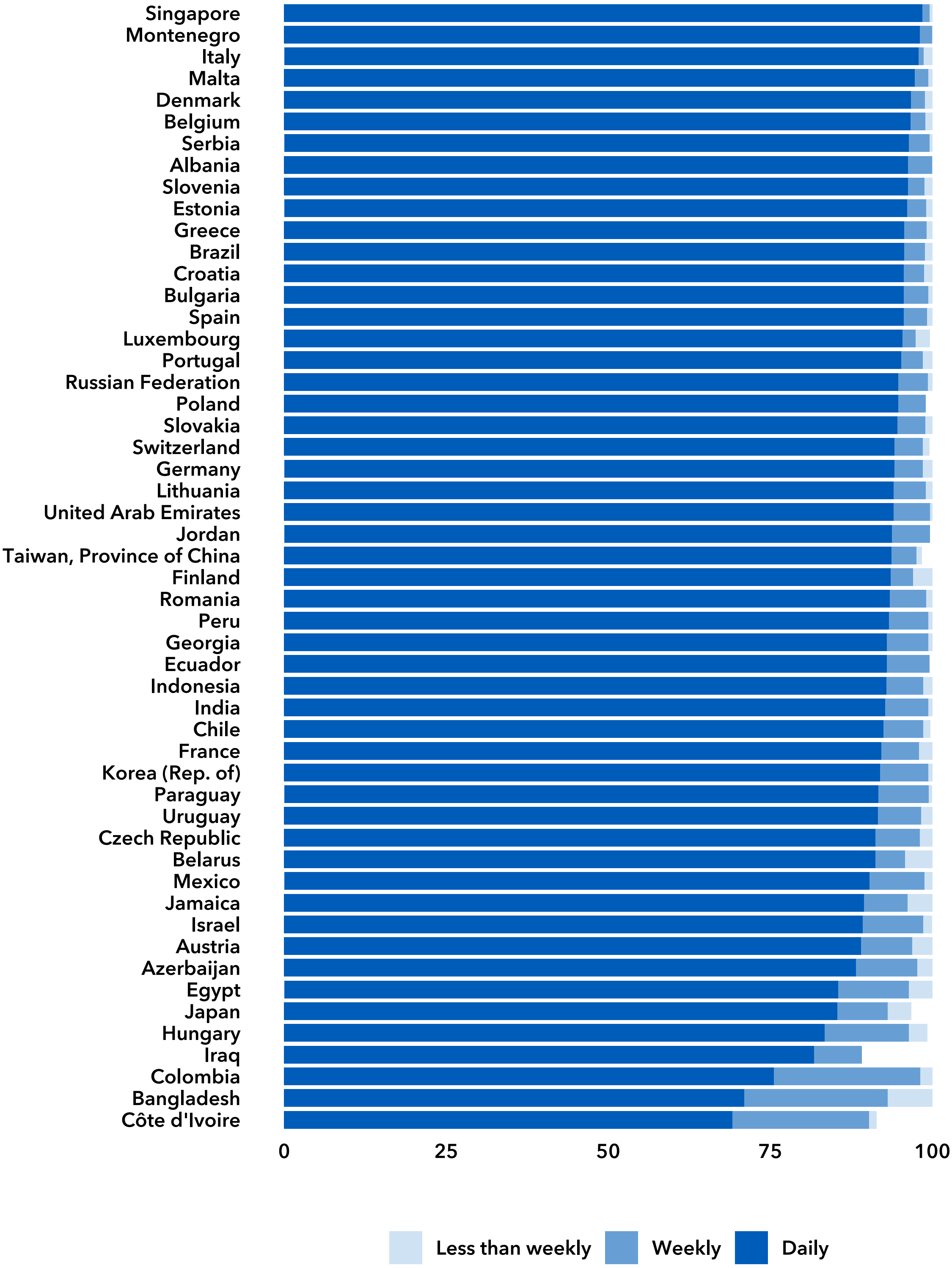
Despite remarkable global progress, a quarter of humanity remains offline, concentrated in low-income, rural and disadvantaged groups. Global averages conceal large and persistent gaps across regions, countries and population groups. These digital divides reflect disparities in income, gender, age, education and location, shaping both access to and the quality of connectivity. Understanding these digital divides is essential to design effective interventions that can close them and accelerate progress toward universal and meaningful connectivity.

The income divide

As highlighted in Chapter 1, income remains one of the most powerful determinants of Internet adoption. Figure 2.4 shows a clear positive relationship between a country's level of economic development and the proportion of its population using the Internet. In high-income economies, Internet use is nearly universal, with penetration rates below 75 per cent rarely observed once income exceeds about USD 15 000 (PPP) per capita. In contrast, most low-income countries remain well below 50 per cent, and in some cases, below 20 per cent.

Lower income levels often translate into higher relative prices for connectivity and devices (see Chapter 4), limited access to capital for network deployment (see Chapter 3), and fewer resources for digital skills development (see Chapter 5). These factors interact to reinforce a persistent structural divide between richer and poorer nations.

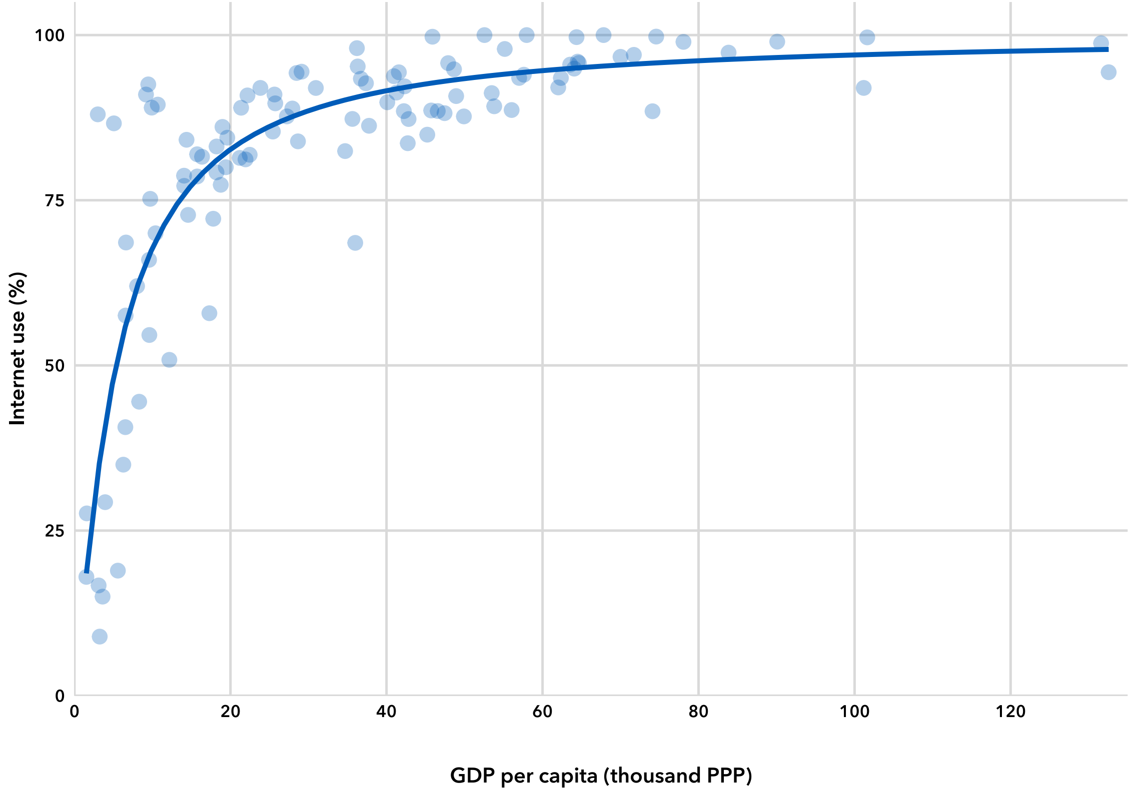
Figure 2.3: Share of Internet users by frequency of use



Note: Includes economies with data for 2022 or more recently

Source: ITU

Figure 2.4: Share of Internet users vs GDP per capita (constant year 2021 PPP)



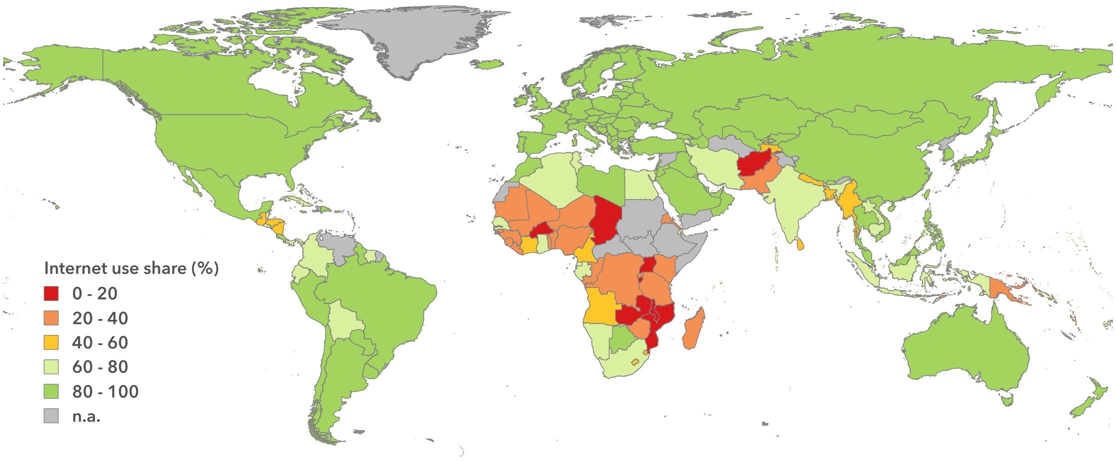
Note: Includes countries with data no older than 2020. GDP per capita refers to thousand 2021 constant price PPP USD.

Source: ITU; International Monetary Fund (IMF) for GDP per capita.

Within the global landscape, a distinct group of low-income economies stands out where Internet adoption remains exceptionally limited. Many of these are least developed countries (LDCs), landlocked developing countries (LLDCs) or small island developing States (SIDS), which face specific geographic and structural challenges such as small markets, dependence on costly international bandwidth, or limited economies of scale.

Geographic disparities in adoption largely mirror income differences (see Figure 2.5). Countries in the Africa region and in the South Asia region are among those with the lowest Internet penetration. These regions combine low-income levels with infrastructure deficits and other barriers. By contrast, Internet adoption is highest in the Europe region and in the CIS region, where adoption exceeds 90 per cent and universal connectivity is within reach.

Figure 2.5: Percentage of the population using the Internet, 2024 or latest year available



Note: The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section. Includes ITU estimates.

Source: ITU

The gender divide

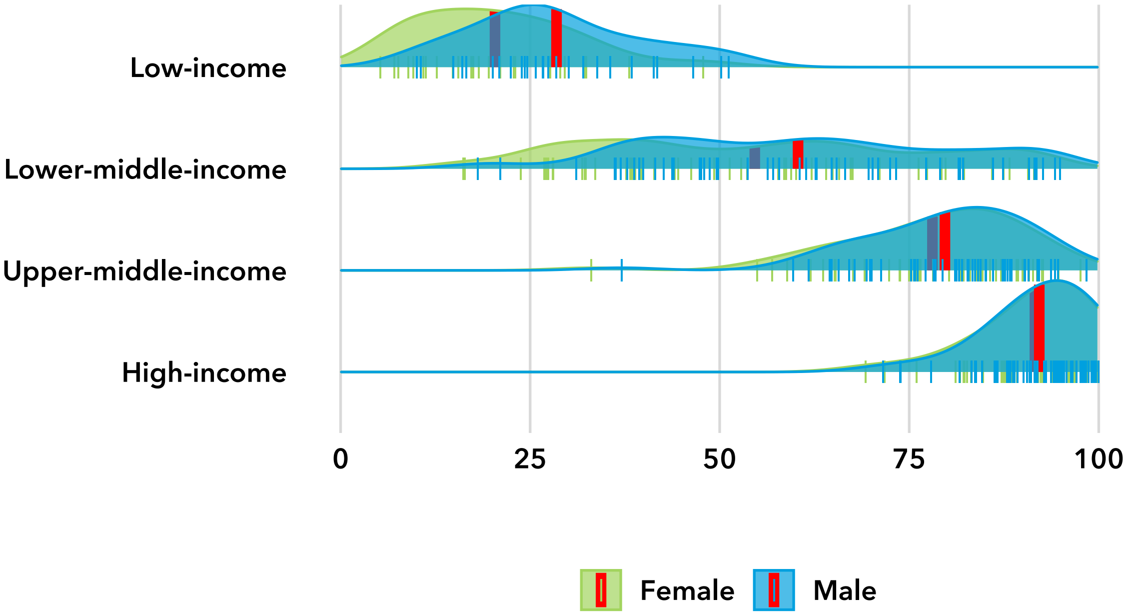
Gender remains one of the most important and visible dimensions of the digital divide. Although the number of female and male Internet users has increased by nearly 45 per cent since 2019, about 280 million more men than women use the Internet worldwide in 2025, with 77 per cent of men using the Internet compared with 71 per cent of women. This results in a global gender parity score of 0.92, which is relatively close to the parity target range of 0.98 to 1.02 (see notes to Figure 2.7, and Box 2.1). However, progress has completely stalled in recent years, and global averages mask large regional and income-related disparities.

In many parts of the world, women are still less likely than men to use the Internet, a pattern that reflects broader social and economic inequalities and discriminations. The gap remains significant in low- and lower-middle-income countries, where women face multiple and intersecting barriers to digital inclusion (see Figure 2.6). By contrast, in upper-middle- and high-income economies, Internet adoption is almost equal between men and women, with gender parity ratios close to one, underscoring the close link between economic empowerment and digital participation.

Figure 2.7 highlights that the largest gender gaps are concentrated in the Africa region and in the South Asia region, where social norms, safety concerns, and affordability constraints often limit women's access to digital devices and services. In several low-income countries (among those appearing in red on the map), men are more than twice as likely as women to be online. Lower levels of education and digital skills further compound these challenges, reinforcing cycles of exclusion.

Bridging the gender divide requires not only addressing affordability and infrastructure barriers but also tackling the social and cultural norms that limit women's participation in the digital sphere.

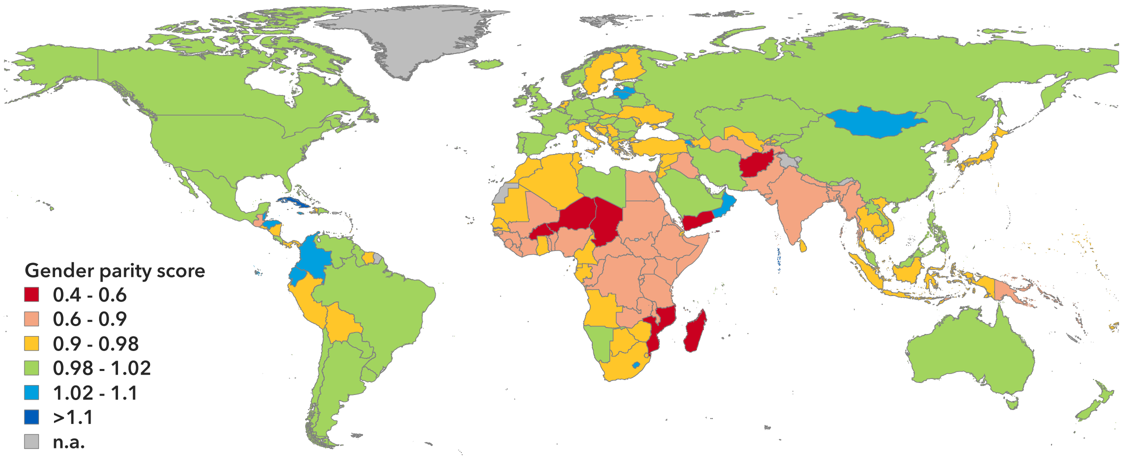
Figure 2.6: Distribution of Internet use percentage by gender and income group, 2024



Note: The chart shows the distribution of country scores. Red lines indicate group average scores. Includes ITU estimates.

Source: ITU

Figure 2.7: The Internet use gender gap, 2024



Notes: The gender parity score is the ratio between the proportions of women and men using the Internet. A value below 1 indicates higher use among men, while a value above 1 indicates higher use among women. Values between 0.98 and 1.02 reflect gender parity. Includes ITU estimates.
The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.
Source: ITU

The age divide

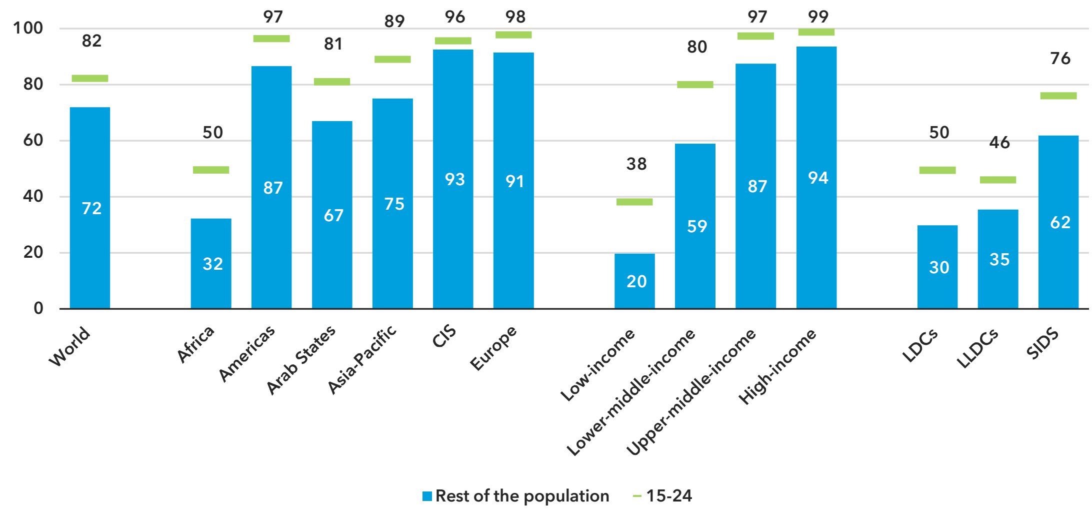
Age is a strong predictor of Internet use, with younger generations consistently more likely to be online than older generations. Unlike their parents, most millennials were born into a world where the Internet was already deeply integrated into daily life. In 2025, 82 per cent of individuals aged 15 to 24 use the Internet, compared with 72 per cent among the rest of the population (see Figure 2.8). This gap, present in every region, has been gradually narrowing over the past four years.

In several regions, young people have already achieved near-universal Internet use. In the Europe, the Commonwealth of Independent States (CIS) and the Americas regions, Internet usage among 15- to 24-year-olds has reached or exceeded 95 per cent, effectively meeting the universality threshold. In low-income countries, however, young people are still 1.9 times more likely to use the Internet than older age groups, which is a significant divide compared to high-income countries where this age group is only five percent more likely to use the Internet than the rest of the population.

Across all regions, youth remain the most connected demographic, while older adults, particularly those aged 75 and above, are the least connected (Figure 2.9). The age gap is especially wide in countries with low overall Internet penetration, where limited digital literacy, affordability barriers, and lack of relevant content continue to constrain uptake among older populations.

Despite these divides, the growing connectivity of young people offers a source of optimism. In countries with predominantly young populations, and particularly in the least developed countries (LDCs), today's digitally active youth will soon form the core of the labour force. Their expanding connectivity and digital skills can potentially drive economic growth, social participation, and innovation, supporting progress toward the Sustainable Development Goals (SDGs) and universal and meaningful connectivity (see Box 2.2). In contrast, in countries where Internet adoption among youth is already near universal, the emerging challenge lies in managing the effects of overuse and excessive connectivity, as discussed in Chapter 1.

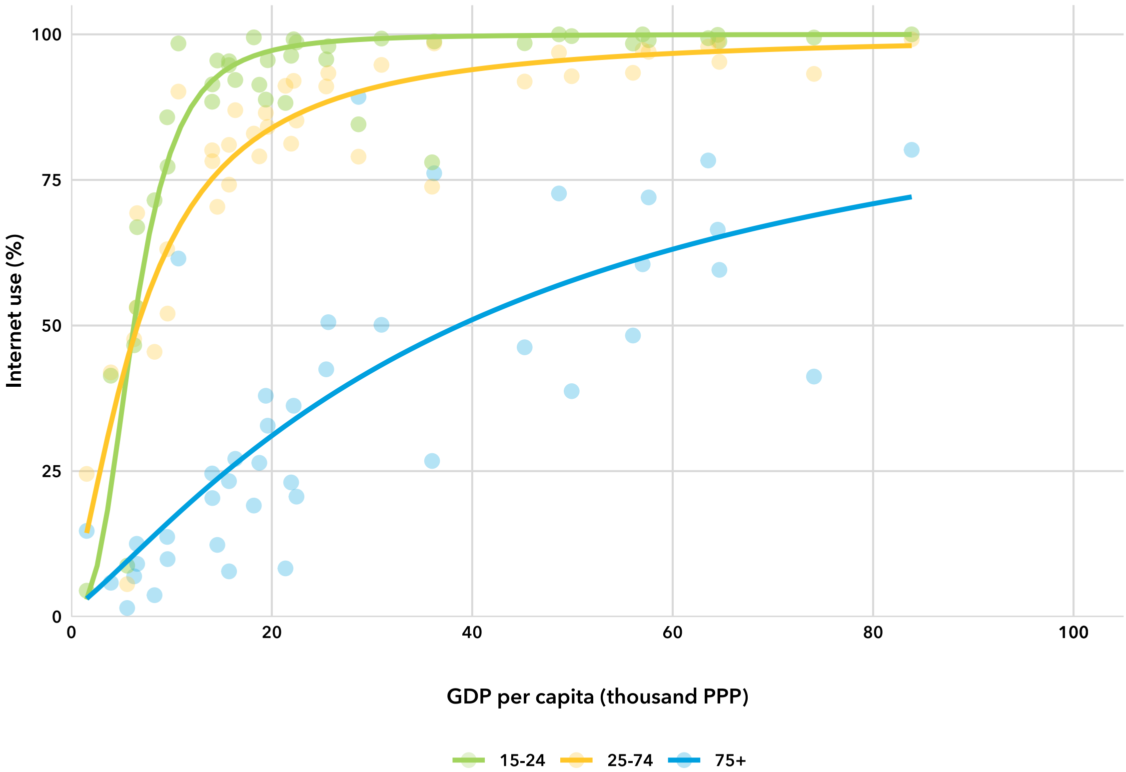
Figure 2.8: Percentage of individuals using the Internet by age group, 2025



Note: "Youth" means 15- to 24-year-olds. "Rest of the population" means individuals aged less than 15 or over 24. Includes ITU estimates.

Source: ITU

Figure 2.9: Share of Internet users vs GDP per capita (constant year 2021 PPP), by age, latest year available



Note: Includes only countries with data for the 75+ age group for 2020 or more recently. GDP per capita refers to thousand 2021 constant price PPP dollars.

Source: ITU; International Monetary Fund (IMF) for GDP per capita.

Box 2.2: Why setting global targets matters: the role of the SDGs and UMC

The 17 sustainable development goals (SDGs) and their 169 targets were adopted in 2015 as part of the UN 2030 Agenda for Sustainable Development. Unlike their predecessor, the Millenium Development Goals (MDGs), the SDGs apply to all economies, lower- and higher-income alike. The aim is to balance the three dimensions of sustainable development: economic, social and environmental (UN, 2015). The environmental aspect was first integrated into the sustainable development definition in the 1987 Brundtland Report which stressed that meeting the needs of today should not compromise the needs of tomorrow (WCED, 1987).

While the role of ICTs as an enabler for SDGs has been long recognized (e.g. UN, 2015), none of the goals specifically address digital connectivity. The adoption of the universal and meaningful connectivity (UMC) aspirational targets in 2020 fills this gap by providing the digital foundation for achieving the SDGs (ITU, 2023).

Understanding the evolution of these frameworks also highlights why setting global targets such as SDGs and UMC is crucial. In an increasingly complex and interconnected world, global challenges, such as poverty, inequality, and climate change, transcend national and sectoral boundaries. Global targets provide multidimensional and coordinated approaches that enable collective progress. They also offer a shared vision and policy framework that promotes coherence across sectors and economies. Furthermore, time-bound and measurable goals strengthen accountability at global, national, and local levels, fostering transparency and peer learning (UN, 2015; UNDESA, n.d.; ITU, 2015). Clear and measurable targets enable evidence-based decision-making by allowing policy-makers to assess gaps, monitor progress and recalibrate strategies (IAEG-SDG, 2015; ITU, 2022a).

These frameworks also advance inclusion and global equity by upholding the principle of *leaving no one behind* (UN, 2015; Digital Regulation Platform, 2023), ensuring that vulnerable and marginalized groups benefit from global progress. By identifying areas of need, they stimulate innovation, investment and political commitment. Ultimately, by building and sustaining momentum over time, global targets translate complex aspirations into actionable pathways for sustainable development, ensuring that present achievements do not compromise the prospects of future generations.

The urban-rural divide

In 2025, 85 per cent of the global population living in urban areas are using the Internet, compared with just over half (58 per cent) of those residing in rural areas. This persistent urban-rural divide underscores the unequal distribution of digital access and opportunities between cities and the countryside. The size of the gap, however, varies widely across income groups.

In high-income countries, the urban-rural divide has been largely bridged, with Internet usage rates in rural areas closely mirroring those in urban centres. On average, the ratio of Internet users in urban to rural areas in these countries stands at 1.1, indicating near parity. By contrast, in low-income countries the gap remains deep and entrenched. Only 14 per cent of rural residents are online, which is just over one-third of the rate observed in urban areas.

Figure 2.10 shows the urban-rural divide at the country level. In many countries, particularly those with lower overall Internet penetration, this gap signals how geography and income interact to shape digital inclusion. Bridging the divide will require continued investment in rural infrastructure and initiatives that enhance the relevance and affordability of connectivity outside major population centres.

The education divide

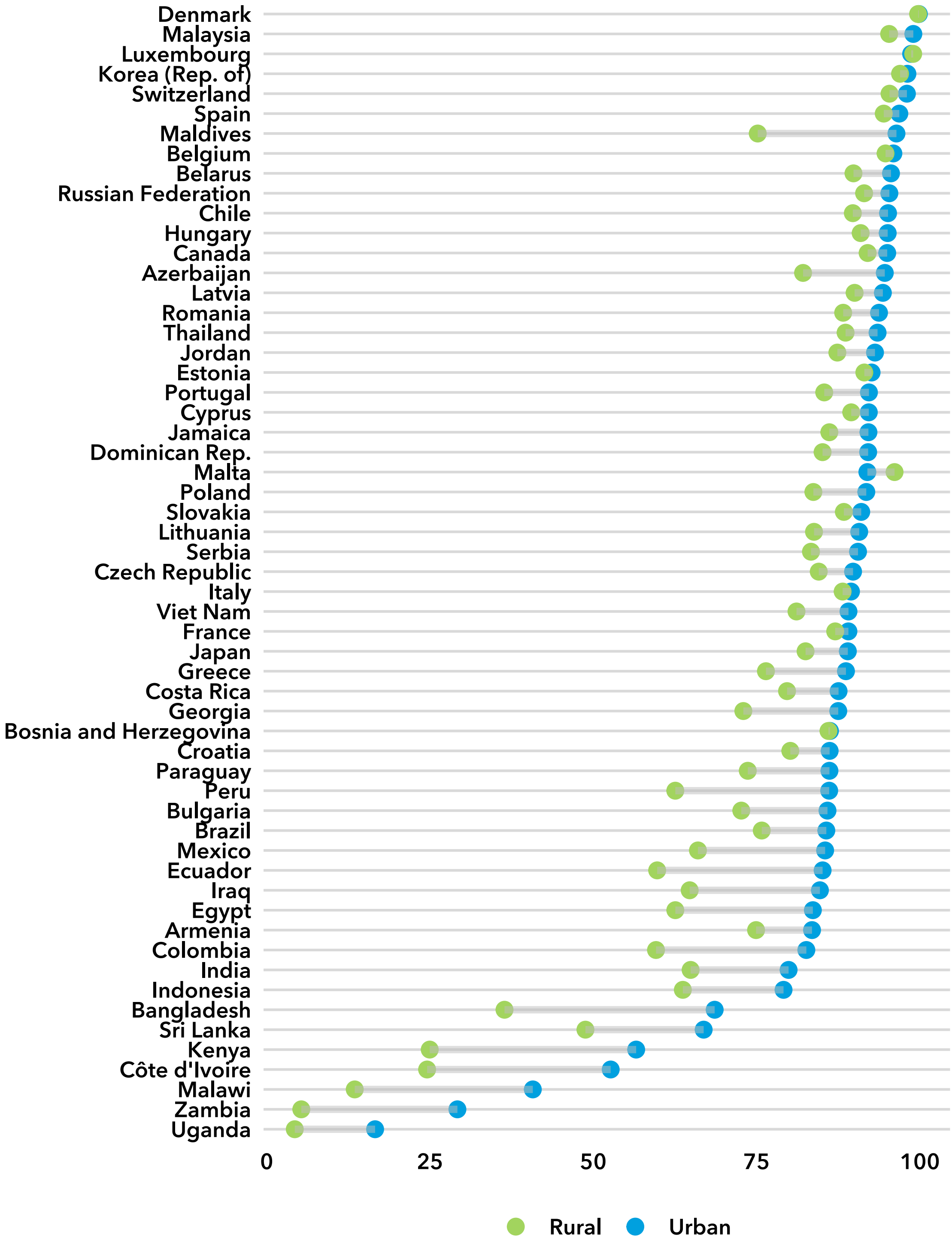
Education is a key determinant influencing Internet use, with higher levels of educational attainment closely associated with greater Internet adoption. Among countries with available data, nearly all individuals with a completed tertiary education are Internet users. Usage rates are also high among those who have completed upper secondary or post-secondary non-tertiary education, while Internet usage is systematically lower among individuals with less formal education.

The gap between the most and least educated can be substantial, exceeding 60 percentage points in some countries between individuals with tertiary education and those with only primary education or less. Unlike other divides, which tend to narrow or disappear in high-income economies, the education gap remains persistent, and can exceed 30 percentage points even in some high-income countries, such as Portugal and Malta.

Educational attainment also strongly influences how people use the Internet and the extent to which they benefit from it (see Figure 2.11). In many higher-income countries, nearly all highly educated individuals report having conducted Internet banking recently, and a large majority have shopped or interacted with government services online. By contrast, those with lower levels of education are far less likely to use these services. In countries such as the Republic of Belarus, Brazil and the Republic of Korea, the difference in Internet banking use between individuals with tertiary education and those with only primary education or less exceeds 50 percentage points. In other contexts, such as in the People's Republic of Bangladesh, the Republic of Iraq, and Malawi, smaller usage gaps do not necessarily reflect greater equality, but rather the limited availability of such services.

These findings highlight the critical role of education not only in equipping individuals with the skills and confidence to navigate the digital world, but also in enabling them to access and benefit from the full range of online opportunities.

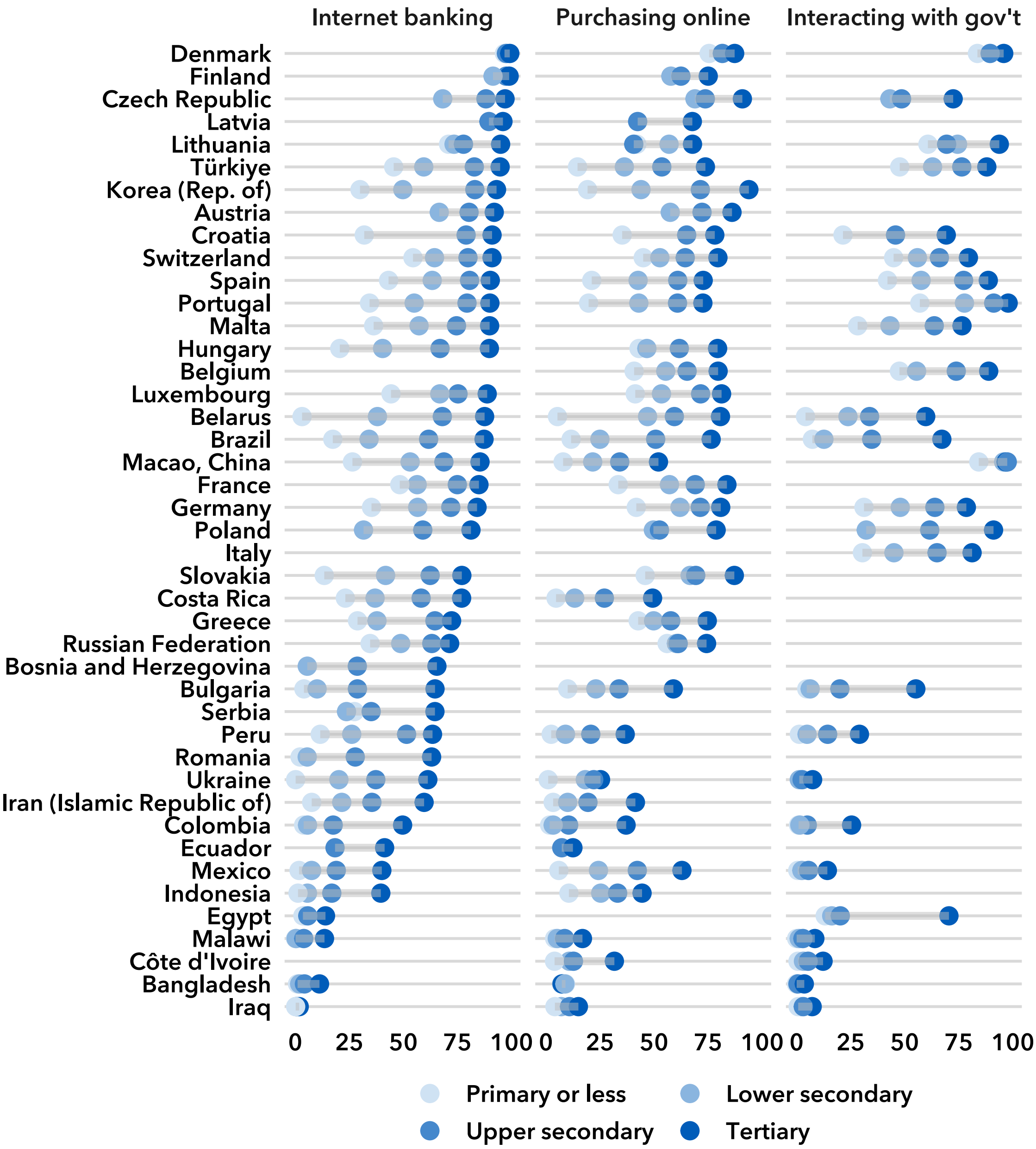
Figure 2.10: Percentage of individuals using the Internet in urban and rural areas, latest year data available



Note: Includes countries with data from 2022 or later.

Source: ITU

Figure 2.11: Percentage of Internet users engaging in selected activities, by maximum education level attained, latest year data available



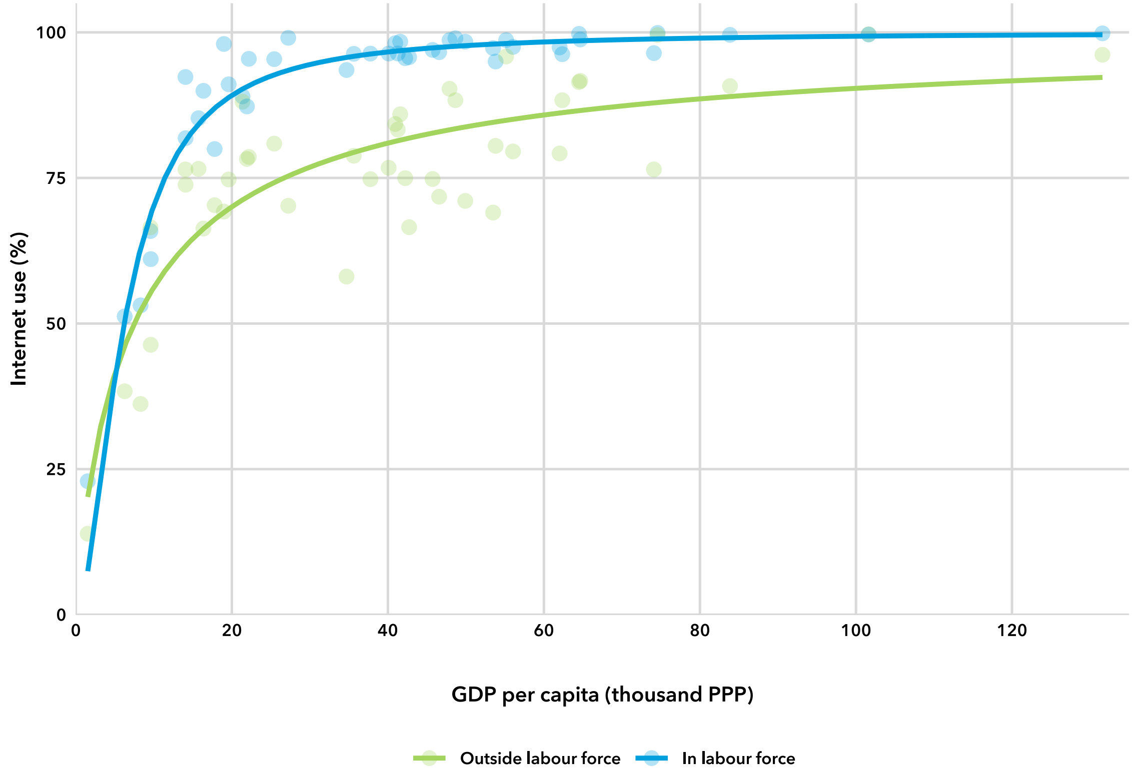
Note: Includes economies with data from 2021 or later.

Source: ITU

The employment divide

Participation in the labour force is an important determinant of Internet use. Individuals who are actively engaged in work are more likely to use the Internet than those outside the labour force (see Figure 2.12). This gap reflects both the influence of employment on digital access and the demographic characteristics of those not working. Older people, for example, are disproportionately represented among non-working populations and are generally less likely to be online. Differences in the age composition of the labour force across countries can therefore affect cross-country comparisons.

Figure 2.12: Percentage of individuals using the Internet, by labour force status, latest year data available



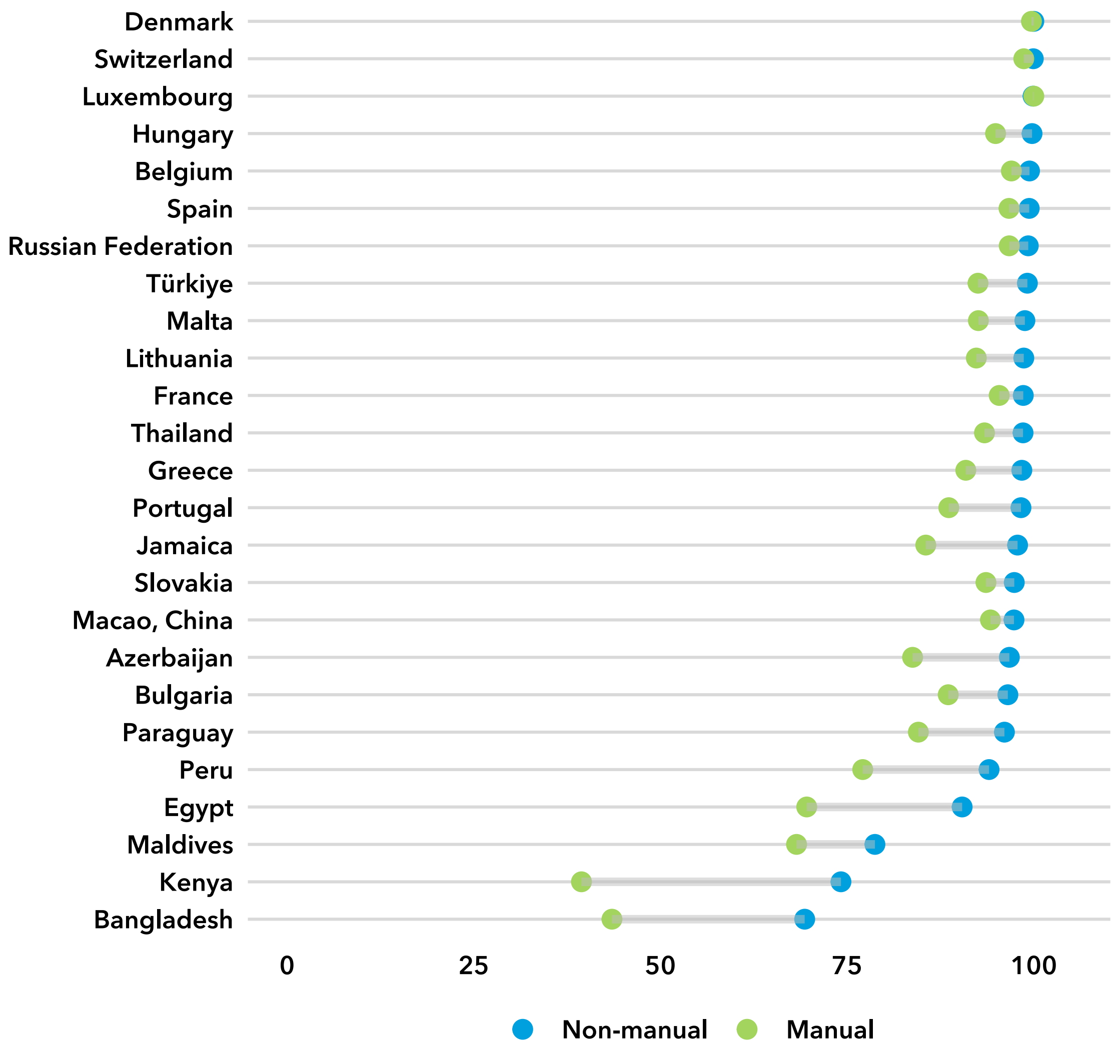
Note: Includes countries with data for 2020 or more recent data. GDP per capita refers to thousand 2021 constant price PPP dollars.

Source: ITU; International Monetary Fund (IMF) for GDP per capita.

Among those in the labour force, the nature of the profession also plays a role in determining Internet usage. Individuals engaged in non-manual professions are more likely to use the Internet than those in manual occupations (see Figure 2.13).[5] This occupational divide is particularly pronounced in countries with lower overall Internet penetration, where structural barriers, such as limited workplace connectivity and lower digital literacy, are more pronounced for workers in manual sectors.

[5] Major groups 0 to 5 of the International Standard Classification of Occupations (ISCO) classification (ILO, 2012) are considered non-manual professions, while major groups 6 to 9 are considered manual professions.

Figure 2.13: Percentage of individuals using the Internet, by occupation, latest year data available



Note: Includes economies with data from 2020 or later.

Source: ITU

2.3 Barriers in connectivity

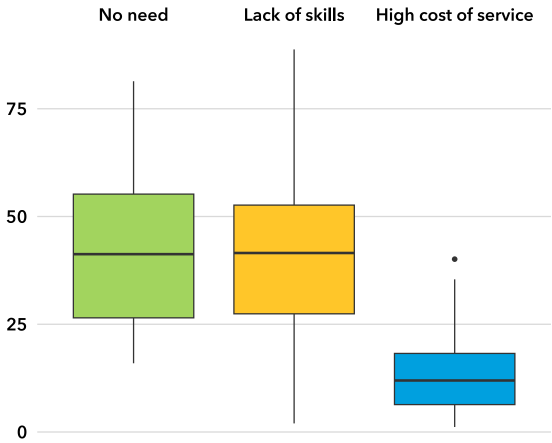
Understanding the reasons why individuals do not use the Internet is essential for designing effective interventions to promote digital inclusion. Household ICT surveys provide valuable insights into these reasons, which act as barriers to connectivity. Among the ten commonly identified reasons for not using the Internet, three are consistently cited in countries that collect relevant data: the lack of need, the lack of skills, and the high cost of service.[6]

Figure 2.14 illustrates the relative importance of these three main barriers to Internet adoption. The analysis considers only individuals who do not use the Internet, with the reported reasons shown as a proportion of this group. The prevalence of each barrier varies with

[6] The other reasons identified in ITU's *Manual for Measuring ICT Access and Use by Households and Individuals* (ITU 2020a) are: *privacy or security concerns*; *Internet service is not available in the area*; *cultural reasons*; *don't know what Internet is*; *not allowed to use the Internet*; *lack of local content*; and *other reason*.

a country's overall level of Internet use and broader socioeconomic context.

Figure 2.14: Share of individuals not using the Internet citing various barriers



Note: Includes countries with data from 2020 or later.

Source: ITU

Two primary reasons dominate. Many people remain offline because they report either not needing the Internet or lacking the skills to use it effectively. Although service affordability is one of the three reasons consistently cited, it appears much less prominent in available data.

That said, data from the World Bank *Global Findex Database* (Klapper et al., 2025) point to the continued importance of device affordability.[7] Across 75 low- and middle-income countries, many of which had not reported on barriers to the ITU dataset, the 2024 results show that among adults aged 15 and older, *not enough money* was cited as the main reason for lacking a mobile phone by 68 per cent of respondents in low-income countries and by 47 per cent in lower-middle-income countries. These findings indicate that while service affordability may appear a lesser constraint, the cost of devices remains a critical barrier for large segments of the population.

2.4 Enablers of connectivity

Achieving universal and meaningful connectivity (UMC) requires closing existing digital divides and addressing the barriers that prevent people from getting online. This can be done through targeted policies and coordinated investments that strengthen the main enablers of connectivity. Improving connection speed and affordability, for example, allows people to use the Internet more frequently and for a wider range of purposes. Likewise, equipping users with digital skills enables them to use the Internet safely and productively.

The UMC framework features six enablers that must be addressed to achieve UMC:

1) **Quality of connection**: Ensuring reliable, high-speed Internet to support seamless online activities.
2) **Availability for use**: Ensuring Internet access is available in all areas, including remote and underserved regions.
3) **Affordability**: Making Internet services and related costs affordable to all.
4) **Devices**: Ensuring access to affordable and functional devices that enable Internet use.
5) **Skills**: Equipping everyone with ICT skills enabling everyone to benefit from online opportunities.
6) **Safety and security**: Ensuring everyone can engage online confidently and without risk.

Addressing these six enablers systematically can reduce and ultimately remove the barriers to Internet access and use, paving the way toward UMC.

Availability and quality of connection

Access to a network is a prerequisite for Internet use. While mobile networks are the primary means through which most people connect, fixed-broadband networks remain essential for high-capacity and reliable connections. Compared to mobile technology, fixed broadband typically offers faster speeds,

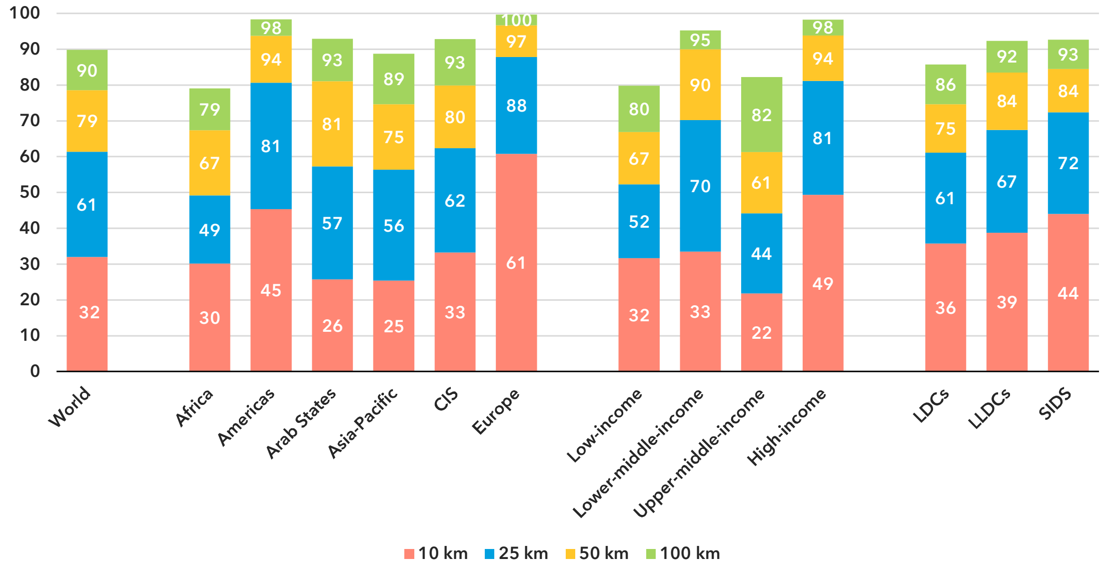
7 Findex is a global demand-side survey on financial inclusion that also collects information on how adults around the world access and use digital services.

greater stability, and higher or unlimited data allowances, making it better suited for bandwidth-intensive activities.

However, deploying, upgrading, and maintaining fixed networks is costly, particularly in sparsely populated or geographically challenging areas (see Chapter 3). Consequently, mobile networks have become the most accessible option in many regions, bridging connectivity gaps where fixed infrastructure is unavailable.

The emergence of 5G is reshaping Internet access. Offering much faster speeds, lower latency and greater capacity than 4G, 5G can match or even outperform some fixed-broadband connections, especially where legacy fixed networks persist. The ability of 5G to support dense device connectivity also makes it well suited to urban environments, smart-city use cases, and industrial Internet of Things (IoT). By complementing fixed networks, 5G provides a viable alternative where building fixed infrastructure is uneconomical, and can accelerate high-speed access in developing regions.

Figure 2.15: Percentage of population within reach of a fibre-optic node, 2023



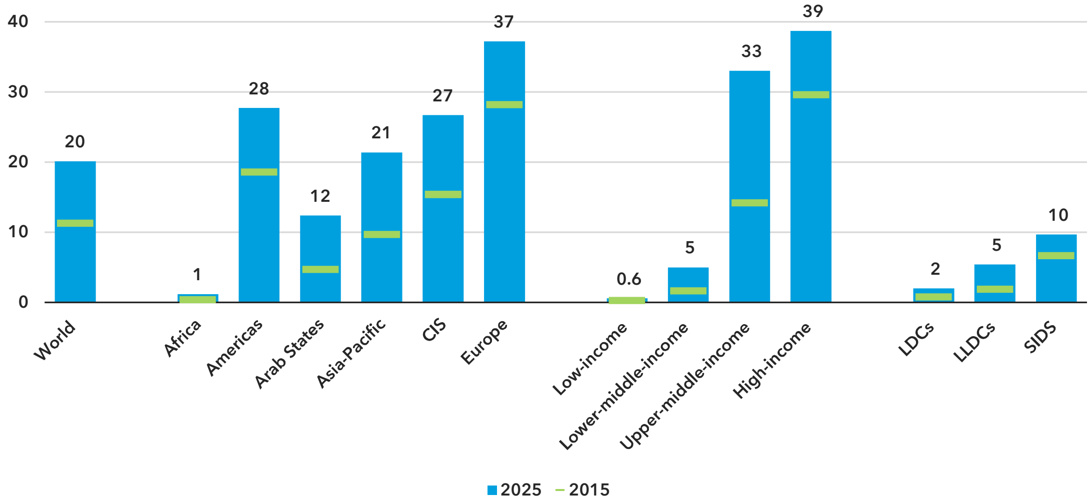
Note: The values for 25 km, 50 km and 100 km represent the incremental share of the population living beyond the previous distance threshold.

Source: ITU

Figure 2.15 shows that access to fibre-optic infrastructure remains limited. As of 2023, only 32 per cent of the global population lived within 10 kilometres of a fibre-optic node. Even proximity does not ensure access, as local components such as points of presence (PoP), optical-line terminals, or fibre-optic drops often preclude households or offices from accessing these networks (ITU 2020b).

Regional disparities are stark: over 60 per cent of the population of the Europe region is within 10 kilometres of fibre-optic infrastructure, 45 per cent in the Americas region, and between 25 and 33 per cent in other regions. Yet even where fibre-optic nodes are geographically accessible, fixed-broadband connections often remain unavailable, unaffordable or underused. This disconnect between network proximity and service adoption is particularly evident in low-income countries, where fixed-broadband subscriptions are exceedingly rare compared with their near ubiquity in upper-middle- and high-income economies (see Figure 2.16).

Figure 2.16: Fixed broadband subscriptions per 100 inhabitants, 2015 and 2025

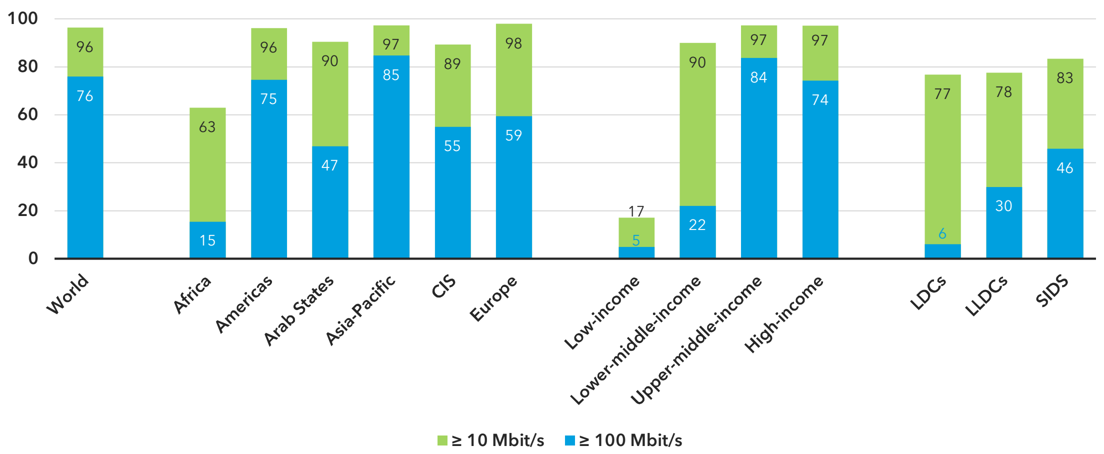


Note: Includes ITU estimates.

Source: ITU

Globally, fixed-broadband penetration has doubled over the past decade, and service quality has markedly improved. Today 96 per cent of connections advertise speeds above 10 Mbit/s, and 76 per cent exceed 100 Mbit/s (see Figure 2.17). Low-income countries, however, continue to lag behind, with fewer than one in five fixed connections above 10 Mbit/s and one in 20 above 100 Mbit/s.

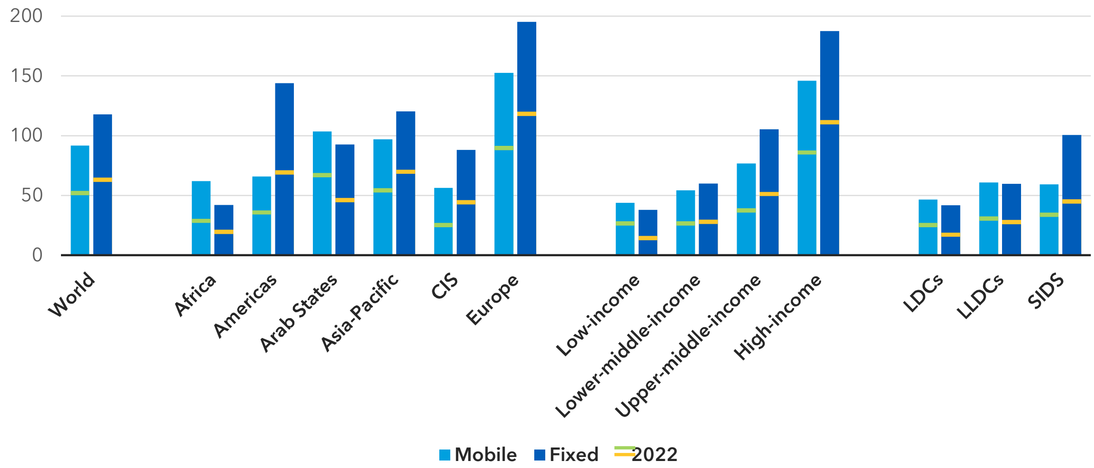
Figure 2.17: Percentage of fixed-broadband subscriptions ≥ 10 Mbit/s, 2024



Note: The values for 10 Mbit/s represent the share of subscriptions with speeds of at least 10 Mbit/s.

Source: ITU

Figure 2.18: Average download speeds, 2022 and 2025



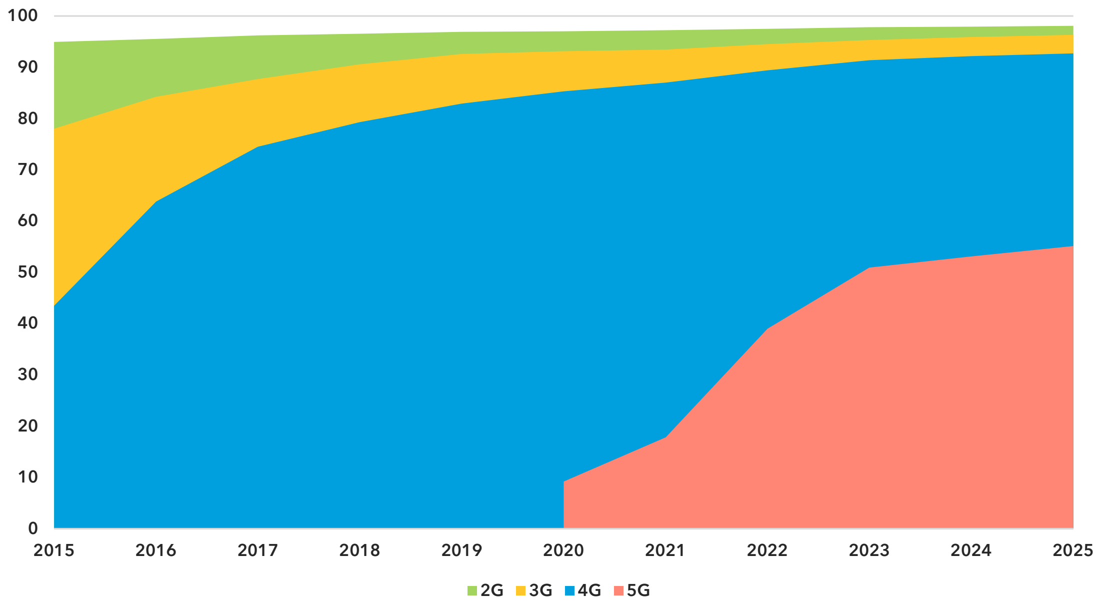
Note: 2025 refers to the average of the January to June period. Fixed broadband speed measured on mobile devices connected through Wi-Fi may result in possible underestimation.

Source: Speedtest by Ookla Global Fixed and Mobile Network Performance Maps, retrieved in July 2025 from https://registry.opendata.aws/speedtest-global-performance.

User-generated data show that in the first half of 2025, average global download speeds reached 92 Mbit/s for mobile broadband and 118 Mbit/s for fixed broadband. However, significantly share divides persist and speeds in low-income economies are just 30 per cent of the mobile speeds and 20 per cent of the fixed speeds recorded in high-income economies (see Figure 2.18). Since 2022 download speeds have risen rapidly worldwide by an annual average of 22 per cent for mobile and 24 per cent for fixed networks.

Service quality gaps also exist within countries. A recent OECD study covering 34 economies found that download and upload speeds in rural areas are consistently lower than in metropolitan regions (OECD, 2025).

Figure 2.19: Population coverage by type of mobile network, 2015-2025



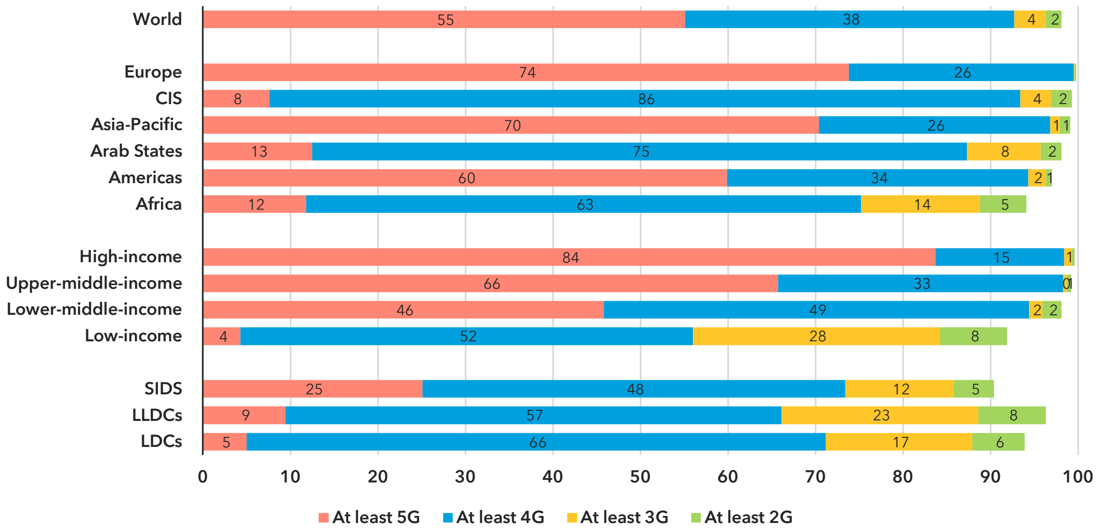
Note: The values for 2G, 3G and 4G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. in 2025, 96 per cent of the world population is covered by at least a 3G or above network, with 3.6 per cent having only 3G, 37.6 per cent having 4G, and 55.1 per cent having 5G). There are insufficient data to produce estimates for 5G coverage prior to 2020. Includes ITU estimates.

Source: ITU

Limited access to fixed infrastructure and the lower cost of mobile connectivity have made mobile networks the primary, and often the only, mode of Internet access in many countries. The rollout of 5G technology has further strengthened this trend, as mobile connections increasingly rival fixed networks in speed and reliability.

As shown in Figure 2.20, 5G coverage now reaches 55 per cent of the global population, but its expansion remains uneven. 5G coverage is highest in the Europe region (74 per cent), the Asia-Pacific region (70 per cent) and the Americas region (60 per cent), while the other three regions lag far behind, at between 8 and 13 per cent 5G coverage.

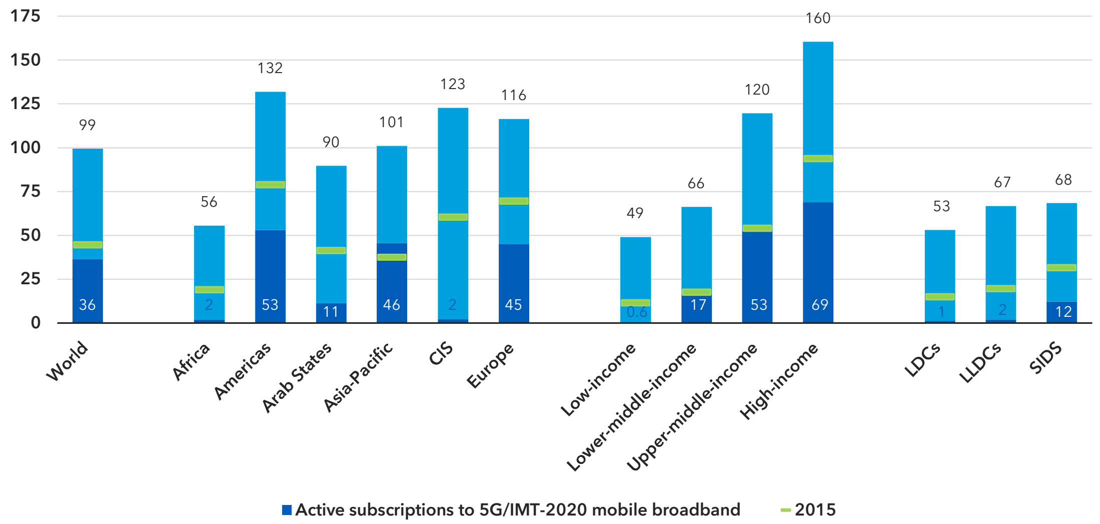
Figure 2.20: Population coverage by type of mobile network, 2025



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 2025, 96 per cent of the world population is covered by at least a 3G or above network, with 3.6 per cent having only 3G, 37.6 per cent having 4G, and 55.1 per cent having 5G). Includes ITU estimates.

Source: ITU

Figure 2.21: Active mobile broadband subscriptions per 100 inhabitants, by region, 2015 and 2025



Note: Includes ITU estimates. There were no 5G subscriptions in 2015.

Source: ITU

Mobile broadband adoption mirrors these regional disparities. Globally, there are 99 subscriptions per 100 inhabitants, but rates range from 132 in the Americas region to just 56 in the Africa region (see Figure 2.21). More than one in three mobile-broadband subscriptions now are 5G subscriptions, with the highest adoption in the Americas region (53 per 100 inhabitants), the Asia-Pacific region (46) and the Europe region (45). In the other regions, 5G subscriptions remain scarce, reflecting the uneven pace of technological diffusion.

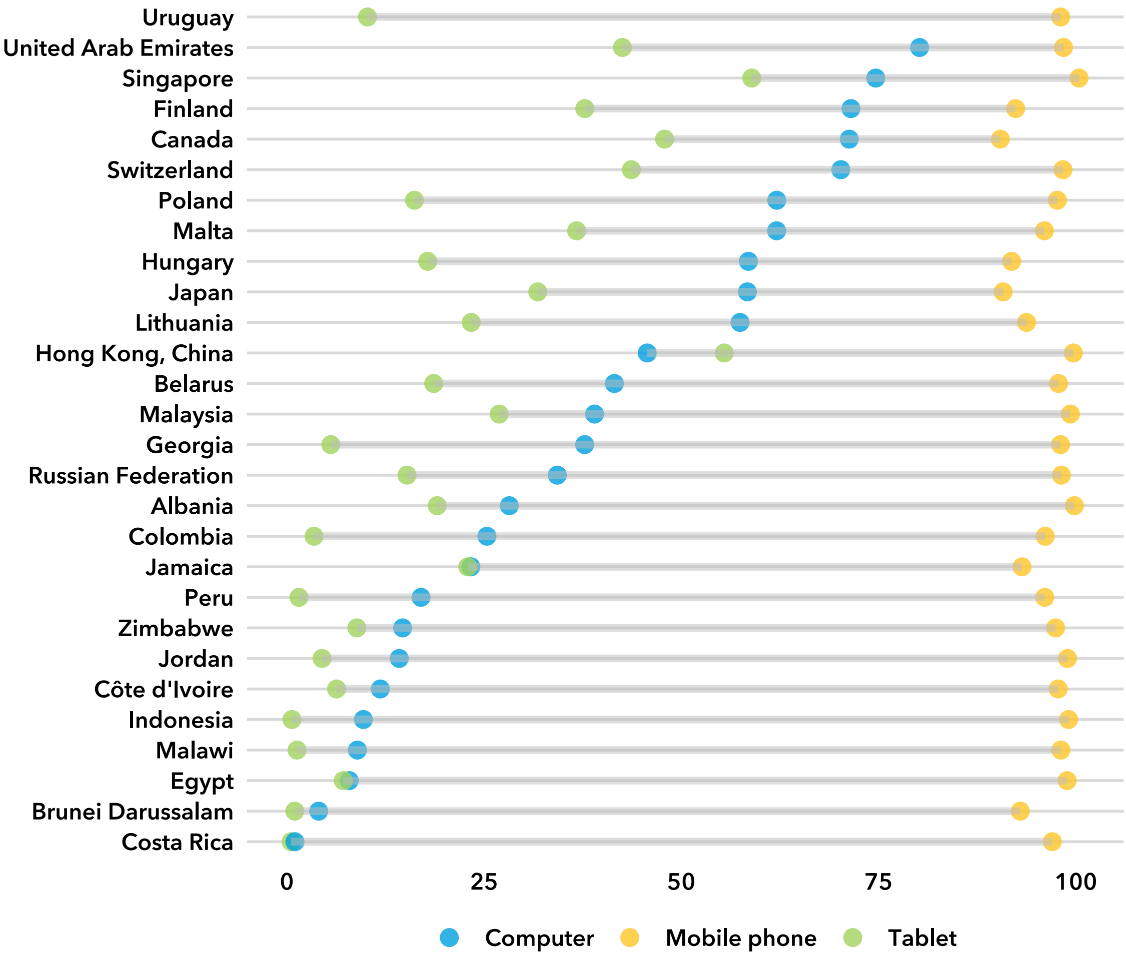
Despite rapid technological progress, large disparities persist in both the availability and quality of Internet connections. Coverage does not automatically translate into use, and access to high-speed, reliable networks still depends heavily on geography and income. While 5G and fibre-optic networks are expanding rapidly, their benefits remain concentrated in wealthier economies and urban areas. In this context, satellite broadband offers a promising alternative for connecting remote and underserved regions, though its uptake remains limited, at less than one subscription per 1 000 inhabitants, owing to high costs, device requirements and regulatory challenges (see Chapter 3).

Access to an Internet-capable device

Access to an Internet-capable device is a basic requirement for going online. However, billions of people remain unconnected simply because they do not own or share a suitable device. Mobile phones are the dominant means of access worldwide, but the type and quality of devices vary widely, shaping the way users experience the Internet.

Globally, an estimated 82 per cent of individuals aged 10 years or older own a mobile phone. However, the penetration of mobile phone ownership varies widely across income groups. In high-income economies, mobile phone ownership has reached near-universal levels, with over 95 per cent of individuals owning a device. Upper-middle-income economies have also achieved impressive progress, surpassing the 90 per cent mark. In stark contrast, mobile phone ownership in low-income economies lags significantly behind, with just over half of individuals aged 10 years or older owning a mobile phone.

Figure 2.22: Share of Internet users, by device used to connect



Note: Includes economies with data from 2020 or later.

Source: ITU

Data from a limited set of countries show that nearly all Internet users gain access online through a mobile phone (see Figure 2.22). Computer access remains limited in most developing countries, constraining the ability to perform more complex digital tasks such as online learning, e-government services or professional work.

Affordability remains a major barrier. Limited access to electricity and network coverage further restricts use in rural and remote areas. The supply of affordable devices is also affected by import tariffs, foreign-exchange shortages, and the lack of local assembly industries (Gallegos and Amin, 2023).

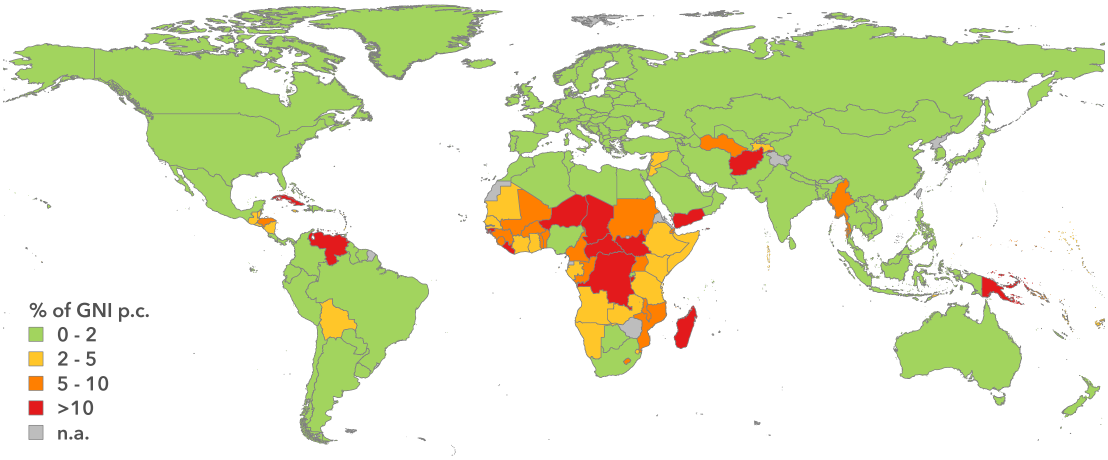
Expanding access to affordable, durable, and energy-efficient devices is therefore essential to close the digital divide. Policies that promote local manufacturing, reduce taxes and tariffs, and encourage refurbishment and recycling can make Internet-capable devices more accessible.

Affordability

The cost of access remains an obstacle to Internet use. When individuals are asked why they do not go online, high costs for devices and services are among the most frequently cited reasons, particularly among low-income groups (Boerkamp et al., 2024). Data from the *Global Findex Database* confirm this pattern, in 2024, 82 per cent of adults without a mobile phone in low-income countries said they could not afford one, and for 68 per cent this was the main reason.

To raise awareness about the connectivity challenge, the UMC framework incorporates the target of the Broadband Commission to reduce the cost of entry-level broadband services to below 2 per cent of monthly gross national income (GNI) per capita.

Figure 2.23: Entry-level data-only mobile-broadband basket prices (% GNI per capita), 2025



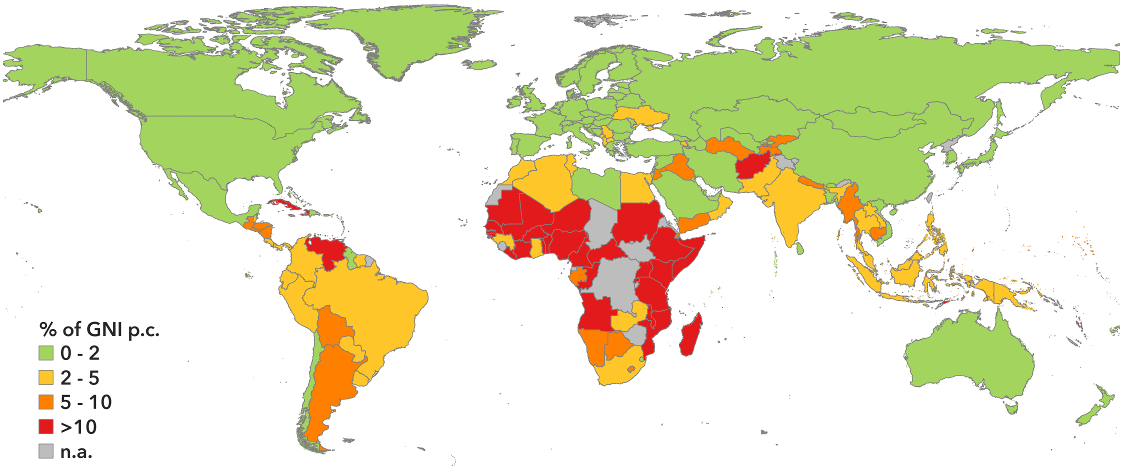
Note: Refers to the price of the cheapest non-promotional option providing at least 5 GB monthly mobile data from the operator with the largest market share in the country.

The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.

Source: ITU

The affordability of entry-level mobile-broadband services closely follows income levels, with the highest prices found in low-income countries (see Figure 2.23). A similar pattern holds for fixed broadband (see Figure 2.24), which remains consistently more expensive than mobile broadband across all regions.

Figure 2.24: Entry-level fixed-broadband basket prices (% GNI per capita), 2025



Note: Refers to the price of the cheapest non-promotional fixed broadband plan providing at least 5 GB monthly data (in most cases, that is unlimited), at speeds of at least 256 kbit/s from the Internet service provider with the largest market share, using the most common technology.

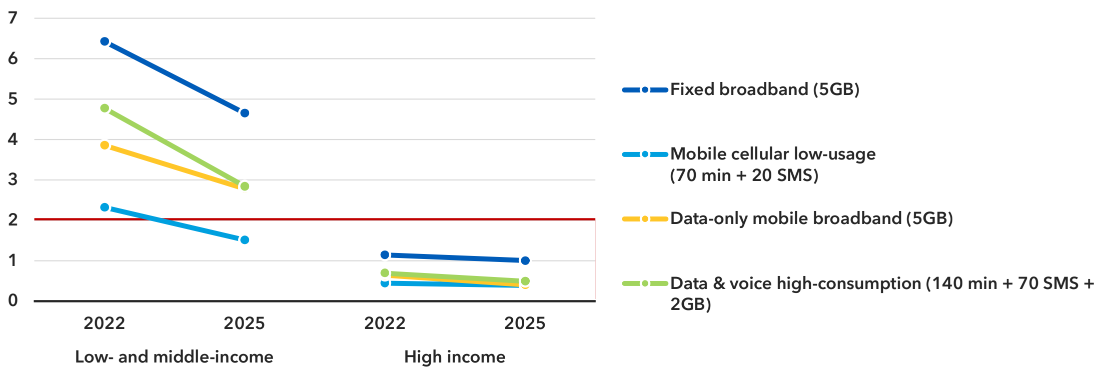
The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.

Source: ITU

Encouragingly, affordability has improved in recent years. Between 2022 and 2025, the cost of connectivity services, including mobile broadband, fixed broadband, combined data-and-voice, and voice and SMS, declined in most countries, narrowing the gap between high- and low-income economies (see Figure 2.25).

These findings highlight the central role of affordability in bridging the digital divide. Lowering the cost of Internet services and devices will be essential to achieving universal meaningful connectivity. For a detailed discussion of affordability and related policy measures, see Chapter 4.

Figure 2.25: Affordability changes (% GNI per capita), 2022 to 2025



Notes: Group medians. 2022 figures for the data-only mobile broadband (5 GB) refer to experimental data collection in collaboration with A4AI. Mobile cellular low-usage basket prices were no longer collected in 2025, values are from 2024.

Source: ITU

Skills

Digital skills are essential for individuals to use ICTs effectively and safely. Because self-reported assessments can be subjective, ITU measures ICT skills through observed activities grouped into five domains: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (see Box 5.1 in Chapter 5 for a description of the methodology.

Despite their importance, reliable data on digital skills remain scarce. Since 2020, only 88 countries have reported data, and coverage across all domains is limited. To date, 48 countries have provided comparable data on revised indicators and only eight have reported on overall skill levels.

Figure 2.26 shows that communication and collaboration skills are the most common basic skill among Internet users. In every reporting country, at least three-quarters of users demonstrate basic proficiency in this domain, regardless of the Internet adoption rate in the country. Information and data literacy generally ranks second, while other domains display greater variation.

Differences in overall ICT skill levels are striking. Among the eight countries reporting comprehensive data, the share of Internet users with at least basic skills ranges from 16 to 74 per cent, a gap of nearly 60 percentage points. These disparities underscore the need for sustained investment in digital literacy and capacity-building to ensure that Internet use translates into meaningful benefits for all.

For a discussion of ICT skills methodologies, more results, and policy implications, see Chapter 5.

Safety and security

A safe and secure digital environment is essential for people to participate fully and confidently online, and is a core element of the UMC concept. Concerns about privacy, fraud, cyberbullying, identity theft and exposure to harmful or misleading content discourage many individuals from using the Internet or engaging more fully.

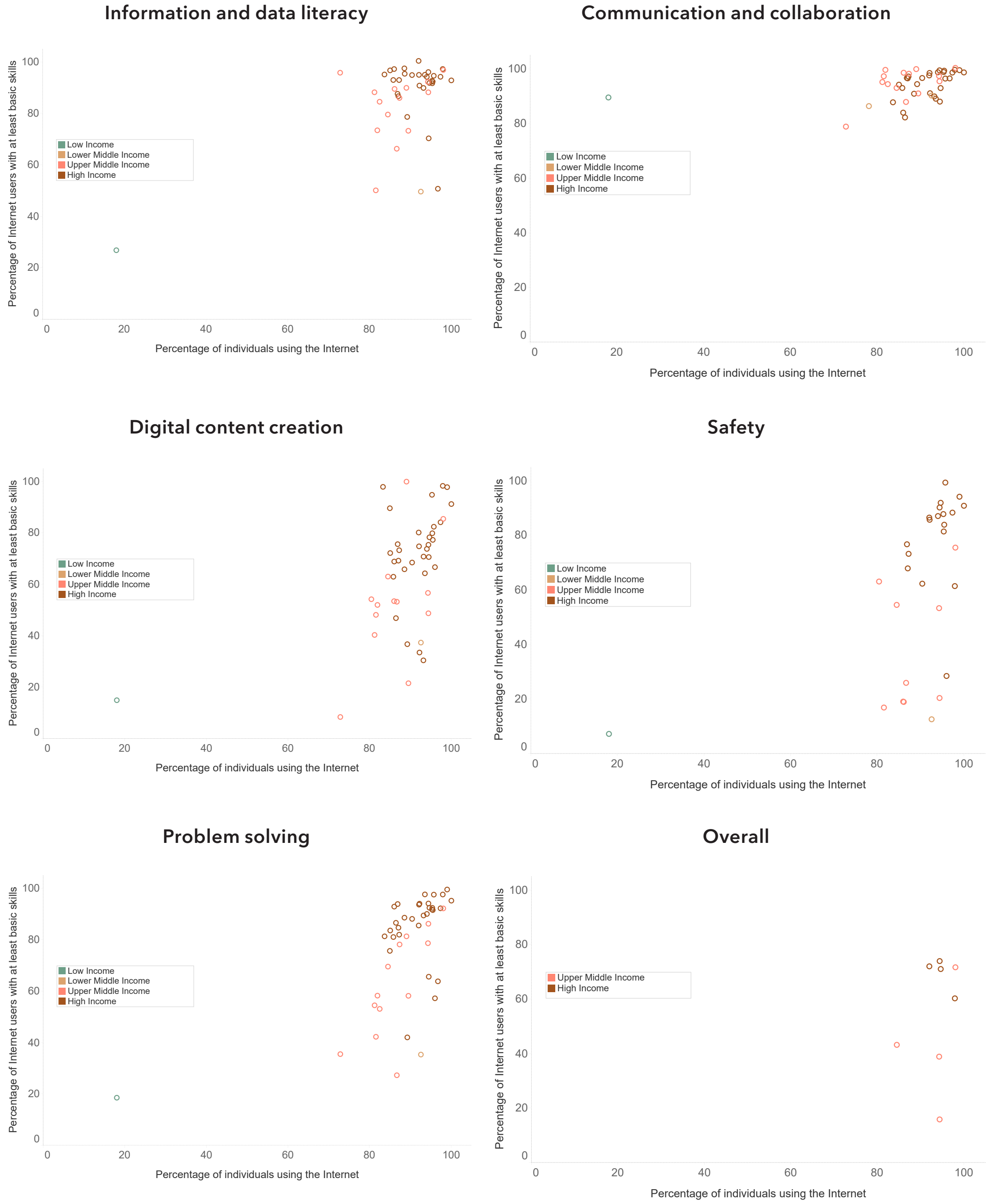
Despite its growing importance, online safety remains a relatively new and difficult area to measure. Data is extremely limited, but household survey results collected by ITU provide anecdotal evidence about the concerns. When asked about the reasons for not using the Internet, non-users sometimes cite *privacy or security concerns*. In fact, 28 per cent of non-users in the State of Qatar, 24 per cent in Brazil and about one-fifth of non-users in the Kingdom of Bhutan cite privacy or security concerns among the reasons for staying offline.[8]

However, comparable global data on the prevalence or cost of cybercrime are not yet available, even though methodological frameworks do exist (see Box 6.6 in Chapter 6) and are already applied by several countries (see Box 1.4 in Chapter 1 for the example of Mexico).

In the absence of such information, the ITU Global Cybersecurity Index (GCI) (ITU, 2024) offers a complementary perspective. Rather than assessing incidents or user experiences, the GCI measures national commitments to improving cybersecurity across five pillars: legal, technical, organizational, capacity development, and cooperation.

[8] More results for this indicator available at https://datahub.itu.int/data/?i=100006&s=23570.

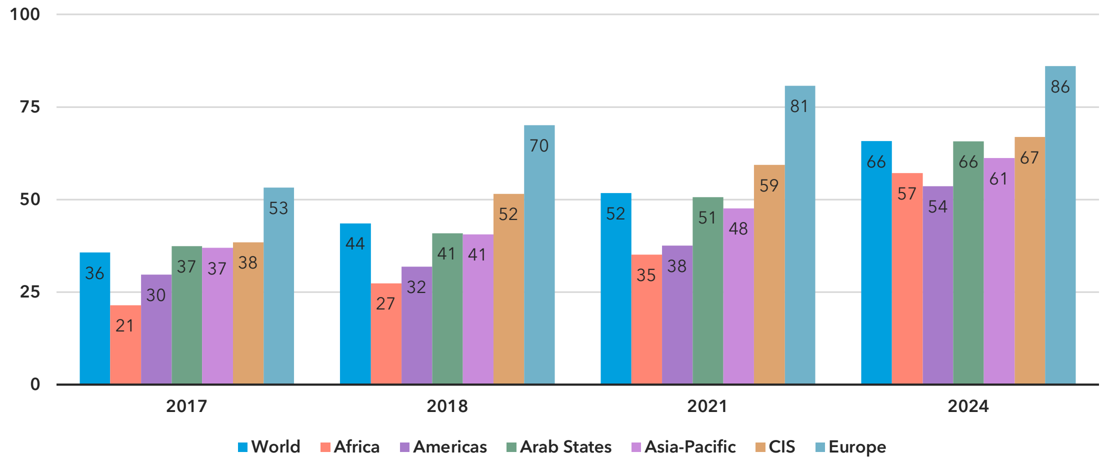
Figure 2.26: Percentage of Internet users with at least basic skills vs percentage of individuals using the Internet, by skill area, 2024 or latest year



Note: Individuals with *At least basic skills* refers to those who have done at least one activity in the corresponding skill area during the survey reference period. Individuals with at least basic overall skills refers to those who have done at least one activity in all five skill areas. The *Information/data literacy* area refers to verifying the reliability of information; getting information about goods or services; reading or downloading newspapers, etc.; and seeking health-related information. *Communication and collaboration* refers to 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 the Internet. *Digital content creation* refers to using copy and paste tools; creating electronic presentations; using basic arithmetic formulae in a spreadsheet; editing online text, spreadsheets, presentations; and uploading self/user-created content. *Safety* refers to changing privacy settings and setting up effective security measures. *Problem solving* refers to 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. Data availability: 44 countries for *information/data literacy,* 45 countries for *communication/collaboration*, 46 countries for *digital content creation,* 29 countries for *safety*, 46 countries for *problem solving*, and 8 for *overall skill levels*. In-scope ages may vary between countries.

Source: ITU

Figure 2.27: Global Cybersecurity Index scores, 2017-2024



Source: ITU

Each of these five pillars includes concrete indicators. For example, the legal pillar assesses the presence of cybersecurity and data-protection legislation; the technical pillar looks at the existence of national computer emergency response teams and standards; the organizational pillar evaluates national strategies and institutional coordination; the capacity-building pillar measures training programmes and awareness initiatives; and the cooperation pillar examines participation in regional and international partnerships. Together, these components provide a multidimensional view of countries' cybersecurity readiness.

In the 2024 edition, the global average GCI score increased to 66 out of 100, reflecting a 30-point improvement since the 2017 edition. High-income countries generally perform best, led by countries in the Europe region and in the Americas region, where comprehensive legal frameworks and incident-response mechanisms are in place. Many low-income countries continue to lag behind, constrained by limited capacity, and fragmented governance structures.

2.5 Key takeaways

Global connectivity continues to expand, with about three-quarters of the world's population now online in 2025. Internet adoption has more than doubled since 2010, but progress has slowed in recent years. The remaining quarter of humanity remains offline, concentrated in low-income countries and among disadvantaged groups.

The global digital divide reflects broader economic and social inequalities. Internet use is nearly universal in the Europe region and in the Commonwealth of Independent States region, exceeds 75 per cent in the Americas region and in the Asia-Pacific region, but remains below 40 per cent in the Africa region. In many low-income economies, fewer than one in four people are online.

Gender differences remain significant in low- and lower-middle-income countries, where women are still far less likely than men to use the Internet. Younger people are almost twice as likely to be online as older adults in low-income countries, and Internet adoption among rural residents lags far behind that of their urban counterparts. Education is among the strongest predictors of Internet use.

Affordability continues to be a decisive factor. The cost of devices and service represent a barrier for Internet use and for a more meaningful online experience. A lack of skills and perceived lack of need also prevent many from going online, particularly in countries where digital literacy is low.

Network availability and quality continue to improve. Fixed-broadband speeds have doubled since 2022, and 5G networks now cover more than half of the global population. However, coverage gaps remain large, and access to high-speed connections is still concentrated in wealthier economies and urban areas. Satellite broadband offers potential to extend access to remote regions, but its adoption remains extremely limited.

Safety and security are core dimensions of universal and meaningful connectivity and are assuming growing importance. The same connectivity that enables opportunity also creates new avenues for harm. Emerging evidence suggests that cyber-enabled crime and online violence are becoming serious and widespread challenges, yet data on their scale and impact remain limited and are urgently needed. Awareness of these risks is at least increasing, and many countries are strengthening their defences and improving their cybersecurity readiness.

Progress across all six enablers, namely quality, availability, affordability, devices, skills, and safety, will shape the journey towards universal and meaningful connectivity and determine how long it takes to get there.

Evidence confirms steady progress toward universal and meaningful connectivity. However, significant digital divides persist, driven by disparities in geography, income, gender, age, and education. These gaps threaten inclusivity and equality, as many people remain unable to fully participate in the digital economy and society. Addressing these challenges requires targeted efforts to overcome barriers such as lack of affordability, limited digital skills, restricted device access, and uneven connectivity quality.

Global Internet usage has grown rapidly, with nearly three quarters of the world's population now online, and yet progress remains uneven. Internet use is fully integrated into modern life, but access continues to be shaped by economic status, education, age, gender, and whether people live in rural or urban areas. While the younger and the more educated individuals, benefit greatly from digital opportunities, others, especially women, older adults, and rural populations, are consistently excluded.

Multiple barriers to more meaningful use of connectivity persist, including lack of digital skills, lack of awareness or lack of perceived need, alongside lack of affordability and lack of access to reliable, high-quality connectivity. Many developing regions still face gaps in infrastructure, while access to advanced devices remains out of reach for many.

References

Boerkamp, L. G. P., van Deursen, A. J. A. M., Laar, E. van, van der Zeeuw, A., & van der Graaf, S. (2024). Exploring Barriers to and Outcomes of Internet Appropriation Among Households Living in Poverty: A Systematic Literature Review. *SAGE Open*, *14*(1). https://doi.org/10.1177/21582440241233047

Broadband Commission for Sustainable Development. (2021). *The state of broadband 2021: People-centred approaches for universal broadband*. Geneva: ITU & UNESCO. Retrieved from https://www.broadbandcommission.org/publication/the-state-of-broadband-2021/

Digital Regulation Platform. (2023). *Access for all: Universal meaningful connectivity and efforts to promote access and affordability*. Retrieved from https://digitalregulation.org/access-for-all-umc-and-efforts-to-promote-access-and-affordability/

Gallegos, D. & Amin, R. (2023). *Affordable Devices for All Innovative Financing Solutions and Policy Options to Bridge Global Digital Divides*. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/099080723143031193

Inter-agency and Expert Group on SDG Indicators (IAEG-SDG). (2015). *Indicators and a monitoring framework for the Sustainable Development Goals*. United Nations. Retrieved from https://sdgs.un.org/publications/indicators-and-monitoring-framework-sustainable-development-goals-17958

International Labour Organization (ILO). (2012). *International Standard Classification of Occupations: ISCO-08 structure, index correspondence with ISCO-88*. Geneva, Switzerland: International Labour Office. Retrieved from https://www.ilo.org/public/english/bureau/stat/isco/

International Telecommunication Union (ITU). (2015). *World Summit on the Information Society (WSIS) outcomes: Geneva declaration, plan of action, and Tunis agenda*. ITU. Retrieved from https://www.itu.int/net/wsis/

International Telecommunication Union (ITU). (2020a). *ITU Manual for Measuring ICT Access and Use by Households and Individuals, 2020 Edition*. ITU. https://www.itu.int/en/ITU-D/Statistics/Pages/publications/manual.aspx

International Telecommunication Union (ITU). (2020b). The Last-mile Internet Connectivity Solutions Guide: Sustainable Connectivity Options for Unconnected Sites. ITU. https://www.itu.int/pub/D-TND-01

International Telecommunication Union (ITU). (2022a). *Achieving universal and meaningful digital connectivity in the decade of action. Aspirational targets for 2030*. ITU. https://www.itu.int/itu-d/meetings/statistics/wp-content/uploads/sites/8/2022/04/UniversalMeaningfulDigitalConnectivityTargets2030.pdf

International Telecommunication Union (ITU). (2022b). *Global connectivity report 2022*. ITU. https://www.itu.int/itu-d/reports/statistics/global-connectivity-report-2022/

International Telecommunication Union (ITU). (2022c). *Achieving universal and meaningful digital connectivity. Setting a baseline and targets for 2030*. ITU. https://www.itu.int/itu-d/meetings/statistics/wp-content/uploads/sites/8/2022/04/UniversalMeaningfulDigitalConnectivityTargets2030_BackgroundPaper.pdf

International Telecommunication Union (ITU). (2023). *Global gateway: New investments to connect people via universal and meaningful internet*. Retrieved from https://international-partnerships.ec.europa.eu/news-and-events/news/global-gateway-new-investments-connect-people-universal-and-meaningful-internet-2023-04-27_en

International Telecommunication Union (ITU). (2024). *Global Cybersecurity Index 2024. 5th Edition*. ITU. https://www.itu.int/dms_pub/itu-d/opb/hdb/d-hdb-gci.01-2024-pdf-e.pdf

International Telecommunication Union (ITU). (2025a). *ITU ICT Price Basket Statistics Manual Methodology*. ITU. January. https://www.itu.int/en/ITU-D/Statistics/Documents/ICT_Prices/ITU_IPBQManual_2025.pdf

International Telecommunication Union (ITU). (2025b). *Manual for measuring ICT access and use by households and individuals, 2020 Edition. 2025 ICT skills revision (HH9/HH15).* ITU. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/manual/ITU_HHManual_ICTskills_rev2025.pdf

Klapper, L., Singer, D., Starita, L. & Norris A. (2025). *The Global Findex Database 2025: Connectivity and Financial Inclusion in the Digital Economy*. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-2204-9

OECD (2025). *Closing Broadband Connectivity Divides for All: From Evidence to Practice*, OECD Publishing, Paris, https://doi.org/10.1787/d5ea99b2-en.

United Nations (UN). (2020). *Road map for digital cooperation: Implementation of the recommendations of the High-level Panel on Digital Cooperation: Report of the Secretary-General* (A/74/821). United Nations General Assembly. https://undocs.org/en/A/74/821

Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens – With new examples of knowledge, skills and attitudes* (EUR 31006 EN). Publications Office of the European Union. https://doi.org/10.2760/115376

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. A/RES/70/1. United Nations General Assembly. Retrieved from https://sdgs.un.org/2030agenda

United Nations Department of Economic and Social Affairs (UNDESA). (n.d.). *Voluntary national reviews (VNRs): High-level political forum on sustainable development (HLPF)*. Retrieved from https://hlpf.un.org/vnrs

World Commission on Environment and Development (WCED). (1987). *Our common future*. Oxford: Oxford University Press. Retrieved from https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

Chapter 3: Infrastructure for universal and meaningful connectivity

Telecommunications infrastructure, as the backbone of communication, plays a vital role in facilitating connectivity, driving economic growth, and enhancing societal well-being. In an increasingly interconnected world, robust and reliable infrastructure is essential to meet the growing demand for high-speed Internet, mobile services, and data transmission.

Telecommunication infrastructure includes telecommunication and ICT components such as wireless and fixed broadband networks, systems for connecting rural and remote areas, spectrum management, digital broadcasting, and the efficient management of telecommunication resources (ITU, 2022). It provides the technical and structural foundation for connectivity, enabling reliable connections, universal access, and digital inclusion, especially in developing and underserved regions, and facilitates the transmission of data, voice, and information among individuals, organizations, and systems. As such, telecommunication infrastructure is a core enabler of universal and meaningful connectivity (UMC), ensuring that everyone can access the Internet in optimal conditions, at an affordable cost, whenever and wherever needed (see Chapter 1).

3.1 Institutions and governance for digital infrastructure

The performance of telecommunication infrastructure does not depend only on its physical existence but is also influenced by the institutional environment in which it exists. In this sense, while infrastructure forms the foundation of connectivity, its impact depends on the quality of the institutions that regulate, protect, and manage it (Levy & Spiller, 1994). Institutions foster growth by facilitating capital accumulation, driving innovation, and ensuring the efficient allocation of resources. Without well-defined property rights, there is little incentive to invest in or to embrace new technologies (Acemoglu, Johnson, & Robinson, 2005).

Institutions are the "rules of the game" in society (North, 1990). These rules, whether formal, such as laws and contracts, or informal, such as customs and traditions, create stability and reduce uncertainty by providing a framework for interaction among people and organizations. They strongly influence the ease and cost of doing business in a country.

The institutional framework is especially important in telecommunications, where investments are large, long-term, and specific to a location. Infrastructure assets are highly specialized, costly to install and maintain, have long pay-back periods, and are difficult to repurpose. Stable, transparent, and predictable institutions reduce risk and encourage sustained investment.

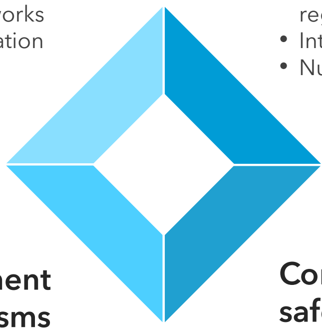
Sound governance also depends on coordination among public institutions. Telecommunication regulators, ministries, universal-service agencies, and statistical offices must collaborate to ensure coherence in planning and monitoring of infrastructure deployment. Broader collaboration across government is equally important to align infrastructure development with national priorities such as sustainability, cybersecurity, and universal service.

3.2 Policy levers for accelerating UMC

With strong institutions providing stability and predictability, the next step is to translate this foundation into effective policies and regulation that shape how digital infrastructure develops. Regulation gives institutional principles concrete form, setting the rules and incentives that govern investment, competition, and innovation in telecommunications.

Clear, proportionate, and coherent regulation defines the terms for market entry, licensing, and spectrum use; safeguards fair competition and consumer protection; and balances commercial incentives with public goals such as universal access, affordability, and quality of service. Regulation lowers investment risks, accelerates deployment, and channels resources toward underserved areas. Figure 3.1 summarizes the main policy and regulatory instruments that can be used.

Figure 3.1: Policy and regulatory instruments



Source: ITU

Key policy measures for accelerating UMC

Seven key policy measures have the potential to accelerate progress toward UMC. Prioritized for their broad impact, they can be sequenced and scaled to national contexts:

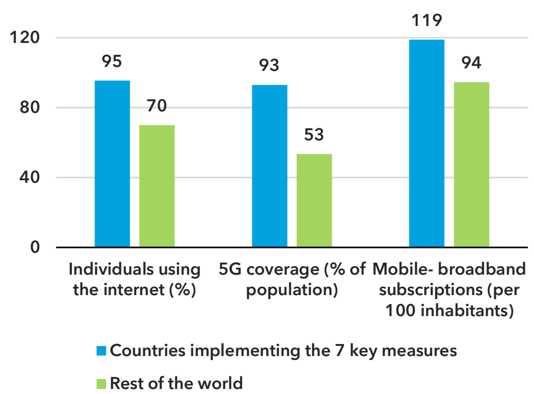
- **National digital transformation strategy:** A government-endorsed strategy that positions UMC as an enabler of growth, jobs, service delivery, and resilience linking connectivity targets to outcomes in education, health, finance, public administration, and private sector development. The strategy should set time-bound milestones, allocate resources, and assign institutional responsibilities.
- **Converged licensing regimes:** Simplified, technology-neutral authorizations (e.g. unified service licences) with transparent conditions for entry, interconnection, and wholesale access.
- **Infrastructure sharing:** Rules and reference offers for passive infrastructure (sites, ducts, poles) and, where appropriate, active sharing, with enforceable access terms and dispute-resolution service levels.
- **Spectrum trading:** Secondary spectrum markets (trading, leasing, sharing) under clear eligibility and competition safeguards, complemented by transparent assignment roadmaps.
- **Technology-neutral and service-neutral regulatory frameworks:** Principle-based rules that avoid technology-specific mandates, enabling flexible network use while maintaining safety, security, and consumer protection.
- **Level of competition in basic services:** Sustained contestability in fixed and

mobile access, including mobile virtual network operators (MVNOs), wholesale offers, and switching tools such as MNP/eSIM, to discipline prices and improve quality.

- **Regulatory spaces for experimentation:** Controlled trials for new technologies and business models such as spectrum sharing, open RAN, satellite-to-device, and IoT/AI in networks, with time-bounded conditions, outcome metrics, and review points.

The measures employed influence deployment costs, time to market, policy transparency, coherence, and adaptability. Analysis of key connectivity indicators such as individuals using the Internet, 5G coverage, and mobile broadband penetration, indicates that countries that have adopted all of these measures significantly outperform those that have failed to do so (see Figure 3.2). In particular, 5G coverage is 40 percentage points higher in these countries, signalling faster rollout and uptake in countries having a connectivity conducive environment. In these countries Internet use has also reached or is nearing universality.

Figure 3.2: Comparative outcomes of adopters versus non-adopters of key policies, 2025



Source: ITU

Coherent and coordinated governance

While individual regulatory instruments play a crucial role, it is the overall coherence and integration of these policies that determine their real impact. The ITU *G5 Benchmark* tool provides a holistic framework for assessing how well countries design and coordinate regulatory environments. The G5 Benchmark tool measures not only the existence of policies but also their consistency, adaptability and long-term alignment with digital development goals.[9]

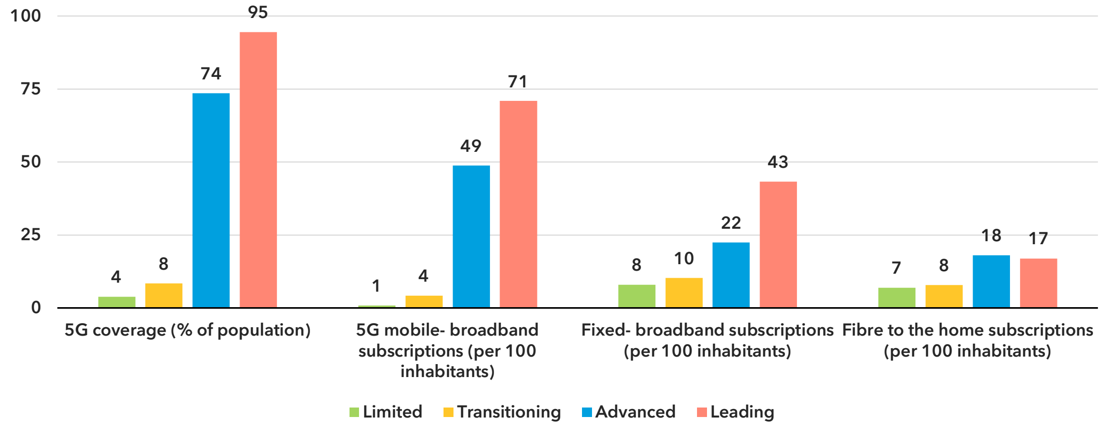
Countries that attain the *Leading* or *Advanced* tier on the G5 Benchmark typically demonstrate transparent, forward-looking, and collaborative regulatory practices that underpin market stability and sustained sector growth.[10] Comparative analysis shows a strong correlation between digital governance maturity and infrastructure outcomes (see Figure 3.3). Countries in the *Leading* tier consistently achieve the highest levels in both indicators, while peers at *Advanced*, *Transitioning* or *Limited* levels of readiness record progressively lower results. This pattern underscores the pivotal role of mature and collaborative regulatory environments.

Advanced governance reduces deployment frictions, maintains competition in converged markets, and uses targeted, performance-based instruments where commercial viability is weak. Collaboration across sectors and principle-based, risk-proportionate oversight further lower operational risks. Together, these attributes support earlier investment decisions, faster upgrade cycles and broader take-up, including outside of major urban centres.

9 ITU, G5 Benchmark, app.gen5.digital/benchmark

10 Methodologically, the G5 Benchmark evaluates the maturity of national regulatory and policy frameworks for digital transformation using a collaborative, fifth-generation approach. It is based on 70 indicators grouped into four pillars, with data sourced from official surveys, international databases, and desk research. Each indicator is scored from 0 to 2 according to international best practices, and results are normalized on a 0-100 scale. Countries are then classified into four maturity levels, Limited; Transitional; Advanced; and Leader, enabling meaningful comparisons and supporting the development of tailored strategies for regulatory improvement and digital advancement. For more information, see app.gen5.digital/benchmark

Figure 3.3: Infrastructure indicators by G5 Benchmark average scores, 2025



Source: ITU

Although correlation does not prove causation, the association is clear: improvements in institutional quality in terms of predictability, transparency and coordination align with better outcomes. Strengthening governance is therefore a practical lever to accelerating progress toward universal and meaningful connectivity.

Effective regulatory institutions

Beyond system-wide coherence, the strength of individual regulatory institutions determines how effectively frameworks are implemented. The quality of regulation depends on three attributes in particular:

- **Independence**: A clear legal mandate, transparent procedures, and stable multi-year funding limit political and commercial pressure and support consistent decisions on spectrum, infrastructure access, and consumer protection.
- **Capacity**: Skilled staff, modern systems and the ability to address new and emerging issues help identify bottlenecks and tailor strategies for connecting underserved users.
- **Effectiveness**: Timely and consistent enforcement of regulations, coordination across public bodies, cooperation with peer regulators, and clear targets for coverage, affordability, quality and inclusion, ensure that regulatory action delivers measurable results.

When these conditions hold, private investment and innovation are directed toward closing access gaps and improving the quality and affordability of connectivity.

These attributes are operationalized through practical approaches promoted in the ITU Global Symposium for Regulators (GSR) Best Practice Guidelines, which emphasize five complementary priorities:[11]

- **Collaborate**: Make coordination a working norm. Build cross-sector partnerships, use shared evidence and targets, and codify roles so delivery is coordinated and accountable.
- **Connect**: Deploy a multi-technology stack and simplify the rules. Combine fibre-optic, mobile and satellite communications as complementary layers, reduce licensing friction, modernize spectrum sharing and ensure data-governance parity across terrestrial and non-terrestrial networks.
- **Include**: Design for inclusion, not just access. Pair connectivity with culturally appropriate, gender-responsive and disability-inclusive services. Invest in disaggregated data and co-design with communities to target gaps and measure progress.
- **Sustain**: Embed sustainability and circularity into regulation. Measure what matters such as energy, emissions, materials, etc., and strengthen e-waste

[11] See itu.int/bestpractices for more information.

frameworks with enforceable extended-producer-responsibility rules.

- **Innovate**: Balance emerging-technology opportunities with guardrails, using sandboxes and predictable governance to foster entrepreneurship while managing risk.

Evidence-based policy-making

Sound regulation and policy depend on evidence. Data reveal where market failures persist, which barriers hinder adoption, and what interventions have the greatest impact. Evidence-based policy-making grounds decisions in facts rather than assumptions, improving efficiency, targeting, and accountability. Without evidence, policies risk being ineffective or even counterproductive, for instance, investing in infrastructure where demand is already met, or launching digital-skills programmes without understanding actual needs.

Key areas for evidence-based digital policies include market regulation, infrastructure deployment, social inclusion, and economic development or affordability. For the latter, data on prices, competition and household incomes guide interventions that improve affordability without undermining sustainability (see Chapter 4). Similarly, disaggregated survey data by gender, age, education or income identify who remains unconnected and why.

Despite progress, major data gaps persist (see Chapter 6). Many vulnerable groups, such as refugees, rural communities, or informal workers, remain invisible in datasets. Privacy concerns, fragmented responsibilities and limited statistical capacity further constrain effective data use. Strengthening the supply of reliable, comparable and timely ICT statistics is therefore critical.

But data alone are not enough. Evidence must also be used. Many policy-makers still lack the skills, incentives or culture to integrate data into policy cycles. Weak analytical capacity, institutional silos, and poor coordination between regulators, ministries and statistical offices limit the use of evidence in decision-making. Promoting a data-driven culture is as important as collecting better data.

To help build this capacity, ITU launched its first Summer school on evidence-based digital policies in 2025. The week-long seminar brought together policy-makers, researchers and practitioners to explore how data and research can inform UMC policies.

When the supply of statistics and the demand for statistics reinforce each other, they form a virtuous cycle: better evidence leads to better policies, and better policies, in turn, generate better data. Embedding this feedback loop into national governance systems is essential to achieving universal and meaningful connectivity.

3.3 Global connectivity infrastructure

Policies and institutions create the enabling environment for connectivity, but physical networks determine how far and how fast that connectivity can reach. Infrastructure gives substance to governance choices while investment climates, competition rules, and cross-border coordination ultimately shape the structure, reach, and resilience of networks.

Among global telecommunication systems, submarine cables and satellites occupy a special position. They form the outer layers of the global connectivity fabric, carrying data across continents and linking regions that terrestrial networks cannot efficiently reach. Both are essential to achieving universal and meaningful connectivity, ensuring that national networks are interconnected and that no area remains digitally isolated.

Submarine cables and satellites play complementary roles. Submarine cables, composed of high-capacity fibre-optic lines laid across ocean floors, provide low-latency[12], high-bandwidth transmission suited to sustained data flows between major hubs. Satellites, by contrast, extend coverage to areas where terrestrial or submarine infrastructure is impractical or uneconomical, such as small islands, mountainous terrain or sparsely populated regions. Together, they extend the global network to the hardest-to-connect places with submarine cables linking continents and islands, and satellites reaching remote or mobile users beyond the range of terrestrial systems.

Beyond reach, both technologies strengthen network resilience and redundancy.[13] Submarine cables often operate on parallel routes to mitigate risks from damage or disruption, while satellite systems provide alternative transmission paths during emergencies or outages. Their coexistence creates an integrated global backbone that supports the digital economy, and essential services such as cloud computing and digital public infrastructure. Given their strategic, economic, and geopolitical importance, the next sections examine each in turn.

3.4 Submarine cables: strengthening the backbone of connectivity

Submarine cables are the hidden backbone of the global digital economy, transmitting over 99 per cent of all international data. As digital demand continues to accelerate, the importance of robust, secure, and inclusive submarine cable infrastructure has become more prominent, especially in relation to resilience, economic development, and global connectivity.

Figure 3.4 shows a detailed view of the global network of submarine cables (in green) and terrestrial networks (in blue) that form the backbone of digital connectivity. Submarine cables span the Atlantic, Pacific and Indian Oceans, linking continents through vast undersea infrastructure. Terrestrial networks complement this system by connecting regions within continents, ensuring continuity and interaction across national borders. The concentration of connections in certain areas reflects both technological advancement and strategic relevance in the global digital ecosystem.

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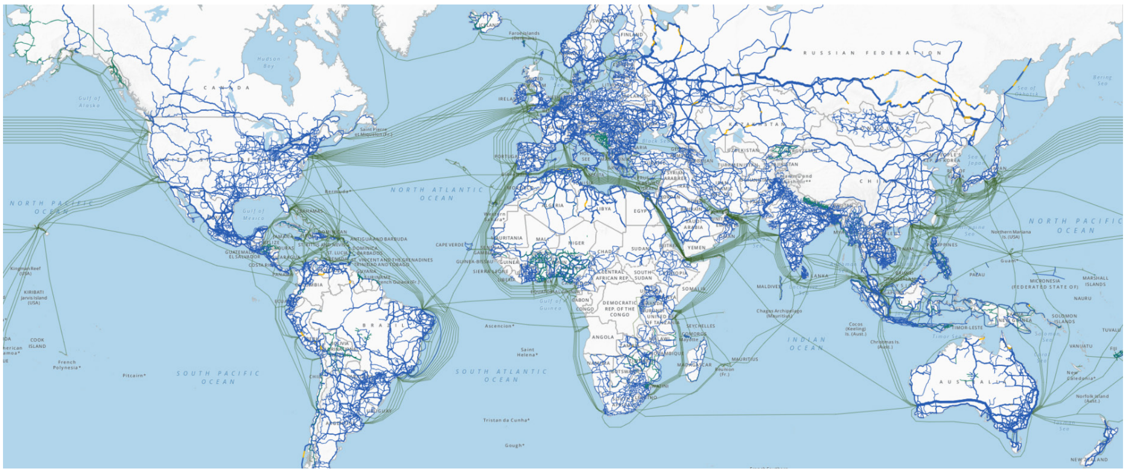
12 Internet latency is the time it takes for a data packet to travel from its source to its destination and back, known as round-trip time (RTT). It is measured in milliseconds (ms) and reflects the delay between a request and its response across the network. Low latency enables a smooth user experience, while high latency can cause interruptions in video calls, delays in online gaming, and failures in critical applications.

13 Redundancy in Internet refers to the planned duplication of components, routes or links within a network to ensure service continuity in the event of failures or disruptions. It involves having multiple alternative paths for data transmission so that if one fails, another can take over without affecting connectivity or system availability.

Figure 3.4: Telecommunication submarine cable systems



Note: The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.

Source: ITU. Available at: https://bbmaps.itu.int/bbmaps/

Investment in the submarine cable system rose from USD 0.8 billion in 2015 to 9.7 billion in 2025, with cumulative investment totalling more than USD 45 billion.[14] Whereas cable investment was once dominated by telecommunication companies, today hyperscale technology companies, such as major cloud computing and content providers, are playing a leading role, often financing and operating their own infrastructure to ensure greater control over data transmission.

As of 2025, the global submarine cable network comprises more than 500 operational systems, stretching over 1.4 million kilometres. The sector continues to expand rapidly, with over 60 new cable projects either recently completed or underway, driven by surging demand for data, cloud computing, 5G, and artificial intelligence.

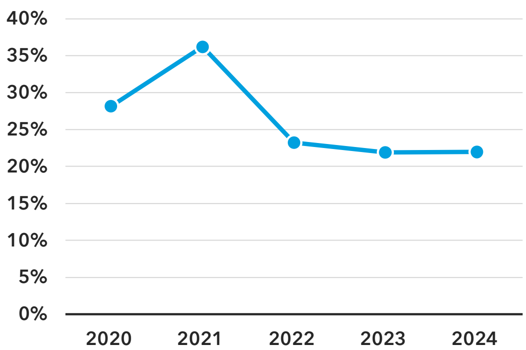
Across regions, there is a notable push to expand connectivity to underserved areas, including the Pacific Islands, parts of Sub-Saharan Africa, and even Antarctica, with new routes also being explored through the Arctic.

[14] SubTel Forum Almanac, June 2025. Available at: https://subtelforum.com/submarine-cable-almanac/

The share of trans-Pacific cables in the total submarine system length is expected to grow from 14 per cent to nearly 25 per cent, whereas that of the cables in the Americas region will shrink from 16 per cent to 7 per cent. Polar region cables are expected to account for 5 per cent of the system length, up from less than 0.5 per cent currently (SubTel Forum, 2025a).

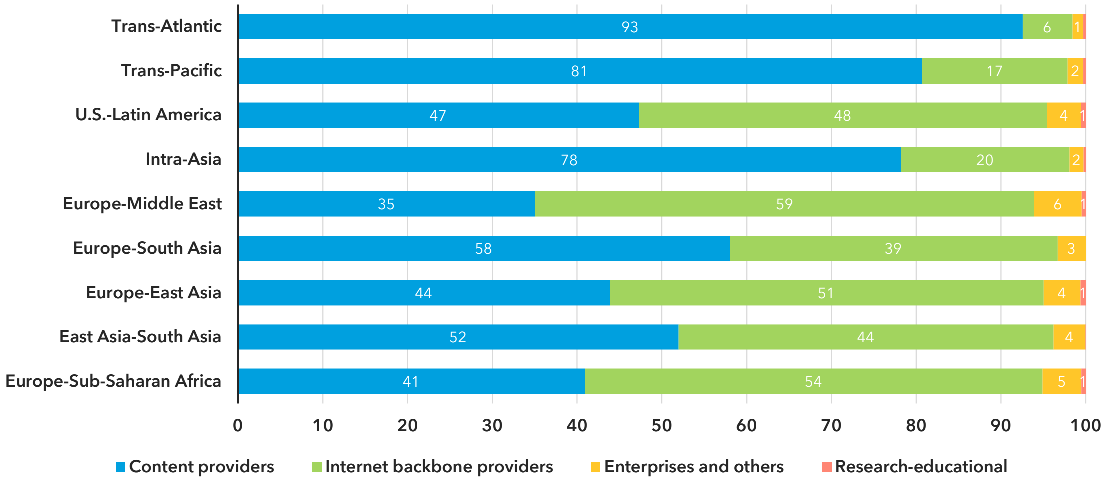
Globally, bandwidth demand surged during the COVID-19 pandemic, with a growth of 27 per cent in 2020, and 36 per cent in 2021. Since then, bandwidth continue to grow fast, averaging 22 per cent per year (see Figure 3.5).

Figure 3.5: Global international bandwidth growth



Source: ITU

Figure 3.6: Share of used bandwidth by category for major submarine cable routes



Source: TeleGeography

Although the proportion varies by route, content providers now dominate global bandwidth demand across most major submarine cable routes. On the high-capacity trans-Atlantic, trans-Pacific, and intra-Asian routes, their networks are responsible for at least 83 per cent of total bandwidth demand (see Figure 3.6). This underscores the growing influence of digital platforms and cloud service providers in shaping the global connectivity landscape.

Submarine cables are now widely recognised as a critical form of strategic infrastructure. Some governments have proactively updated their legal frameworks to reduce the occurrence of submarine cable damage.

Their susceptibility to damage, whether from natural events such as earthquakes and undersea landslides, or from human activities such as anchoring and fishing, poses significant threats to digital sovereignty, economic continuity, and the reliability of emergency communication systems.

Submarine cables are laid in some of the harshest environments on Earth and are increasingly regarded as critical national infrastructure. These networks span multiple jurisdictions and often land in countries with differing legal frameworks, making their operation uniquely exposed to geopolitical risks.

It is estimated that 86 per cent of cable faults result from fishing and anchoring activities, while the remaining 14 per cent stem from natural causes such as geological events, seabed abrasion, or equipment failure (UNEP-WCMC & ICPC, 2025).

In 2024, there were 204 cable cuts recorded globally, or four cable cuts per week. While this number has been relatively stable since 2015[15], the number of incidents reported has doubled, amplifying public concern (SubTel Forum, 2025b).

Strategic positioning is also gaining in importance. Several countries are actively seeking to transform themselves into international digital gateways by hosting multiple cable landing stations and attracting infrastructure investments. This trend is reshaping regional connectivity ecosystems and influencing the geography of future deployments.

Furthermore, the coming years will pose new challenges to maintenance. An estimated 47 per cent of the global cable maintenance fleet with an average age of more than 20

[15] See more information at: https://subtelforum.com/submarine-telecoms-industry-report/

years will reach end-of-life by 2040, while demand is surging with 1.6 million new cable kilometres expected between 2026 and 2040, notably concentrated in the Southwest Pacific, Northwest Pacific, Northeast Atlantic, and Northeast Pacific.

While many old cables are set to be decommissioned in the next five years, growing demand for bandwidth and redundancy will drive new deployments, leading to an overall 48 per cent net growth in total cable kilometres by 2040, highlighting the urgency of addressing fleet modernization, capacity gaps, and coordination mechanisms in a context of increasing geopolitical tensions and climate exposure (Constable, Burdette, & Mauldin, 2025).

One of the most acute challenges in the submarine cable ecosystem remains the delay in repairing damaged infrastructure. Depending on the geographic location, weather conditions, and procedural hurdles, repairs can take from two weeks to several months, leaving entire regions vulnerable to prolonged connectivity disruptions.

Several interrelated factors contribute to these delays:

- lengthy permitting procedures in Exclusive Economic Zones (EEZs) and territorial waters;
- delays in customs clearance for specialized repair vessels and equipment;
- cabotage laws that restrict foreign vessels from operating within national waters;
- limited regional repair capacity, especially affecting remote, island, or landlocked economies, as the latter rely on indirect connections and do not have direct access to submarine cables.

The lack of harmonized regulations and effective coordination among coastal and transit countries not only delays repairs but also inflates their costs. These challenges underscore the need for multilateral cooperation and streamlined regulatory frameworks.

In 2024, to address these systemic issues, ITU, building on decades of normative and technical work, in partnership with the International Cable Protection Committee (ICPC) launched the International Advisory Body on Submarine Cable Resilience.[16] This platform brings together governments, industry leaders, and technical experts to develop solutions aimed at expediting deployment, enhancing resilience, and coordinating repair responses.

3.5 Satellites: extending reach and resilience

Recent advances in satellite technology have transformed the way people connect to the Internet, extending connectivity to areas previously beyond the reach of traditional networks. What was once a specialised solution is now a strategic tool to expand access to communication services across a wide range of settings.

This transformation is driven by the growing ability of the satellite sector to respond to diverse connectivity needs. In places where terrestrial networks are impractical due to cost or geography, such as rural, mountainous, and insular areas, satellites provide coverage that connects people to opportunities, services, and development.

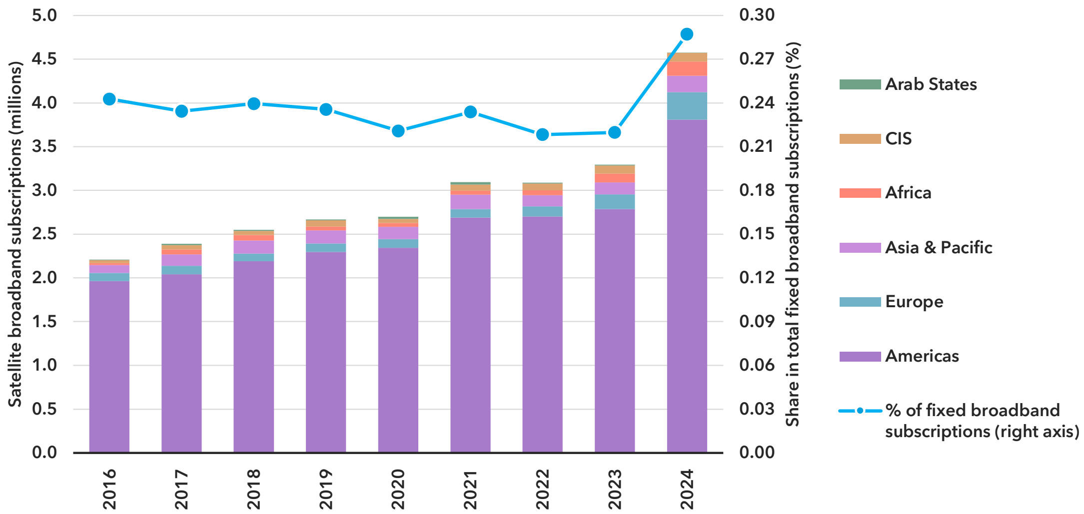
Satellites also play a vital role in emergencies, maintaining communication when terrestrial networks collapse, and supporting rescue coordination, aid delivery, and real-time damage assessment in areas affected by conflict or natural disasters. Their importance extends to strategic sectors such as agriculture, mining, transport, defence, meteorology, Earth observation, and environmental monitoring.

[16] See more information at: https://www.itu.int/digital-resilience/submarine-cables/advisory-body/

This shift is evident in the steady growth of satellite broadband subscriptions (see Figure 3.7), driven by broader service offerings and technological advances that have improved efficiency and reduced costs. Growth accelerated markedly in 2024, with 1.1 million new satellite subscriptions. In parallel, fixed broadband grew steadily, underscoring the complementarity between the two technologies. However, satellite penetration rates remain very low and globally, there are fewer than one satellite subscription per 1 000 inhabitants, compared with about 200 fixed broadband subscriptions per 1 000 inhabitants. Satellite penetration has nevertheless doubled since 2015, and growth is likely to continue.

The Americas region accounts for over 80 per cent of all satellite broadband subscriptions, a result driven primarily by growth in the United States, Brazil, Mexico, and Argentina. These countries have been instrumental in consolidating and expanding this mode of connectivity across the region.

Figure 3.7: Evolution of satellite broadband subscriptions



Source: ITU

Recent technological advances are contributing to the expansion of satellites for connectivity. Operators are deploying multi-orbit networks, combining geostationary (GEO), medium Earth orbit (MEO), and low Earth orbit (LEO) satellites, to balance coverage, speed, and responsiveness (see Box 3.1). These systems are increasingly flexible and user-focused, incorporating innovations such as steerable beams[17] to direct signals where needed, inter-satellite links for continuous connections, and software-defined satellites that simplify integration with other networks.

New generations of satellite antennas of various sizes, together with software-defined spacecraft, have significantly enhanced bandwidth and spectrum efficiency, enabling scalable, cost-effective and resilient connectivity solutions that extend access to more people and places, while addressing a wide range of needs (LSTelcom and VVA, 2023).

The evolution of standards and the introduction of non-terrestrial networks (NTN) into the 3rd Generation Partnership Project (3GPP) is playing a major role in the integration of satellites into 5G and 6G ecosystems.

17 *Steerable beams* are satellite signals that can be redirected to focus on specific areas or users. This allows satellites to send stronger signals where they are most needed, helping improve coverage and optimize the use of available bandwidth.

The ability to provide connectivity to small antennas, whether in smartphones or fixed terminals at homes and businesses, and to antennas integrated into vehicles will further extend connectivity capabilities in the near future.

Satellite technologies are playing an increasingly important role in advancing UMC. By complementing terrestrial networks, satellite technologies can connect remote communities, improve resilience during disasters, and bridge persistent digital divides (see Box 3.2).

Box 3.1: Types of satellites and their role in global connectivity

Satellites orbit Earth at different altitudes and serve distinct purposes for communication, navigation, and observation. They fall into three main categories (see Table 3.1):

- Geostationary (GEO) satellites, about 36 000 km above Earth, remain fixed over one position and provide wide, stable coverage ideal for broadcasting, weather monitoring, and fixed broadband.
- Medium Earth orbit (MEO) and Low Earth orbit (LEO) satellites are non-geostationary, operating at altitudes between 300 and 20 000 km. They move continuously over different areas of the planet and are often deployed in constellations that deliver low-latency Internet, navigation, and real-time data services.

Together, these systems form a complementary network: GEO satellites ensure reach and stability, while non-geostationary satellites add speed, flexibility, and coverage in areas beyond the reach of terrestrial networks. Recent investments in large satellite constellations are accelerating global connectivity efforts, offering new opportunities to extend access to remote or underserved areas.

However, the rapid growth in satellite numbers also poses significant risks for space sustainability. The growing density of satellites in orbit increases the likelihood of collisions and debris generation, threatening the long-term viability of the space environment on which connectivity itself depends. More than 12 500 active satellites[18] and hundreds of thousands of debris fragments now circulate in orbit, with thousands more satellites planned. Without effective coordination, congestion in popular orbital bands, and especially LEO, could lead to signal interference, physical collisions, and cascading debris events.

Ensuring sustainability requires coordinated space-traffic management, effective debris-mitigation standards, and transparent data-sharing among operators and regulators. The UN COPUOS Guidelines for the long-term sustainability of outer space activities provide a global framework for responsible behaviour, while ITU plays a central role in spectrum coordination to prevent harmful interference and ensure equitable access to orbital resources.[19] Building on this mandate, the ITU Space Sustainability Forum brings together administrations, operators, and experts to advance collaborative approaches that align technical regulation with operational safety and sustainability.

18 European Space Agency, *Space debris by the numbers* (accessed 14 October 2025) available at https://www.esa.int/Space_Safety/Space_Debris/Space_debris_by_the_numbers

19 https://www.itu.int/en/mediacentre/backgrounders/Pages/Regulation-of-Satellite-Systems.aspx

Table 3.1: Types of satellites

Feature	Geostationary satellite (GEO)	Non-geostationary satellite (LEO/MEO)
Orbital altitude	36 000 km above Earth	500-20 000 km above Earth
Orbital speed	Matches Earth's rotation	Faster than Earth's rotation
Orbital position	Fixed over the equator	Covers different areas as it moves
Coverage area	Very large (1 satellite can cover 1/3 of Earth)	Smaller per satellite; global coverage requires constellations
Number of satellites needed	Few (3 satellites can cover most of Earth)	Many (hundreds or thousands for full coverage)
Ground equipment	Fixed antennas	Switching antennas
Polar region coverage	Limited or none	Excellent coverage
Best uses cases	TV broadcasting, weather, fixed broadband, emergency alerts	Real-time Internet, GPS, Earth observation, mobile connectivity
Deployment complexity	Easier (few satellites, stable orbits)	Requires coordination across many satellites
Power requirements	Higher (due to long distance)	Lower (closer to Earth)
Regulatory coordination	Well-established international frameworks	Evolving coordination due to rapid growth

Source: ITU

Box 3.2: Examples of initiatives and policies for global satellite connectivity

Countries worldwide are integrating satellite development into their digital strategies to extend access, strengthen resilience, and advance universal and meaningful connectivity.

In the Americas region, governments have made satellite connectivity central to digital inclusion. Brazil uses GEO and LEO satellites to connect the Amazon and other remote areas through large-scale projects and international partnerships. The Internet for All initiative in Mexico targets Indigenous and rural populations with satellite-based services. Argentina and the Republic of Colombia have invested in LEO constellations and in enabling regulation to connect schools and health centres, highlighting the role of the technology in social and educational equity. The United States and Canada support private satellite constellations to expand broadband in rural and remote areas. Canada has also advanced frameworks to extend mobile satellite services for healthcare and education in northern regions.

In the Africa region, satellites are vital for expanding coverage and access to essential services. The Federal Republic of Nigeria has signed international agreements to extend connectivity in unserved areas, while South Africa integrates satellite solutions into rural education. The Republic of Kenya and other African countries use satellite broadband to link mobile clinics and schools, showing a pragmatic approach to urgent social needs.

Across the Europe region, policies emphasize satellite–terrestrial integration to strengthen rural connectivity. Spain supports advanced technologies in small communities, including direct-to-device trials. France participates in European programmes such as $IRIS^2$ to enhance resilience in mountainous areas. The Federal Republic of Germany applies satellite technology to intelligent transport and resource management, while the United Kingdom of Great Britain and Northern Ireland has developed regulatory frameworks for direct mobile services.

In the Asia and the Pacific region, satellite connectivity helps reduce inequalities and improve disaster management. Australia has expanded rural and Indigenous coverage through infrastructure investments and satellite messaging, and New Zealand is currently trialling full rural and disaster coverage. The Republic of India is using satellite services to reach mountainous and remote regions, while the Republic of Indonesia is connecting dispersed islands and the People's Republic of China is developing next-generation direct mobile technologies. The Republic of the Philippines has used satellite connectivity to strengthen national disaster response capabilities and to extend connectivity to schools and rural areas.

In the Arab States region, satellites are a pillar of digital transformation. The Sultanate of Oman and the State of Qatar have introduced regulatory frameworks and licences to expand broadband connectivity. The United Arab Emirates invests in satellite innovation to enhance network resilience, while the Islamic Republic of Mauritania and the People's Democratic Republic of Algeria promote regional collaboration on satellite projects to extend access.

In the Commonwealth of Independent States region, satellite technology is being employed to modernize telecommunications and expand coverage. The Russian Federation is developing LEO and MEO constellations and remote base-station links. The Republic of Kazakhstan is combining fibre-optic and satellite technologies with the goal of achieving near-universal rural coverage by 2027. The Republic of Uzbekistan and other Central Asian nations are running pilot programmes to expand e-government and public-service access in remote communities.

3.6 Conclusions and recommendations

Telecommunication infrastructure is the foundation of universal and meaningful connectivity (UMC), and its effectiveness depends as much on governance and policy as on technology. Strong, predictable institutions and coherent regulation create the conditions for investment, innovation, and sustained network expansion.

Countries that adopt integrated regulatory frameworks, that combine converged licensing, infrastructure sharing, spectrum trading, and experimental regulatory spaces, achieve better connectivity outcomes. Similarly, evidence from the ITU G5 Benchmark tool confirms that mature, coordinated governance systems are closely associated with improved network performance and greater digital inclusion.

Physical infrastructure remains the backbone of global connectivity. Submarine cables and satellites form the outer layers of the digital ecosystem, linking continents and extending access to areas beyond the reach of terrestrial networks. As reliance on these systems deepens, ensuring resilience and sustainability becomes a priority. Submarine cable protection, repair coordination, and fleet renewal require significant investment and multilateral cooperation, while the rapid expansion of satellite constellations demands reinforced efforts on space sustainability, spectrum coordination, and debris mitigation.

To accelerate progress toward UMC, governments and partners should:

- strengthen institutional capacity and coordination, embedding evidence-based decision-making in all aspects of digital policy;
- ensure coherent, forward-looking regulation that encourages investment, competition, and innovation while protecting consumers and the environment;
- promote multi-technology infrastructure, integrating fibre-optic, mobile, and satellite systems to reach underserved populations;
- advance resilience and sustainability through global frameworks for cable protection, orbital management, and responsible spectrum use.

References

Acemoglu, D., Johnson, S., & Robinson, J. (2005). Institutions as a Fundamental Cause of Long-Run. In Handbook of Economic Growth, Volume 1A. (pp. 386-414). Elsevier B.V.

ARCEP. (2025). Le partage de réseaux mobiles. Autorité de régulation des communications électroniques, des postes et de la distribution de la presse. https://www.arcep.fr/la-regulation/grands-dossiers-reseaux-mobiles/le-partage-de-reseaux-mobiles.html.

Constable, M., Burdette, L., & Mauldin, A. (2025, June). The Future of Submarine Cable Maintenance: Trends, Challenges, and Strategies. Infra-Analytics and TeleGeography: Retreived from https://www2.telegeography.com/hubfs/LP-Assets/Ebooks/The%20Future%20of%20Submarine%20Cable%20Maintenance_%20Trends%2C%20Challenges%2C%20and%20Strategies.pdf.

European Space Agency. (2025). Space debris by the numbers. (accessed 14 October 2025). Retrieved from https://www.esa.int/Space_Safety/Space_Debris/Space_debris_by_the_numbers.

GSOA. (2024). New Satellite Technologies for Transformative Connectivity. Retrieved from https://gsoasatellite.com/wp-content/uploads/GSOA-New-Satellite-Tech-Paper_July-2024.pdf#:~:text=This%20paper%20highlights%20how%20innovative%20solutions%20in%20satellite,and%20other%20users%20for%20increased%20capacity%20and%20connectivity.

GSOA. (2025). Satellite Solutions for Universal Service: Bridging the Digital Divide. Retrieved from https://gsoasatellite.com/wp-content/uploads/GSOA-Satellite-Solutions-for-Universal-Service.pdf.

ICASA. (2016). Findings Document on the Regulatory Framework on Electronic Communications Infrastructure Sharing. Independent Communications Authority of South Africa.

International Telecommunication Union. ITU. (2019). Evolving Satellite Communications. ITU's role in a brave world. ITU News Magazine No. 02.

International Telecommunication Union. ITU. (2022). World Telecommunication Development Conference 2022 (WTDC-22) Final Report. Kigali, Rwanda: ITU Development Sector.

International Telecommunication Union. ITU. (2023a). Global Digital Regulatory Outlook. Retrieved from https://www.itu.int/pub/D-PREF-BB.REG_OUT01.

International Telecommunication Union ITU. (2023b). Satellite Connectivity. ITU News Magazine No. 04.

International Telecommunication Union. ITU. (2024a). Benchmark of fifth-generation collaborative digital regulation 2023: Global and regional trends. Retrieved from https://digitalregulation.org/wp-content/uploads/D-PREF-BB-2023-01-PDF-E.pdf.

International Telecommunication Union. ITU. (2024b). Facts and Figures 2024. Retrieved from https://www.itu.int/itu-d/reports/statistics/facts-figures-2024/.

International Telecommunication Union. ITU. (2025a). The Affordability of ICT Services 2024. Retrieved from https://www.itu.int/itu-d/reports/statistics/affordability2024/.

International Telecommunication Union. ITU. (2025b). Transformative Connectivity: Trends in Satellite Innovation. ITU-D Interim deliverable Study Group 1.

Levy, B. & Spiller, P. (1994). The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunications Regulation. Journal of Law, Economics, & Organization, Oxford University Press. Vol. 10, No. 2 (Oct., 1994)., 201-246.

LSTelcom and VVA. (2023). The Socio-Economic Value of Satellite Communication.

Retrieved from https://gsoasatellite.com/reports_and_studies/the-socio-economic-value-of-satellite-communications/.

North, D. C. (1990). Institutions, Institutional Change and Economic Performance. Washington University, St Louis: Cambridge University Press.

Report on the World Dialogue on Regulation. (2005). Stimulating Investment in Network Development: Roles for Regulators: Case studies and research from WDR Research Cycle 2. A.K. Mahan and W.H. Melody.

Secretaria de Infraestructura, Comunicaciones y Transporte. (2023). Programa de Cobertura Social 2023-2024. Mexico.

SubTel Forum. (2025a). Submarine Cable Almanac Issue 51. June 2025. Retrieved from https://subtelforum.com/submarine-cable-almanac/.

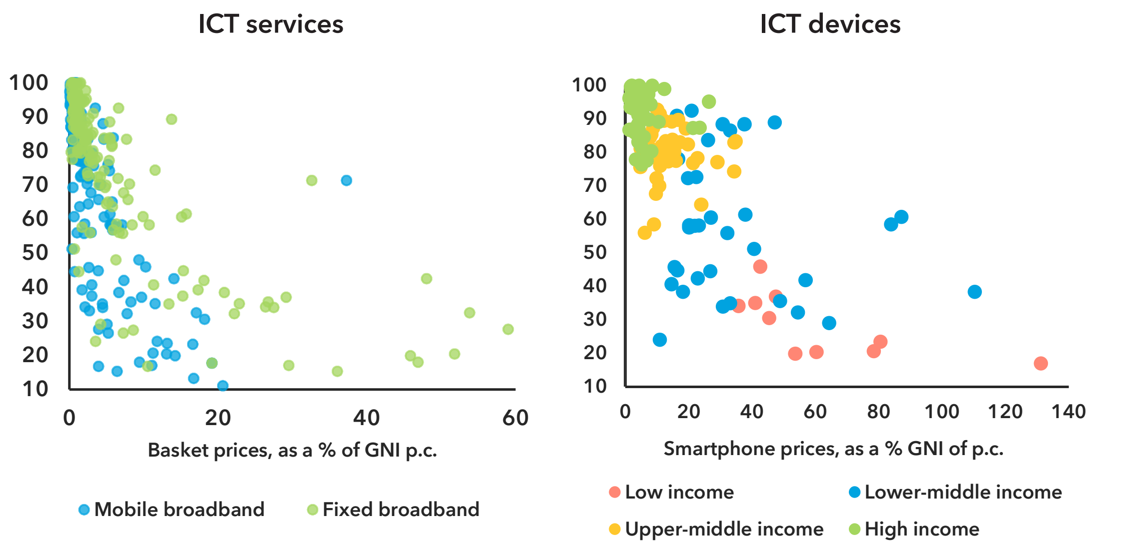
SubTel Forum. (2025b). Industry Report. Issue 13. Reporting Trends and Repair Times. Retrieved from https://subtelforum.com/submarine-telecoms-industry-report/.

UNEP-WCMC & ICPC. (2025). Submarine cables and marine biodiversity. Retrieved from https://resources.unep-wcmc.org/products/WCMC_RT691/access?option=9&endpoint_id=1457794.

Chapter 4: Making connectivity affordable for all

Digital poverty leads to exclusion from digital life. Just as economic deprivation can result in social exclusion by limiting access to essential goods, services, and community participation, digital poverty isolates people from educational, professional, and social opportunities in an increasingly digital world. Since the advent of the Internet, low-income households have consistently been among the slowest adopters (Weiner and Puniello, 2014). When asked why they do not use the Internet, high device costs and high service costs are common responses across groups experiencing poverty, including youth, students, migrants, and rural communities (Boerkamp *et al*., 2024, Klapper *et al*., 2025).

Figure 4.1: Internet use versus the affordability of ICT services and devices



Note: Baskets refer to fixed and mobile broadband services providing at least 5 GB monthly data allowance. Expressed as a percentage of monthly gross national income (GNI) per capita. Each dot represents a country.

Source: ITU; GDIP (2024)

As digital connectivity becomes increasingly essential worldwide, many individuals and households continue to face challenges in meeting basic needs, including access to Internet connectivity. ICT price statistics provide valuable insights into global affordability trends, divides and their underlying causes. These insights are critical for shaping effective policies to achieve universal and meaningful connectivity[20].

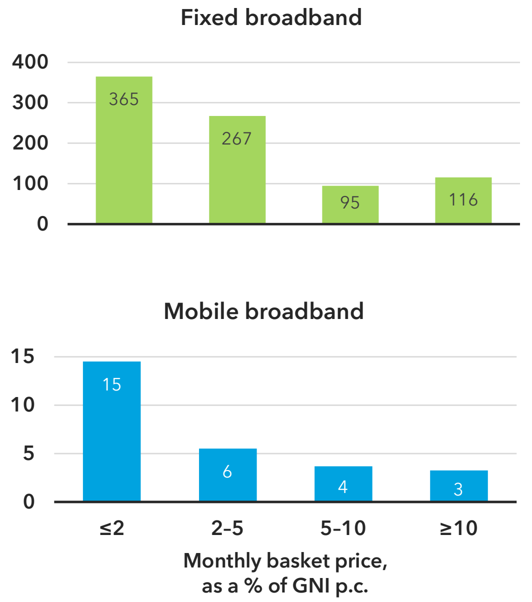
4.1 Affordability and Internet use

As shown in Figure 4.1, the share of population using the Internet negatively correlates with the price of both ICT services and devices. In countries where Internet use is low, the price of mobile or fixed broadband represents a significant share of income. ITU data for 2025 show that in places where the price of a mobile broadband basket exceeds 5 per cent of monthly gross national income (GNI) per capita, only about one third of the population used the Internet. The situation is similar for smartphones: in low-income economies, where entry-level smartphones prices typically cost around 60 per cent of the average monthly income, Internet penetration

[20] See Chapters 1 and 2 for a detailed discussion of the concept and measurement of universal and meaningful connectivity.

was just under 30 per cent in 2024. By contrast, in high-income economies, where entry-level smartphones cost only 4 per cent of monthly income, Internet use exceeded 93 per cent.

Figure 4.2: Monthly Internet data traffic per subscription in GB, by basket price ranges, 2025



Note: Median monthly traffic per subscription, by affordability ranges.

Source: ITU

Meaningful connectivity depends on affordable Internet access. High access prices constrain and limit online activity, whereas affordable access enables greater data use. This pattern is clearly visible in recent mobile broadband and fixed broadband traffic statistics for 2024. As shown in Figure 4.2, in economies where broadband access costs are a maximum of 2 per cent of monthly GNI per capita, monthly data traffic per subscription was the highest, with median values around 15 GB for mobile broadband and 365 GB for fixed broadband. By contrast, in economies where mobile broadband prices exceeded 5 per cent of monthly GNI per capita, traffic typically remained at about 4 GB per month for mobile broadband and at about 100 GB for fixed broadband.

While this analysis does not attempt to define a minimum data-use threshold for meaningful connectivity, which is a constantly moving target, global median mobile broadband traffic per subscription, based on administrative data, was about 14 GB per month in 2024. The average user in an economy where broadband prices were unaffordable (i.e. above the 2 per cent target – see below) evidently experienced a more limited online experience.

Box 4.1: Challenges in measuring ICT service prices

A globally harmonized methodology for ICT price data collection is fundamental for measuring and comparing affordability. ITU price statistics rely on the basket methodology developed and updated by the ITU Expert Group on Telecommunications/ICT Indicators (EGTI). This methodology consists of strictly defined data collection rules for a set of baskets, which are internationally comparable units of fixed and mobile broadband services including a minimum amount of monthly data, and in certain cases, voice and SMS allowance. These are typically the cheapest available non-promotional subscription plans (and add-ons) from the operator with the largest market share in the country, that meet the availability and technical requirements. The latest, 2024 revision, defined five baskets. These include a fixed broadband basket (with a minimum of 5 GB monthly data allowance) and 4 mobile broadband baskets comprising a data-only mobile broadband basket with a minimum of five GB monthly allowance; a mobile data and voice low-consumption basket (70 minutes, 50 SMSs and 1 GB); and two mobile data and voice high-consumption baskets (one with 140 minutes, 20 SMSs and 5 GB data, and another with 140 minutes, 70 SMS and 2 GB data) (ITU, 2025).

For international comparison, prices collected in national currencies are converted into a common unit. Affordability, which is measured as the share of income users must pay for telecommunication services, is calculated by dividing the monthly basket price by the monthly average gross national income (GNI) per capita, both measured in local currency. Alternatively, for comparing price levels across countries, basket prices can also be expressed in USD for a straightforward comparison, or in international dollars (PPP USD) to reflect differences in purchasing power parity (PPP).[1]

A basket is considered affordable if the GNI per capita rate is below a normative target rate. The Broadband Commission for Sustainable Development was established by ITU and UNESCO to bring broadband to the top of the international policy agenda. Its affordability target aims to reduce the price of entry-level fixed or mobile broadband services in developing countries to less than 2 per cent of monthly gross national income (GNI) per capita.

Measuring the affordability of devices remains a significant challenge, as no globally harmonized methodology currently exists. Future approaches may build on previous efforts, such as the methodology used by the Alliance for Affordable Internet (A4AI) which relies on device prices data from major operators, or on price data obtained from e-commerce platforms (A4AI, 2022).

* The detailed methodology document for data collection, price conversion as well as on definition changes in times series is available online: https://www.itu.int/en/ITU-D/Statistics/Pages/ICTprices/default.aspx.

1 The detailed methodology document for data collection, price conversion as well as on definition changes in times series is available online: https://www.itu.int/en/ITU-D/Statistics/Pages/ICTprices/default.aspx.

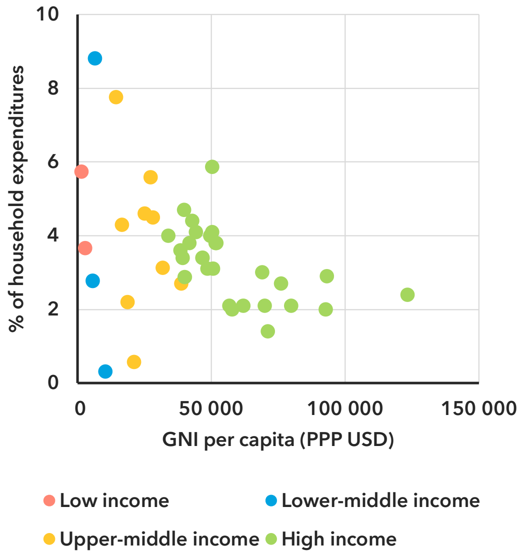
4.2 Household spending on ICT services

Household expenditure data provide additional insights into the amounts families are prepared to pay for ICT services (see Box 4.2). While respondents often struggle to recall exact spending, a consistent pattern emerges from household data across countries. In 2022, the latest year available, the share of household expenditure on fixed and mobile telecommunication services varied considerably, especially in countries with lower GNI per capita. Based on the 41 countries for which relatively recent data was available, the following pattern emerges (see Figure 4.3).

In the richest countries, where GNI per capita (adjusted for differences in purchasing power) exceeds USD 55 000, ICT services typically account for 2-3 per cent of household expenditure. In economies with a GNI per capita between USD 22 000 and USD 55 000, the share of household expenditure ranges from 3 to 6 per cent. Economies with a GNI per capita below USD 20 000, form the most diverse group. In some of these economies, households spend less than 1 per cent of their budget on ICT services, while in others the share of household expenditure rises to nearly 9 per cent. Despite measurement challenges, this variation reflects differences in both needs and availability. Households that recognize the opportunities of connectivity may sacrifice other expenses and prioritize ICT services, provided those are available. Conversely, in countries where households do not perceive ICTs as essential, demand for services remains low. Limited infrastructure often further constrains access and as a result, many households remain offline.

Where available, survey data generally show that rural populations spend more of their income on ICT services than urban populations. While prices tend to be similar within a country, income levels are typically higher in cities. At the same time, deploying and maintaining telecommunication infrastructure outside urban areas is more costly and time-consuming. As a result, people living in rural areas pay relatively more for lower-quality services.

Figure 4.3: ICT services as a share of household expenditures, 2022 (%)



Note: Information and communication services defined according to COICOP 2018 class 08.3, which cover fixed and mobile communication services, including Internet access. Each dot represents a country, and is coloured based on the World Bank income level classification.

Sources: ITU, Eurostat, World Bank (GNI)

Box 4.2: Measuring household expenditure in ICT services

Indicator HH16 from the *core ICT indicators* list, proposed by ITU and approved by the United Nations Statistical Commission, is designed to capture annual household expenditure on ICT goods and services. According to the ITU *Manual on Measuring ICT access and use by households and individuals*, this indicator is generally derived from household budget surveys (HBS), income and expenditure surveys, and only occasionally through specific surveys on ICT access and use with dedicated expenditure modules. Data collection involves asking households to report actual spending, usually during the previous 12 months, on categories[1] such as:

- ICT equipment (computers, tablets, mobile phones, accessories, etc.)
- Communication services (fixed-line, mobile, Internet, bundled services, etc.)
- Other ICT-related expenses (software, repairs, subscriptions, etc.)

Expenditure should be recorded before accounting for subsidies and should include both recurring payments such as subscriptions to streaming services, and one-off payments. In cases where services are bundled, such as for example in triple-play packages, interviewers may need to assist respondents to estimate the portion attributable to ICT components. Amounts should be recorded in local currency and later converted into international units such as current USD or PPP USD, for comparability.

The global availability of this indicator remains limited, except in the European Union, as its Member States submit household budget surveys (HBS) data to Eurostat, disaggregated by types of goods and services. Indeed, HBS are costly operations and are usually programmed when updates of the basket for the Consumer Price Index or National Accounts are scheduled. Additionally, specific data collection challenges appear, such as respondent fatigue, and recall bias (households may have difficulties in accurately remembering their ICT spending, especially for small, irregular, or bundled purchases). Disaggregating costs requires respondent estimation or using auxiliary data from providers. The extent and detail of the goods and services classification system also affect the ability to compile data which are internationally comparable.

1 Defined as per the COICOP classification.

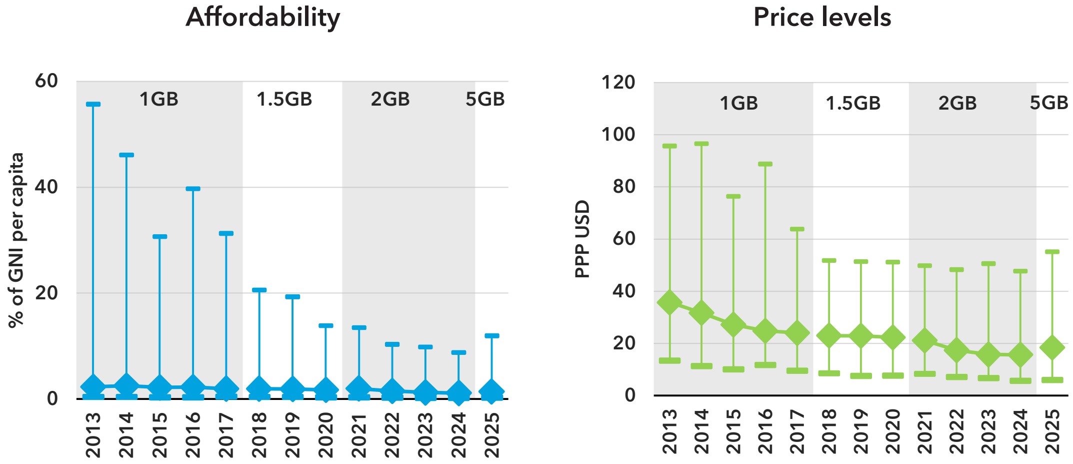
4.3 Global trends and divides in affordability

Since ITU started monitoring mobile broadband prices in 2013, access has become significantly more affordable, while the quality of connectivity has improved. Entry-level data-only mobile broadband subscriptions now include larger data allowances, enabling more meaningful connectivity.

Between 2013 and 2025, the median price in PPP of the entry-level data-only mobile broadband basket dropped by about 50 per cent, from 35.6 to 18.3 PPP USD, accounting also for inflation (see Figure 4.4, right panel). Affordability, measured as a share of GNI per capita, improved by about 40 per cent, from 2.3 to 1.4 per cent. Over the same period, the data allowance used to define the entry-level basket increased fivefold.

The most notable gains occurred in countries where ICT services were the least affordable in 2013 (see Figure 4.4, left panel). The long-term reduction in the global affordability gap reflects both declining price levels (see Figure 4.4, right panel), especially in the 2010s, and rising income levels. The increase observed in 2025 is due to the change that raised the threshold for the reference basket data allowance from 2 to 5 GB basket (see Box 4.1). Calculations with experimental data for a 5 GB basket in 2024 show that while price levels increased by about 2 per cent, the affordability continued to

Figure 4.4: Range of the typical data-only mobile broadband basket prices, 2013-2025



Notes: The diamonds indicate global median prices, whiskers indicate the range of values between the 5th and 95th percentiles. Values for 2013 to 2017 refer to the price of postpaid data-only mobile broadband USB/dongles with 1GB data, from 2018, they refer to any type of mobile broadband plans providing at least 1.5 GB (2018 to 2020), 2 GB (2021-2024) and 5 GB (2025) monthly data usage.

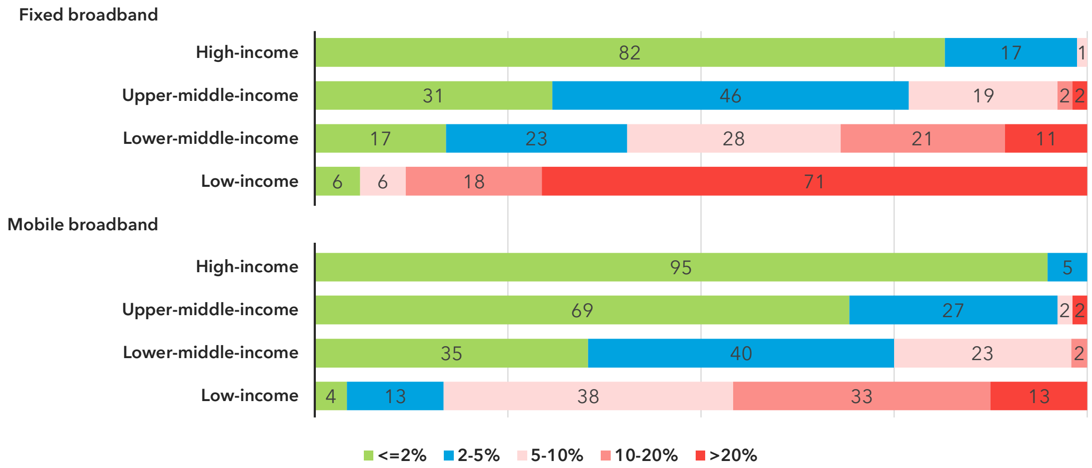
Source: ITU

improve between 2024 and 2025 by about 7 per cent globally.

The main affordability gaps are between income groups, regardless of the service (see Figure 4.5). In most high-income economies, individuals on average do not need to spend more than 2 per cent of their monthly income to access the Internet. In contrast, in low-income economies, prices remain very high and in nine out of ten low-income economies, a 5 GB data-only mobile broadband basket costs more than 10 per cent of the monthly income. Even a basket with a minimum data allowance of 1 GB exceeds 2 per cent in 80 per cent of low-income economies, according to experimental data from ITU.

Considering recent trends in the progress of countries toward the 2 per cent affordability target, most of the countries that surpassed this threshold were middle-income economies. These countries have typically benefitted from a combination of favourable regulatory and competitive environments, increasing overall income levels, and increased mobile broadband penetration. Nevertheless, in one in four lower-middle-income economies the cost of mobile 5 GB mobile broadband data usage per month can still amount to 10 per cent or more of monthly income.

Figure 4.5: Share of economies per income group by mobile broadband and fixed broadband basket prices, 2025



Note: Based on data-only mobile broadband (5 GB) and fixed broadband (5 GB) basket prices of 2025, and using 2025 income group classification of the World Bank.

Source: ITU

4.4 Affordability gaps within countries

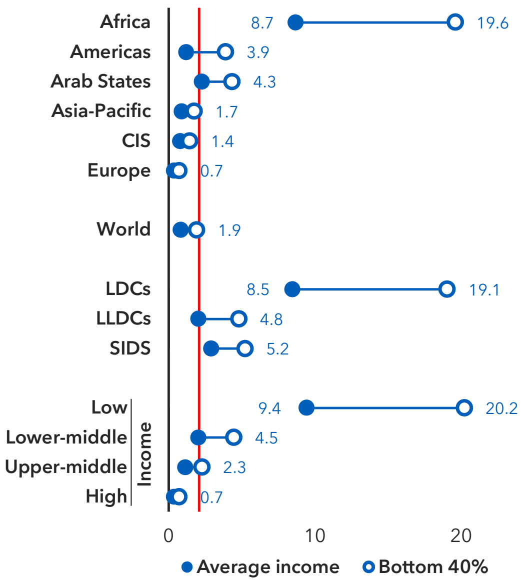
Socio-economic disparities are major drivers of affordability gaps within countries which in turn contribute to connectivity gaps. Because affordability is a relative measure, unequal income distribution means that the cost of an ICT basket represents a larger share of monthly income for people in the bottom 40 per cent of the income distribution compared with those earning the national average, which is the benchmark value considered for computing the baseline affordability indicators. This gap widens as income inequality increases.

As shown in Figure 4.6 for the 5 GB data-only mobile broadband basket, both the level of affordability and the size of the gap vary by region and economic classification. In low-income economies and in least developed countries (LDCs), many of which are in Africa, the cost of the basket calculated against national income is just under 10 per cent. However, for the bottom 40 per cent of earners in these countries, it rises to about 20 per cent, effectively doubling the burden.

At the global level, the median affordability for the bottom 40 per cent appears to fall below the 2 per cent target, though this is probably influenced by data availability as there are only 107 economies with recent and comparable income inequality data and most of these are high- or upper-middle-income countries.[21]

[21] Inequality data is sourced from the World Bank Poverty and Inequality Platform (PIP), which offers country-level estimates of poverty, inequality, and shared prosperity. Countries with surveys older than six years were not considered. For methodological details on the source, see https://pip.worldbank.org/.

Figure 4.6: Mobile broadband affordability gaps between the bottom 40 per cent and average income, as a percentage of GNI per capita, 2025



Note: Based on 107 countries with available recent inequality survey data (not older than 2019) and price data (2025).

Source: World Bank PIP, ITU

In addition to income level differences, affordability gaps can also be observed within countries along geographical or administrative boundaries. While granular and timely data availability poses a measurement challenge, identifying these affordability gaps is an essential step for achieving evidence-based policies to achieve universal and meaningful connectivity, as illustrated by the case of Peru (see Box 4.4 below).

4.5 Understanding cross-country differences in ICT prices

Global affordability disparities stem from structural factors, policy and market dynamics, and corporate strategies (Katz and Jung, 2025). In regions with challenging features, such as mountainous areas, vast territories, and low population density, the costs of network deployment and maintenance are substantially higher, and return on investment is lower. Additionally, unfavourable socio-economic conditions, including low-income levels, macroeconomic instability, exchange-rate volatility, and limited purchasing power, further reduce the attractiveness of these markets for investment. The absence of existing infrastructure, such as electricity (see Box 4.3), further increases costs, resulting in services that are less affordable for the population.

Commercial strategies of operators and service providers also play a significant role in shaping price levels and affordability. Operators can adjust several parameters for specific markets and segments, from the number and types of plans offered, to bundling practices, to the application of volume caps, and speeds. This explains cross-country differences in prices even among countries with similar income levels (e.g. as evidenced by Calzada and Martínez-Santos, 2014; Genakos *et al*, 2018, across OECD countries).

Additionally, regulations also influence affordability. For instance, supply-side measures, such as flexible spectrum use, infrastructure sharing, tariff policies, and policies promoting competition, can help lower prices. On the demand-side, taxation policies affect affordability by influencing both service costs and consumer purchasing power.

Box 4.3: The impact of energy supply on broadband affordability

In 2024, the average price of a 2 GB mobile broadband basket in the Africa region amounted to 4.8 per cent of GNI per capita, or more than twice the Broadband Commission 2 per cent affordability target. A key but often overlooked driver of high prices in this region is the weakness of electricity infrastructure. Mobile networks require a stable energy supply to power base stations, yet only about half the population of the Africa region has grid access, and grid reliability is among the lowest worldwide. As a result, operators rely heavily on diesel generators, significantly increasing costs.

A new study (Tohidimehr, 2025) quantifies this effect using cross-country data for 143 countries between 2015 and 2019. Drawing on ITU prices and subscriptions data, ICT regulation scores, and World Bank electricity indicators, the study applies a structural model of market entry and competition to separate the roles of demand, costs, and technology in shaping prices. The findings show that unreliable electricity is a major driver of high mobile prices. Energy constraints raise both the marginal costs of operating networks and the fixed costs of deployment, reducing incentives for new companies to enter and limiting competition. Counterfactual analysis indicates that achieving universal electricity access would reduce mobile service prices in the Sub-Sahara Africa region by about 42 per cent on average, and by 47 per cent when quality improvements are considered. The results highlight a strong complementarity between energy and digital infrastructure: without reliable electricity, the potential of telecommunication networks to deliver affordable connectivity remains severely constrained.

4.6 Policy leverages to improve affordability

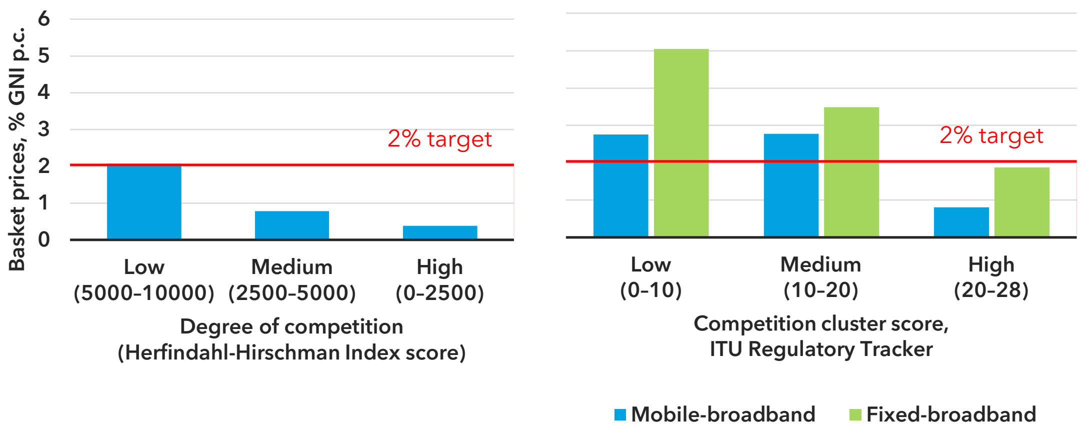
Competition and ICT prices

The degree of competition in the telecommunication market is an important driver of the affordability of ICT services. When more operators are in competition, consumers tend to benefit from lower prices and better quality of service. Competition potentially induces innovation among service providers, leading to improvements in technology, quality, and reliability of connectivity, as well as a more differentiated service offering.

Regulators have a crucial role to play shaping the competitive landscape, influencing the number of participating companies and their market shares, and the level of foreign participation across various telecommunication services, including retail, wholesale, and international services.

There is no single methodology to measure the degree of competition in the market. A frequently used numerical representation of competition is the Herfindahl-Hirschman Index (HHI). Calculated based on the sum of the squares of the market shares of all firms within an economy, scores range between 0 (perfect competition) and 10 000 (monopoly). In fact, the price of a 5 GB data-only mobile broadband basket measured as a percentage of GNI per capita generally declines as the GSMA HHI index scores increase (see left panel of Figure 4.7). The ITU Regulatory Tracker measures the degree of competition based on qualitative criteria, assigning scores of 0 to 2 to 14 indicators covering the level of competition and foreign ownership across various service categories, including fixed-line services, mobile services, and international gateways, as well as the dominance or significant market power (SMP) of operators. Although its strength varies depending on the type of service, there is a clear, positive relationship between affordability and degree of competition (see right panel of Figure 4.7).

Figure 4.7: Affordability of broadband ICT services by degree of competition



Note: Bar heights show the median basket price for the countries in a given competition score range. HHI index is only available for the mobile segment.

Sources: ITU; GSMA intelligence; ITU Regulatory Tracker (2024).

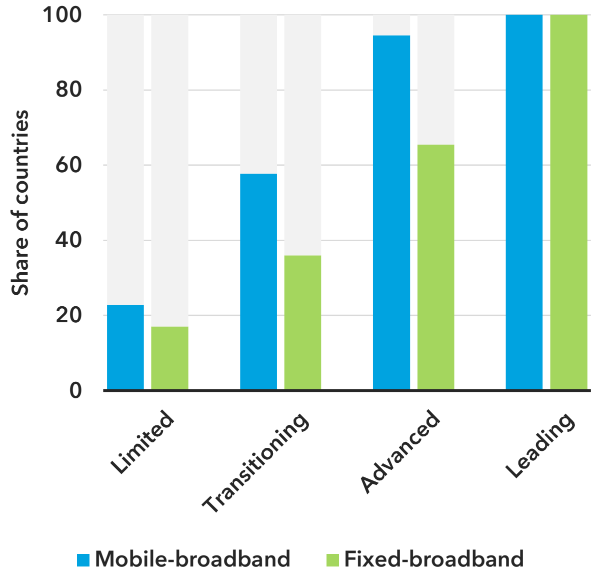
Regulatory framework and affordability improvements

The telecommunication and digital regulatory frameworks are paramount for affordability as they directly and indirectly shape market competition, service provision, and the overall cost structure for both providers and consumers. Regulatory interventions are particularly important where the market forces of supply and demand alone cannot increase broadband network deployment or improve affordability beyond a certain level. A dynamic digital policy agenda goes far beyond simply delivering ICT services and actively seeks partnerships with government bodies in sectors such as education, industrial development, and rural advancement. It promotes coordination among diverse agencies and ministries to leverage the growing contribution of technology to broader socioeconomic goals, fostering more comprehensive strategies and solutions.

The ITU G5 Benchmark is a policy tool designed to help regulators and policy-makers assess, map, and track the progress of collaborative digital regulation in their countries, focusing on cross-sector cooperation, policy design, and digital development. The G5 Benchmark policy tool offers a framework comprising 70 indicators across four key areas, collaborative governance, policy design principles, digital development tools, and digital economy agendas, enabling countries to benchmark their regulatory readiness and identify pathways for advancing digital transformation (see G5 Accelerator).

Cross-tabulating G5 Benchmark readiness levels with basket price reveals a general trend: broadband services tend to be more affordable in countries where digital governance mechanisms are well established. Particularly in countries in the 'leading' tier, both mobile and fixed baskets were affordable (see Figure 4.8). While some countries deviate from this overall pattern due to differing national contexts and the time lag between policy reforms and outcomes, the results nevertheless highlight the potential of regulatory collaboration to improve affordability.

Figure 4.8: Share of economies where ICT services are affordable (up to 2% of GNI per capita), by maturity of national enabling environment for digital markets (G5 Benchmark)



Sources: ITU; ITU G5 Benchmark (2023)

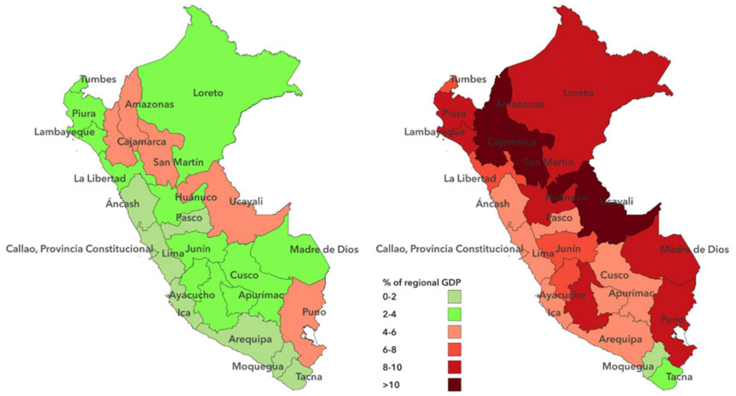
Box 4.4: Improving affordability of connectivity in Peru

Digital connectivity improved significantly in Peru from 2019 to 2024, and the share of offline population halved from 43 to 21 per cent. By 2025, about one in two citizens owned a mobile wallet, a telling indicator of the socio-economic impact of connectivity.

However, connectivity across the 25 regions of Peru is uneven. In the capital region of Lima, only one in ten people does not use the Internet, by contrast, this ratio reaches four out of ten in rural areas, such as in the Amazon forest or the Andean highlands. Other indicators of universal and meaningful connectivity (see Chapter 2), such as infrastructure deployment, broadband speeds, device ownership, and affordability paint a similar picture of interregional divides. Sub-national data on affordability provides a valuable perspective for more accurate diagnostics and policy decision-making. As GNI is not available at the regional sub-national level in Peru, to capture intra-country disparities, regional GDP per capita is used as a proxy for mobile and fixed broadband affordability evaluation. It should be noted that national GNI is significantly higher than regional GDP. For comparison, 2025 data shows that the data-only mobile broadband basket cost 1.2 per cent of GNI per capita, and the fixed broadband basket cost 2.6 per cent of GNI per capita at the national level. The same values would be 2.3 and 5.4 per cent of regional GDP per capita, respectively.

Figure 4.9: Broadband basket price distribution across regions of Peru, 2025

Mobile broadband | Fixed broadband



Note: Lima region combined with Metropolitan Lima (capital city) and the Callao province (conurbation to Metropolitan Lima).

The designations employed and presentation of material in this publication, including maps, do not imply the expression of any opinion whatsoever on the part of ITU concerning the legal status of any country, territory, city or area, or concerning the delimitations of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.

Sources: ITU and INEI.

Figure 4.9 shows the variation in broadband affordability across the 25 regions of Peru. Seven regions are below 2 per cent of GDP per capita considering mobile broadband, while in the case of fixed broadband, only one region, Moquegua, falls below this threshold. Five regions, comprising almost 14 per cent of the national population are above or near 10 per cent of GDP per capita (San Martín, Amazonas, Ucayali, Cajamarca, and Puno) regarding fixed broadband, while 16 regions out of 24 are above 5 per cent of GDP per capita.

Important efforts have been made in recent years to encourage infrastructure deployment, deliver services, and foster competition, through two channels of investment: a direct channel using public funding, and an indirect channel promoting mandatory and incentive policies for private investment.

On the one hand, through the direct public funding channel, the National Telecommunication Programme (PRONATEL) has been developing and executing a portfolio of 29 projects to expand connectivity in regions with investments exceeding USD 2.5 billion, benefiting nearly 11 000 out of the 108 000 national localities. On the other hand, the indirect channel approach is promoting regional connectivity through recent spectrum auction obligations (3.5 GHz in 2025; 2.3 GHz and AWS-3 in 2023) to develop connectivity in underserved localities, active infrastructure-sharing regulations, the coverage fee (canon) mechanism, rural infrastructure mobile (wholesale) operators, and, more recently, the Ministry of Transport and Communication regulatory sandbox process.

Although country level connectivity indicators align with those expected for an upper-middle-income economy, Peru continues to experience major inter-regional disparities, primarily in terms of affordability of Internet access. Bridging the affordability divide in regions such as the Amazon forest or in the Andean highlands requires not only reorienting direct public investments, or fostering private investment participation through incentives, but also adopting innovative policy approaches.

Peru is not alone in comprising regions where broadband is unaffordable. In an international comparison, regions where broadband is unaffordable will show higher similarity with one another than with other regions within the same country. Directing government actions and the commitment of multiple stakeholders to these regions should be a high priority.

4.7 The road ahead

Ensuring affordable access for all unlocks the potential for achieving universal and meaningful connectivity. The high cost of ICT services and devices continues to prevent many individuals and communities, particularly in low-income economies, from using the Internet. This lack of access further exacerbates economic and digital poverty, creating cycles of exclusion that are difficult to escape. As connectivity becomes increasingly essential for participation in educational, economic, and social activities, those who cannot afford it risk being left behind.

Despite global improvements in technology and reductions in ICT service prices over the years, significant affordability gaps persist. These disparities are not only evident between countries of varying income levels but also within countries. Prioritizing affordable access for the 40 per cent of the population with the lowest income, as well as those living in rural areas should be a key policy objective.

Data suggests that a regulatory framework that goes beyond mere service delivery and encourages partnerships with government bodies across various sectors, and enhancing competition can play an important role in making ICT services more affordable, ensuring better-quality services, benefiting consumers, and encouraging innovation among service providers.

Bridging the global digital divide requires a multifaceted approach. Closely monitoring the price of ICT services and international benchmarking is the first step. It also calls for comprehensive policies that address both the supply and demand sides of the ICT market, enhance infrastructure, and promote competition. By tackling these issues, policy-makers and business leaders can help more people access the digital world and the opportunities it offers, thus working towards universal and meaningful connectivity.

References

A4AI (2022). Methodology Guide. A4AI Device Pricing Survey 2022. https://docs.google.com/document/d/1jEe-Ju3koUMtJDvKCJIeFgd_5PjmdPBabaiUL2vvtEM/edit?tab=t.0

Boerkamp, L. G. P., van Deursen, A. J. A. M., Laar, E. van, van der Zeeuw, A., & van der Graaf, S. (2024). Exploring Barriers to and Outcomes of Internet Appropriation Among Households Living in Poverty: A Systematic Literature Review. *SAGE Open*, *14*(1). https://doi.org/10.1177/21582440241233047

Calzada, J., & Martínez-Santos, F. (2014). "Broadband prices in the European Union: Competition and commercial strategies". *Information Economics and Policy*, *27*, 24-38.

GDIP (2024), *The price of the world in your pocket: a price only some can afford*. Global Digital Inclusion Partnership. https://globaldigitalinclusion.org/wp-content/uploads/2024/09/GDIP-The-price-of-the-world-in-your-pocket-a-price-only-some-can-afford.pdf

Genakos, C., Valletti, T., & Verboven, F. (2018). Evaluating market consolidation in mobile communications. *Economic Policy*, *33*(93), 45-100.

ITU (2023) *Global Digital Regulatory Outlook 2023*. https://www.itu.int/pub/D-PREF-BB.REG_OUT01-2023

ITU (2025) *ITU ICT Price Basket Statistics Manual. Methodology for the compilation of internationally comparable ICT service price statistics based on retail price data*. January 2025. https://www.itu.int/en/ITU-D/Statistics/Documents/ICT_Prices/ITU_IPBQManual_2025.pdf

Katz, R. & Jung, J. (2025). Drivers of mobile broadband pricing: Cross-national evidence on policy and market dynamics. *Utilities Policy*, *93*, 101879. https://doi.org/10.1016/j.jup.2024.101879

Klapper, L., Singer, D., Starita, L. & Norris A. (2025). *The Global Findex Database 2025: Connectivity and Financial Inclusion in the Digital Economy*. Washington, DC: World Bank. doi:10.1596/978-1-4648-2204-9

Tohidimehr, H. (2025). Powering Digital Affordability: Can Better Electricity Infrastructure Make Mobile Services Affordable in Sub-Saharan Africa? (December 20, 2024). Available at SSRN: http://dx.doi.org/10.2139/ssrn.5166197

Weiner, M. D., & Puniello, O. T. (2014). The Effect of Poverty on the Propensity to Adopt Broadband: Household-Level Evidence from the Broadband Technology Opportunities Program. *Journal of Poverty*, *18*(4), 427–452. https://doi.org/10.1080/10875549.2014.951983

Chapter 5: Developing digital skills and opportunities for all

Today, digital technologies penetrate all structures and systems of society from politics to economics to culture. Coverage through a mobile broadband network (3G or better) has reached 96 per cent of the world's population and nearly three-quarters of the global population uses the Internet (see Chapter 2). The abundance of digital technologies in nearly every corner of society has wide-ranging impacts. Digital technologies are used for interacting socially, accessing information and entertainment, work, accessing public and health services, conducting digital transactions, and for many other purposes (see Chapter 1).

Digital access is only a part of what enables individuals to benefit from digital technologies. A persistent gap remains between those with access to broadband networks and those actually using the Internet, particularly in low-income countries and remote communities. This gap is further compounded by low levels of digital skills even among Internet users in these areas. Limited digital skills and knowledge of how to make use of digital products and services are major barriers to closing connectivity gaps and fully harnessing the benefits of digital technologies and connectivity. As a result, existing inequalities risk being further reinforced.

Digital skills are critical to achieve universal and meaningful connectivity (UMC), a situation in which everyone can access the Internet in optimal conditions, at an affordable cost, whenever and wherever needed.

The UMC framework (see Figure 1.2 in Chapter 1) outlines six connectivity enablers. Two of the enablers are directly connected with ICT skills (see Table 5.1). *Digital skills* refer to four skill areas, namely: *information and data literacy; communication and collaboration, digital content creation; and problem solving. Safety and security* refers to the fifth and final skill area – *safety*. These digital skill areas are part of a larger construct of digital skills (ITU, 2024b).

The importance of strengthening digital skills in realizing the potential of digital technology is acknowledged in the Global Digital Compact (GDC), adopted by the United Nations General Assembly in 2024 (see Box 5.1). Digital skills development is also a key element of Goal 4 on quality education within the Sustainable Development Goals (SDGs) framework. Indicator 4.4.1 "Proportion of youth and adults with ICT skills, by type of skill", for which ITU serves as custodian, monitors progress in building the digital competencies needed for education, employment, and inclusion.

Table 5.1: Digital skills in the UMC framework

Dimensions	Framework for measuring UMC	Indicators/skill areas
Digital skills	Do people possess the necessary skills to leverage digital opportunities and manage potential risks effectively? Assessing individuals' competency and confidence in using the Internet effectively.	Information and data literacy; Communication and collaboration; Digital content creation; Problem solving
Safety and security	Do people have access to secure Internet connections, can they navigate online safely, and do they feel secure in their online interactions and activities? Assessing the safety and security of user online experience including concerns and exposure to harmful content and to cyber-enabled crime.	Adopting security measures; Adopting privacy procedures; Perception of online safety

Box 5.1: Global Digital Compact (GDC)

To develop an inclusive, open, sustainable, fair, safe, and secure digital future for all, the *Global Digital Compact* (GDC) guides United Nations Member State actions until 2030 (United Nations, 2024). The GDC is a non-binding document that sets out the objectives and actions through five main objectives. For achieving basic digital skills and for their measurement, two of these objectives are of special interest:

- **Objective 1** sets goals for digital literacy, skills and capacities. This should ensure that people can meaningfully navigate the digital space according to their social, cultural and linguistic needs.
- **Objective 3** focuses on a safe and secure digital space by addressing issues such as online violence (e.g. sexual, gender-based violence), hate speech and discrimination, misinformation and disinformation, cyberbullying, and child sexual exploitation and abuse, and measures to protect privacy and freedom of expression.

5.1 Measuring ICT skills

ICT skills can be measured by examining the activities individuals report having carried out on digital devices. These reported activities serve as a proxy for having digital skills. Such data can inform targeted policies to improve ICT skills. To capture the full breadth of digital skills, current recommendations from the ITU Expert Group on ICT Household Indicators (EGH) (ITU, 2024b) refer to questions in household surveys concerning 20 activities that people carry out using digital technologies (see Table 5.2). These activities are device-agnostic, meaning they can be performed with a computer, mobile phone, or tablet (see Box 5.3 for a history of recommendations). SDG Indicator 4.4.1: *Proportion of youth and adults with information and communication technology (ICT) skills, by type of skill* is harmonized with these recommendations.

ICT skills activities are organized into five skill areas (see Table 5.2): (1) Information and data literacy; (2) Communication and collaboration; (3) Digital content creation; (4) Safety; and (5) Problem solving. Each skill area is considered equally important regardless of its number of components. The grouping reflects different areas of the construct of digital skills and is underpinned by the Digital Competence Framework for Citizens (see Box 5.2).

Table 5.2: Activities used to calculate ICT skills, by skill area

Information and data literacy	
	Verifying the truthfulness of information found online
	Finding information about goods or services
	Accessing news or books in a digital format
	Finding health information
Communication and collaboration	
	Sending content in messages
	Making calls (telephoning over the Internet/VoIP)
	Participating on social networking platforms
	Taking part in consultations via the Internet to define civic or social issues
Digital content creation	
	Editing text documents, spreadsheets or presentations using digital tools
	Duplicating or moving data, information, and content in digital environments
	Creating content combining different digital media
	Using spreadsheet software
	Programming or coding in digital environments
Safety	
	Taking security measures to protect devices and online accounts
	Taking measures to protect privacy on your device, account or app
Problem solving	
	Connecting new devices
	Installing software or apps
	Using Internet or mobile banking
	Doing an online course or accessing online learning material
	Purchasing or ordering goods or services

Box 5.2: Digital Competence Framework for Citizens

The Digital Competence Framework for Citizens (DigComp) stems from objectives of the European Union to enhance digital skills for a secure, safe and sustainable digital transformation of societies and economies. Digital competence, as one of eight key competences for lifelong learning (EU, 2018), offers a reference tool for education and training stakeholders, as well as helping to frame digital skills policies at national and international levels.

Since 2013, the DigComp framework has outlined 21 competencies which are crucial for engaging with digital technologies for learning, work, and participation in society. All of the competencies are device-agnostic, in the sense that the activities could be performed on any device such as a computer, mobile phone, or tablet. The fourth and most recent iteration was published in 2022 (EU, 2022).

Today, DigComp has been applied across a wide range of contexts; education and training systems in the European Union use DigComp as a reference framework to support curriculum planning, instruction and/or assessment (Kluzer & Pujol, 2018), and it is also deployed in contexts of employability and employment (Kluzer *et al*., 2020). DigComp is also used to track progress toward one of the European Union Digital Decade targets (EU, n.d.), ensuring that at least 80 per cent of the population has at least basic digital skills, though the Eurostat Digital Skills Indicator (Vuorikari *et al*, 2022). The DigComp framework has also been endorsed by a number of international organizations including UNESCO (2018) and UNICEF (2020).

Individuals' skill levels are calculated for each specific skill area and then aggregated across all five areas to determine overall ICT skills. Skill levels are assessed based on the number of activities individuals report having performed in the last three months. Box 5.3 provides an overview of how ICT skills data collection has evolved in recent years.

Box 5.3: Collecting ICT skills data through household surveys: A brief history

The first ITU questionnaire involving the use of ICT by households and individuals was sent to all national statistical offices in October 2005 (ITU, 2014). A core list of various ICT indicators was established soon afterwards through the Partnership on Measuring ICT for Development[1] in close consultation with other experts. Further review of these indicators continued with the establishment of the Expert Group on ICT Household Indicators (EGH) in 2012.

Two relevant historical questions related to the current ICT skills indicators, originate from the 2014 ITU Manual which introduced the revised core list of ICT indicators on household access and use. Concerning ICT skills, computer users were asked whether they had carried out any of 9 specific activities (HH15). These questions, presented as a multiple-response list, could be grouped into the following areas:

- communication (sending emails);
- digital content creation (moving a file or folder, copy-paste to duplicate or move information, creating electronic presentations, using basic formulas in a spreadsheet and computer programming);
- technical problem solving (connecting new devices, downloading software, transferring files).

In 2018-2020, the EGH created a sub-group to improve the measurement of ICT skills. The subgroup reviewed response categories and recommended two new ICT skills indicators on safety and privacy related to online activities, and a third indicator on whether respondents had verified the reliability of content found online. The 2020 updated ITU Manual also shifted to device-independent activities to better accommodate the use of smart phones connected to the Internet. In 2021, the EGH revived the subgroup to reconsider ways to aggregate indicators on ICT skills in a meaningful way. The current ICT skills indicators are the result of recommendations from this iteration of the subgroup.

1 See Documents and Publications of the Partnership on Measuring ICT for Development for details on the evolution of the core list of indicators.

Calculating ICT skill levels by skill areas

For each skill area, an individual's skill level is based on the number of activities they report having done in the last three months. Individuals reporting at least one activity in an area are assessed to have *basic digital skills* while individuals reporting two or more activities in a skill area are assessed to have *above basic digital skills*.

The share of Internet users can be used when the focus of analysis is on the behaviour of individuals using digital technologies. In this way meaningful connectivity can be analysed separately from universal connectivity. Such a comparison between different socio-economic groups or different countries can then demonstrate differences in the skill levels of specifically those already using the Internet.[22]

On the other hand, when seeking insights on the societal skills level, the share of *the total target population* of the survey can yield more information. This can be a powerful tool for skills gap analysis as it shows immediately the number of people who have used the Internet but have not carried out any activities in the given skill area. Trend analyses can also show how quickly new Internet users are picking up necessary ICT skills.

22 In some cases, there may be individuals who do not use the Internet and have digital skills in certain areas. This is seen more in countries with high use of mobile banking or integrated voice recognition services.

Measuring the level of digital skills of different social groups is important for designing more effective and more targeted digital upskilling interventions. Box 5.4 offers two "user personas" illustrating how surveys can capture actionable data across populations, including low-skilled people in marginalized areas. Understanding digital skill levels across diverse populations can help achieve better policies and avoid generating new social and economic problems due to digital exclusion.

Box 5.4: Examples of user personas to measure digital skills

Inaya is a 50-year-old fruit seller in Nairobi, Kenya who uses a smartphone daily. After completing five years of primary school, she has low literacy skills. Recently, she has installed some useful apps on her smartphone to facilitate her daily tasks. For her fruit stand, she sends pictures of her produce to various instant messaging groups. She also watches news videos on her social media feed daily.

Inaya's digital activities captured by ICT skills indicators:

- **Information and data literacy skills**: Watching news videos on a smartphone.
- **Communication and collaboration:** Sending photos of her fruit-stand produce on a smartphone.
- **Problem solving**: Inaya's installation of apps on her smartphone.

Inaya's digital activities demonstrate a basic level of skill in the areas of information and data literacy, communication and collaboration, and problem solving.

Bindu is a 35-year-old illiterate farmer in rural Uttar Pradesh, India. She uses a basic keypad phone with no connection to the Internet. She sometimes finds health-related information using her phone to navigate an automated telephone system technology to receive information from healthcare providers.

Bindu's digital activities are captured by ICT skills indicators: **Information** and **data literacy skills**: Using a basic mobile phone to navigate an integrated voice recognition system demonstrates near-equivalent results to using the Internet.

This information can help plan digital upskilling campaigns to bring individuals to the *basic level of digital skills* in all digital skill areas. In a case such as that with Inaya's, where individuals already have access to a device and connectivity, the focus should be on their weaker skill areas. For Bindu, access to a useful device and network as well as affordable connectivity will be essential to help in her everyday tasks both in farming and in her personal life.

Measuring overall ICT skill levels

Assessing overall levels of ICT skills can help with assessing how well-rounded the digital skills of a population are. For comparable results, the household survey must collect data on skill levels of individuals for all five skill areas. An individual with basic skills (having performed at least one activity) in each of the five skills areas has *at least basic digital skills*. An individual with above basic skills (having done two or more activities) in each area has *above basic digital skills*.

This approach also allows a detailed assessment of individuals with below basic digital skills. Better understanding of the extent of skills gaps can provide important information for policy-makers in terms of planning strategies for upskilling interventions. For example, an individual with basic skills in four of five areas already has a broad set of skills. Such individuals are likely to have devices and access to the Internet and are familiar with a range of online activities. Targeted training will be easier to plan in these cases than for those who lack skills in three or four areas.

The method of calculating the levels is derived from empirical work carried out in the European Union through the Digital Skills Indicator (DSI). The methodology was established in 2015 and was last updated in 2022 (EU, 2022b).

The ITU ICT skills indicators use self-reporting which is an indirect measurement method. This method is practical and simple, but because it relies on individuals self-declaring digital activities that they have carried out as a proxy for having a skill, it is susceptible to subjective bias. Box 5.5 examines other ways in which researchers are measuring digital skills, while Box 5.6 presents an approach to approximate existing digital skill learning paths.

Box 5.5: Alternative approaches to measuring digital skills

Direct measurement approaches rely on performance-based tasks or observation of individuals carrying out tasks using digital tools. They could also include real-time simulations or performance tasks with multiple-choice answers. However, these tools are resource-intensive to create and time-consuming to deploy. Examples include:

- International Computer and Information Literacy Study (ICILS) for 14-year-olds (IEA, n.d.);
- Programme for International Student Assessment (PISA) 2025 Learning in the Digital World (OECD, n.d.-b);
- Programme for the International Assessment of Adult Competencies (PIAAC) 2017 (OECD, n.d.-c).

Other ways to gauge digital skills focus on ICT professionals or ICT professions (see also ITU Digital Skills Toolkit: Chapter 8 and Chapter 2 of the Digital Skills Assessment Guidebook, ITU, 2020). They differ substantively from measurement through ICT Household surveys but can provide valuable information. Examples include:

- **ICT skills, as measured by formal qualifications**: For example, collecting data on enrolments in various fields of education and levels of attainment. Standards are set jointly by UNESCO-UIS, OECD and EUROSTAT (Eurostat, n.d.-b).
- **Demand for ICT skills from job listings**: Analysis of online job advertisements (OJAs) to understand employers' demand for ICT skills and the types of available jobs. For example, the Skills-OVATE platform (Cedefop, n.d) analyses online job advertisements from 32 European countries.
- **ICT employment**: People working in the information and communication technology (ICT) sector. This indicator is measured as a percentage of business sector employment (OECD, n.d.-a).
- **Measurement of ICT occupations**: For example, focusing on employed persons by detailed occupation (ISCO-08 two-digit level) in labour force surveys. Data on employment is used as a proxy (Eurostat, n.d.-a).

Box 5.6: Measuring learning paths of digital skills

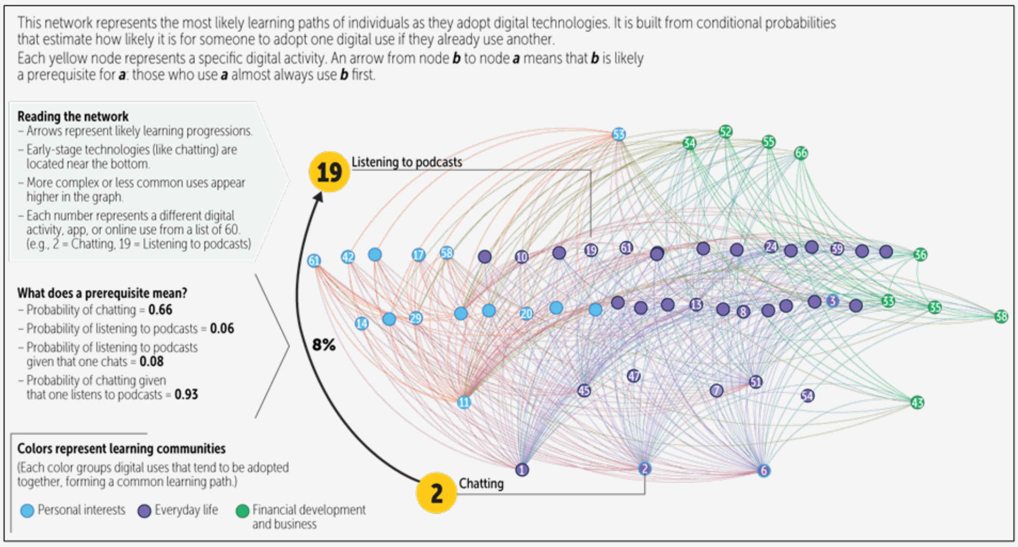
In the Republic of Columbia, the *Centro Nacional de Consultoria* (National Consulting Centre) developed a "digital appropriation path network" to describe the most probable learning paths for adopting digital tools (see Figure 5.1). It aims to identify which technologies must be learned before others and the difficulty of adoption in different contexts using survey-based conditional probabilities expressed as *p(a|b)* - the likelihood of using technology "*a*" given their use of "*b*".

When *p(a|b)* is high and *p(b|a)* is low, *b* is considered a prerequisite for *a*. For example, while 88 per cent of people who sell online also send text messages, only 5 per cent of those who send text messages sell online. This suggests that messaging is a preliminary step before selling online.

The method builds:

- a conditional probability matrix from survey data;
- a "prerequisite matrix" (e.g. $p(b|a) \geq 0.8$ and $p(a|b) < 0.8$) indicating dependencies;
- a network of levels from basic technologies (no prerequisites) to move advanced technologies, reflecting the sophistication level of each technology;
- groups of technologies via network algorithms to reveal common learning paths.

Figure 5.1: Network of digital appropriation and transformation paths



Source: Centro Nacional de Consultoria, Colombia

The resulting network orders technologies from basic to advanced, highlighting adoption paths and barriers, and supporting strategies to strengthen digital skills.

This methodology has two fundamental limitations. The first limitation is the large sample requirements meaning that rare technologies have high error margins, for example crowdfund investment activity was recorded in only 12 cases out of a sample of 3 600. The second limitation is that the definition of prerequisites in the network is data-driven and needs further conceptual research on why some technologies precede others.

For more details see https://www.centronacionaldeconsultoria.com/apropiacion-digital.

5.2 Analysis and interpretation of data on ICT skills

Measuring the level of digital skills among individuals offers insights into policy needs across different demographic groups. Cross-country comparisons and trend analyses provide important information on the level of digital skills among a population.

However, data limitations persist. Data collected from countries rarely include comprehensive socio-economic disaggregations. In addition, the current measurement method was only recently introduced as an international recommendation (see previous section). Consequently, data availability remains very limited in many regions and particularly in those most in need of digital upskilling. Despite these limitations, available data shows clear trends and meaningful differences in skill levels across socio-economic groups, including among Internet users. Some of the more noteworthy results are described in this section. Further data on digital skills and digital skill levels are available in the ITU DataHub.

Little evidence of gender divides

The magnitude of divides varies by skill area and socio-economic group. For some areas such as gender, trends are less apparent for countries reporting data on ICT skills. A common pattern across most countries with available data is that Internet use is reported to be roughly equal between men and women. Similar gender parity for ICT skills shows that in these countries there is no 'hidden' gender gap in ICT skills among Internet users. However, wider gender disparities in Internet use are found in many other countries not covered by the available data. More data on ICT skills for such countries would help assess whether such gaps are compounded by skills gaps.

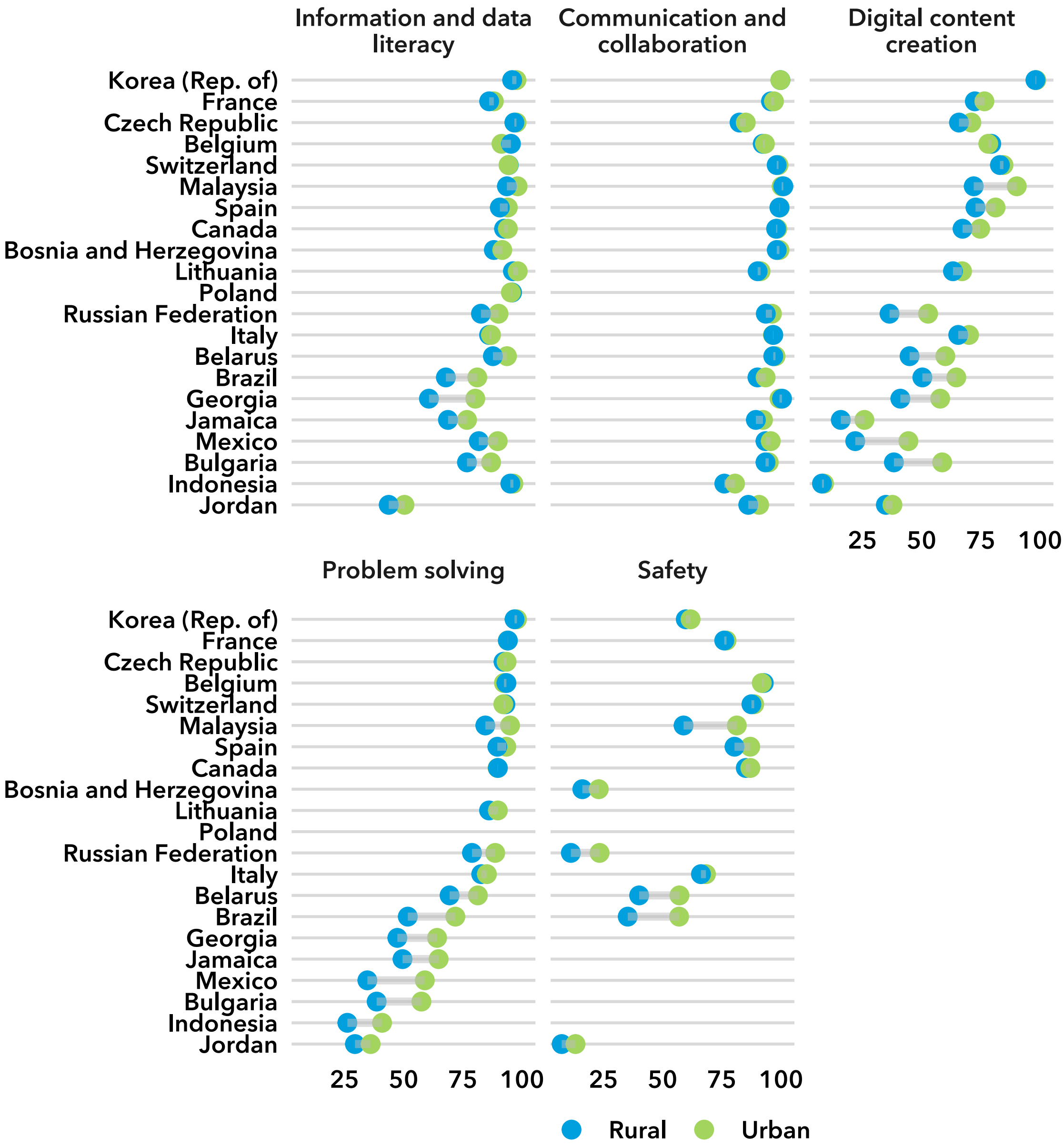
Digital skills for rural Internet users lag in some skill areas

Data for 21 countries in the Europe region, the Asia and the Pacific region, and in the Americas region show how digital skills vary between urban and rural populations (see Figure 5.2). The most striking finding is in the area of communication and collaboration, where a very high percentage of Internet users, both in urban and rural areas, have at least a basic level of digital skills. This is perhaps unsurprising as almost all Internet users engage in basic activities such as using the Internet for messaging or calling.

In the other four skill areas, the distinction between urban and rural residence is sharper. In each case, a higher proportion of Internet users living in urban areas have at least basic digital skills compared with those in rural areas.

The widest disparities by residence are in countries with lower levels of digital skills while disparities are least in countries where skill levels are very high. For countries such as the Czech Republic, France, the Republic of Korea, and the Confederation of Switzerland there is essentially no urban-rural digital skills gap among Internet users. This gap is wider in countries with lower levels of digital skills such as the Republic of Bulgaria, Georgia, and Mexico. The differences in skill level by location are especially large for digital content creation (skills such as using spreadsheet software or creating and editing a short video) and problem solving (skills such as installing apps or using Internet banking).

Figure 5.2: Share of Internet users with at least basic ICT skills, by country, skill area and urban/rural residence, 2024 or latest year



Note: Includes countries with data for 2021 or more recent data. Countries are ordered by overall problem-solving skill levels as most countries have available data for this skill area.

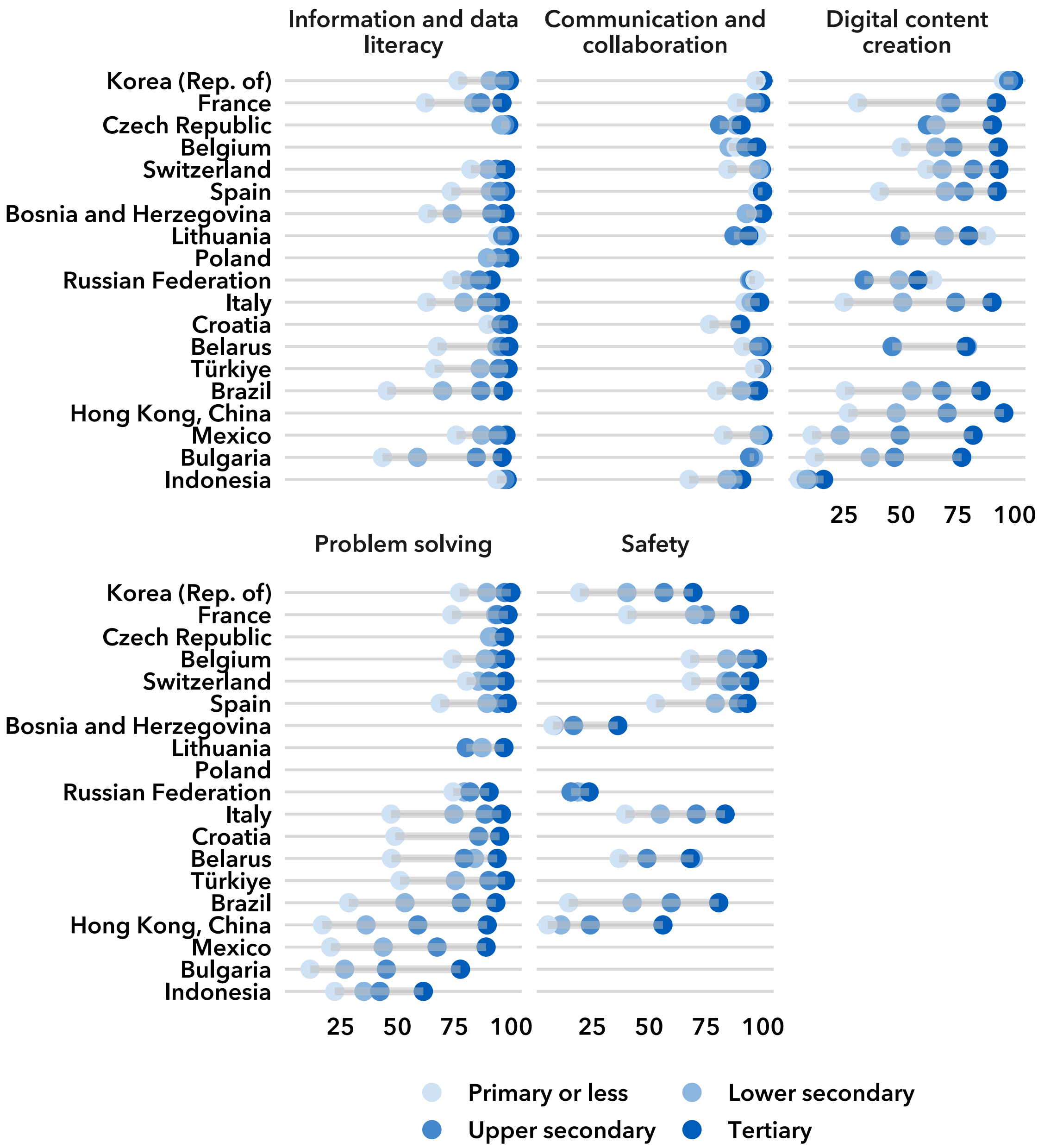
Source: ITU

Strong links between educational attainment and digital skills

Figure 5.3 shows the percentage of Internet users with at least basic digital skills in different skill areas by educational attainment, based on the UNESCO ISCED 2011 classification.[23] Data are available for 19 countries in the Europe, the Asia and the Pacific, and the Americas regions.

[23] More detail available from UNESCO: https://uis.unesco.org/en/topic/international-standard-classification-education-isced

Figure 5.3: Share of Internet users with at least basic ICT skills by country, skill area and level of education attained, 2024 or latest year



Note: Includes countries with data for 2021 or more recent data. *Primary or less* refers to ISCED 0-1, *Lower secondary* to ISCED 2, *Upper secondary* to ISCED 3-4, *Tertiary* to ISCED 5+. Countries are ordered by overall problem-solving skill levels as all countries have available data for this skill area.

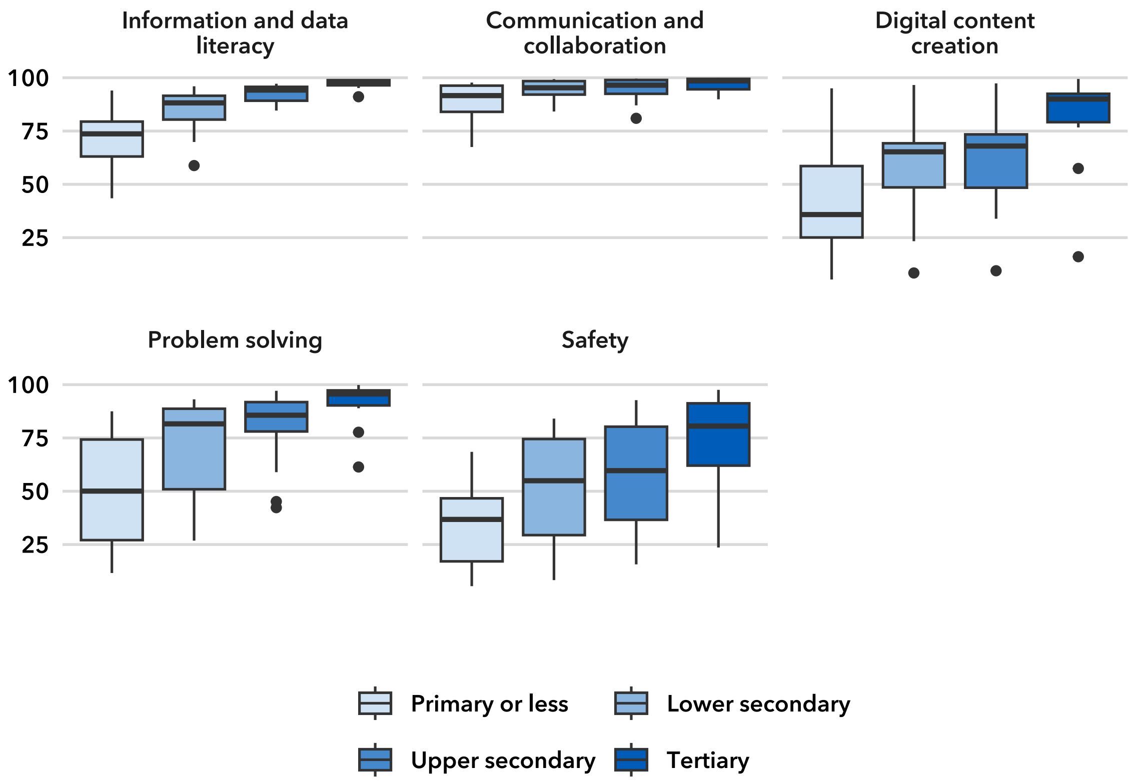
Source: ITU

Among Internet users with tertiary education, the highest level, there is very little variation across countries in communication and collaboration, information and data literacy (skills such as finding health information online or accessing news online), and problem solving. Exceptions include skill levels in digital content creation and safety which are more varied even among Internet users with tertiary education. Additionally, Internet users show high levels of communication and collaboration skills regardless of their education level and country.

A similar pattern emerges for information and data literacy skills, although Internet users with lower levels of education appear to lag slightly behind their more highly educated peers. As some individuals with lower levels of education may be actively pursuing further studies, this correlation may also reflect how schooling itself can increase digital competency.

For other skill areas, the level of education attained is closely linked to the development of digital skills. Each country reports similar sharp divides in digital skill levels between individuals with different education levels. Among the starkest divides is in digital content creation (see Figure 5.4). While digital content creation is typically an activity related to office-based and managerial tasks in employment, it is now also essential for a fulfilling experience outside of this environment, for example by using smartphone applications to create content to share in messages or through social media.

Figure 5.4: Share of Internet users with at least basic ICT skills by skill area and level of education attained, 2024 or latest year



Note: Data for 19 countries with available data for 2021 or more recent data. *Primary or less* refers to ISCED 0-1, *Lower secondary* to ISCED 2, *Upper secondary* to ISCED 3-4, *Tertiary* to ISCED 5+. Bars indicate the 25th, median and 75th percentile of all country values. Bottom and top lines indicate the minimum and maximum values (excluding outliers). Outliers are marked with a dot.

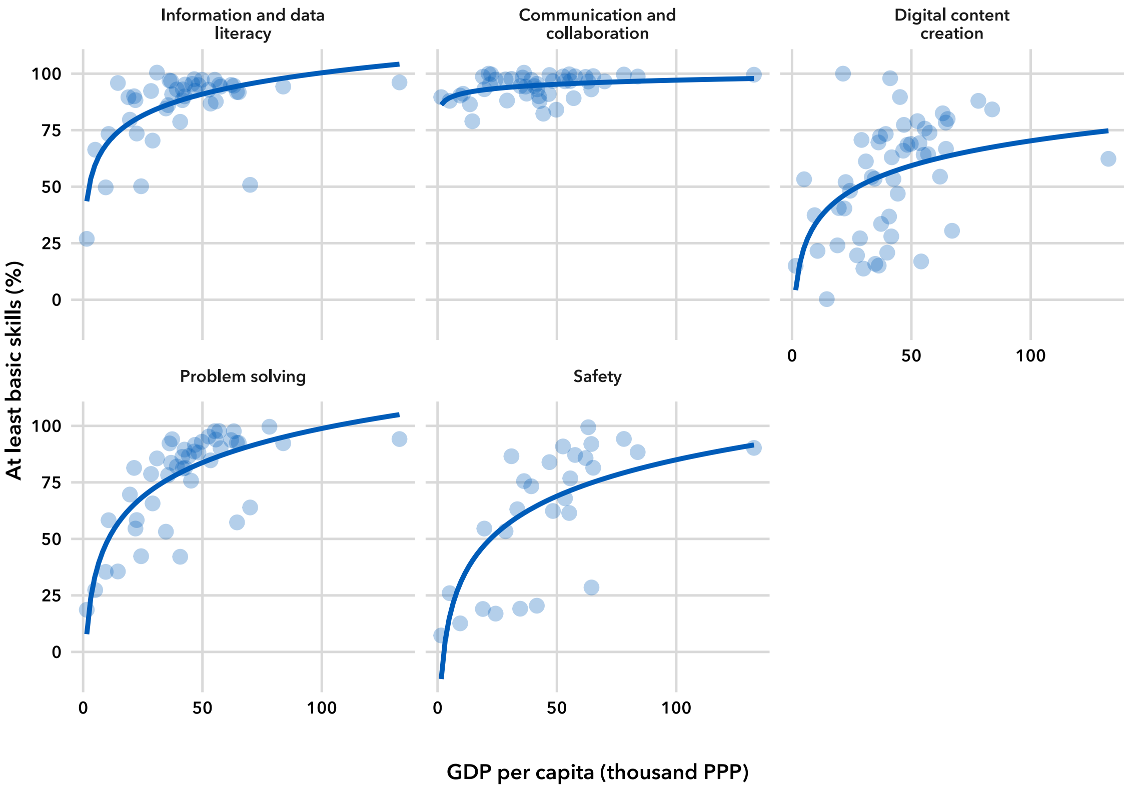
Source: ITU

Problem solving is another area where the level of education reveals a gap in how individuals are able to take advantage of digital technologies to perform tasks such as installing new software or apps and using apps for digital transactions, online shopping or learning. In the essential area of online safety, data availability remains an obstacle. However, a similar pattern emerges with those with lower levels of education being more vulnerable to online attacks and digital hoaxes (e.g. financial scams, online fraud, identity theft, malware attacks, etc.).

Relationship between digital skills and country income level varies by skill area

Data for 47 countries reveals a weak relationship between national income levels (approximated by GDP per capita) and the digital skills of Internet users (see Figure 5.5). Nearly all Internet users have at least basic skills in communication and collaboration, regardless of country income levels. There is more variation in other skill areas, which also confirms previous insights, especially in digital content creation and safety, two areas where countries at a similar income level may achieve very different results. This suggests that income level does not fully predict digital skills of a population, or vice versa. However, the relatively low data availability limits stronger conclusions.

Figure 5.5: Share of Internet users with at least basic ICT skills and GDP per capita by skill area, 2024 or latest year



Note: Includes countries with data for 2021 or more recent data. GDP per capita refers to 2021 constant price PPP USD (in thousands).

Source: ITU; International Monetary Fund (IMF) for GDP per capita.

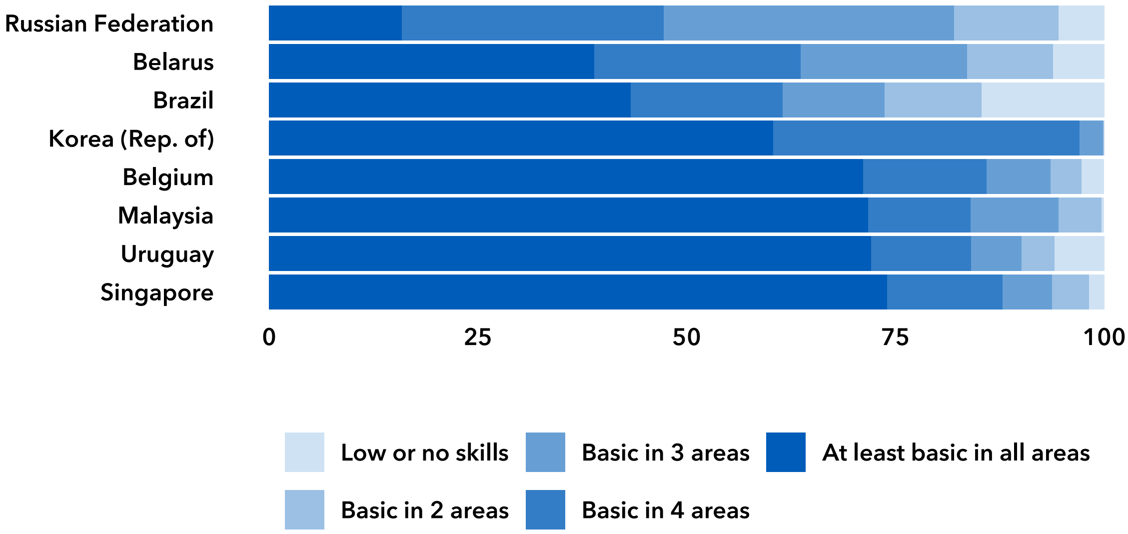
Despite limited availability, overall skills data provide important insights

Figure 5.6 presents the distribution of Internet users in countries with available data based on the newly adopted classification of overall ICT skill levels (see Section 5.1). *Overall ICT skill levels* refers to the proficiency of individuals across the five ICT skill areas.

Although data remains limited, it highlights notable cross-country variation in digital skill proficiency. For instance, in the Republic of Korea, nearly all Internet users have either basic or above-basic skills, with very few falling below basic proficiency in more than one skill area. This suggests that the main challenge is to enhance existing competencies rather than addressing foundational gaps.

By contrast, countries such as Brazil, the Republic of Belarus, and the Russian Federation face broader challenges: more than a third of Internet users in each possess below-basic skills in two or more areas, and a significant share of Internet users lack basic proficiency in any of the five skill areas. This highlights a significant digital skills gap among Internet users.

Figure 5.6: Share of Internet users with overall ICT skills, 2024 or latest year



Note: Includes countries with data for 2021 or more recent data.

Source: ITU

An important advantage of this overall classification is that it provides a clearer picture of the scale and nature of upskilling needs across countries. Although only a limited number of countries have so far reported data using this method, its broader adoption, particularly by low- and lower-middle-income countries, could offer critical insights into the global digital divide and help inform better digital inclusion policies.

This data also reveals the compounding nature of digital divides: lower income countries not only have lower Internet penetration, but also lower levels of ICT skills even among Internet users.

5.3 Recommendations for evidence-based digital skills policies

Digital skills have become a key policy priority, as governments shift their focus from ensuring basic ICT access to enabling individuals to benefit from connectivity, while minimizing its risks and adverse effects. Countries need comprehensive and effective national digital skills strategies to leverage connectivity for social and economic development (see Box 5.8 for the example from the Eastern Republic of Uruguay). Aiming for universal access and use is not enough and national plans should include digital upskilling for meaningful use of digital technologies (see Box 5.7). ITU Digital Skills Toolkit offers a step-by-step guide (ITU, 2024a) for developing such strategies.

Box 5.7: ITU Digital Skills Forum 2024

Under the theme "Developing skills for digital transformation", the ITU Digital Skills Forum 2024 reaffirmed that digital skills are essential for a sustainable and prosperous future.

Launched at the ITU Digital Skills Forum 2024, the ITU Digital Skills Toolkit is a practical guide for developing and implementing a national digital skills strategy and roadmap. The Toolkit offers policy-makers and regulators step-by-step guidance and highlights the need of a digital skills assessment as part of any strategy. Such assessments are critical to understand demand, whether from employers or in civic life, and to measure the supply of people who have sufficient digital skills.

Discussions showcased good practices and challenges from digital-capacity development initiatives worldwide. Participants stressed the importance of promoting digital skills that enable citizens to recognize disinformation, critically assess online content, and apply safe online practices. They also underscored that non-technical skills, such as creative thinking, problem-solving, and human-centred communication must complement technical training.

Delegates acknowledged that that partnerships and multi-stakeholder collaboration are vital to bridging digital-skills gaps and addressing unequal access to technology, education, training, and infrastructure. They called for stronger dialogue among governments, academia, and the private sector to develop joint, forward-looking solutions.

- Digital Skills Forum 2024: https://www.itu.int/itu-d/meetings/digital-skills-forum/
- Digital Skills Toolkit: https://academy.itu.int/itu-d/projects-activities/research-publications/digital-skills-toolkit

Surveying ICT skills across the population provides the baseline needed to measure progress and design targeted policies. The current list of ICT skills indicators (see section 5.1) is well aligned with the evolving nature of digital technologies and the changes that they bring to society and the economy.

Setting concrete targets helps create national ambitions and accountability. The European Union, for example, aims to ensure that 80 per cent of the population possesses at least basic digital skills by 2030. Similar targets can also be linked with international initiatives, such as the UMC framework[24] and the Global Digital Compact (GDC). Targets should cover all skill areas to foster well-rounded digital capabilities that go far beyond simply connecting to the Internet.

Digital-skills programmes should reach all segments of the population, including those who need skills for employment and those outside the labour force such as older individuals (see Box 5.9). They should also reach women and girls, children and youth, persons with disabilities, migrants, refugees, and internally displaced persons to minimize rather than exacerbate existing societal divides.

Programmes should also be tailored to the education level of participants and whether they use the Internet or not. In countries with lower levels of Internet use, efforts should prioritize rural populations, who are most likely to lag behind in digital competence.

[24] See Chapter 2 for more detail on the UMC targets

Box 5.8: Uruguay 2024-2028: National Strategy on digital citizenship for an information and knowledge society

In its strategy, Uruguay established a conceptual framework and common strategic lines that help define competencies for Digital Citizenship (AGESIC, 2024). This framework aims to help coordinate actions among various actors and organizations involved in digital upskilling.

At the conceptual level, the competencies for Digital Citizenship can be mapped to five ICT skill areas making it coherent with international targets (see Table 5.2). The National Strategy focuses on the construction of citizenship in the digital environment and on defining citizen competencies in terms of digital data and data economy, digital platforms, and a basic understanding of the impact of artificial intelligence.

Notably, the strategy is closely aligned with other national strategies such as the Cybersecurity Framework, the Artificial Intelligence Strategy, the National Data Strategy, and the regulatory frameworks for Personal Data Protection, Digital Accessibility, Environmental Protection or Access to Public Information. This alignment is essential to ensure coherence at the national level and to clarify how all actors are working towards the common goal of digital upskilling of citizens.

Box 5.9: National initiatives for enhancing ICT skills in older persons

Several countries have launched dedicated programmes to equip older individuals with digital skills to bridge the digital divide and foster social inclusion in an increasingly technology-driven world.

In the Republic of Singapore, Seniors Go Digital helps seniors adopt digital technology and embrace a digital lifestyle. It focuses on providing seniors with essential digital skills, such as using smartphones, accessing e-services, and staying connected with family and friends online. It includes one-on-one assistance at Seniors Go Digital community hubs as well as a wide range of workshops tailored to the needs of seniors. Similarly, in Austria the *Gütesiegel – Digitale Senior:innen* (Digital Seniors Seal of Quality) programme certifies high-quality ICT training programmes for older adults. This initiative ensures that seniors have access to trusted, age-appropriate learning environments where they can acquire skills such as using smartphones, navigating the Internet, and accessing online government services.

In the Slovak Republic the Digital Seniors programme aims to train over 100 000 people aged 65 and above, and disadvantaged individuals in digital skills by mid-2026. The programme addresses issues such as social isolation, fake content, and limited access to information, as well as issues related to possible anxiety about technology. Participants receive training tailored to their skill level, and tablets with data plans to support ongoing learning and digital inclusion.

In India, the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) programme aims to improve digital literacy in rural areas, including among seniors. Tailored sessions teach seniors how to access government welfare schemes, use mobile wallets, and conduct video calls. In Brunei Darussalam, the Digital Brunei Empowers Warga Emas Community programme organized by the Authority for Info-communications Technology Industry (AITI), in collaboration with local partners including BIBD and Cyber Security Brunei focuses on educating seniors on digital safety, online scams, and the use of local digital applications. Similarly, in the United Kingdom, the government partners with organizations such as Age UK to offer Digital Skills for Seniors programmes, while the Online Centres Network provides free or low-cost digital training in local communities.

These initiatives not only equip older persons with practical digital skills but also foster independence, inclusion, and ultimately well-being.

Special attention should be given to strengthening digital safety skills. As highlighted in Chapter 1, the rise in cyber-enabled crime underscores the urgency of training individuals to protect their privacy and security online. Data shows the need to invest in developing citizens' knowledge of cybersecurity and privacy, and in building digital skills required for the safe use of devices, online accounts, websites, and applications. The lack of such skills poses significant risks not only to personal safety but also to public trust, particularly in environments where false or misleading information circulates widely.

Data is essential to guide targeted efforts to close digital skills gaps. It can help align workforce development programmes with the needs of employers and ensure that upskilling initiatives empower populations to effectively access essential e-government services.

The measurement of ICT skills should form a core part of any national digital development plan. A systematic approach to measuring ICT skills helps align data producers, national statistical offices (NSOs), and government agencies that compile official statistics, with policy-makers across the government.

To measure ICT skills, NSOs should conduct ICT household surveys and apply international recommendations (ITU, 2025). The ITU list of recommended ICT skills indicators is well aligned with the evolving nature of digital technologies and their impact on society and the economy. Existing survey instruments should be reviewed and adapted to reflect the latest methodology. The ITU Academy offers training on ICT measurement and supports the capacity development of NSO staff.

Finally, countries should measure progress regularly and report results at the national and international levels to enhance visibility and accountability. Making data and methods openly available on public websites or other open-access platforms enables stakeholders to collect, use, and analyse data effectively and to plan strategies based on reliable, up-to-date data.

References

Agencia de Gobierno Electrónico y Sociedad de la Información y del Conocimiento. (2024). *Estrategia Nacional de Ciudadanía Digital para una Sociedad de la Información y el Conocimiento. Uruguay 2024-2028*. https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/comunicacion/publicaciones/estrategia-nacional-ciudadania-digital-para-sociedad-informacion

Cedefop. (n.d.). *Skills-OVATE*. Website: https://www.cedefop.europa.eu/en/tools/skills-online-vacancies

European Union. (n.d.). *Europe's Digital Decade Targets 2030*. Website: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

European Union. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens–With new examples of knowledge, skills and attitudes*. Publications Office of the European Union. https://doi.org/10.2760/115376 and http://joint-research-centre.ec.europa.eu/digcomp_en.

European Union. (2018). *The recommendation on Key competences for lifelong learning*. Publications Office of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2018.189.01.0001.01.ENG&toc=OJ:C:2018:189:TOC

Eurostat. (n.d.-a). *ICT specialists in employment*. Website: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=ICT_specialists_in_employment

Eurostat. (n.d.-b). *Reference metadata: Pupils and students–Enrolments*. Website: https://ec.europa.eu/eurostat/cache/metadata/en/educ_uoe_enr_esms.htm

IEA. (n.d.). *International Computer and Information Literacy Study (ICILS)*. Website: https://www.iea.nl/studies/iea/icils

ITU. (2014). *Manual for Measuring ICT Access and Use by Households and Individuals*. https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITCMEAS-2014-PDF-E.pdf

ITU. (2020). *Digital Skills Assessment Guidebook*. https://academy.itu.int/itu-d/projects-activities/research-publications/digital-skills-insights/digital-skills-assessment-guidebook

ITU. (2024a). *Digital Skills Toolkit*. https://academy.itu.int/itu-d/projects-activities/research-publications/digital-skills-toolkit

ITU. (2024b). *ICT skills report from the Expert Group on Household ICT Indicators*. https://www.itu.int/itu-d/meetings/egh2024/wp-content/uploads/sites/28/2024/09/EGH2024_ICTSkillsReport.pdf

ITU. (2025). Manual for measuring ICT access and use by households and individuals, 2020 Edition–2025 ICT skills revision (HH9/HH15). https://www.itu.int/en/ITU-D/Statistics/Documents/publications/manual/ITU_HHManual_ICTskills_rev2025.pdf

Kluzer, S., & Pujol, L. (2018). *DigComp into action, get inspired make it happen – A user guide to the European Digital Competence framework*. Publications Office of the European Union. https://op.europa.eu/en/publication-detail/-/publication/2b2c2207-5ca2-11e8-ab41-01aa75ed71a1/language-en

Kluzer, S., Centeno, K., & O'Keeffe, W. (2020). *DigComp at work*. Publications Office of the European Union. https://op.europa.eu/en/publication-detail/-/publication/de6190cb-c4b2-11ea-b3a4-01aa75ed71a1/language-en

OECD. (n.d.-a). Website: *Indicators, ICT employment*. https://www.oecd.org/en/data/indicators/ict-employment.html

OECD. (n.d.-b). Website: *PISA 2025 Learning in the Digital World*. https://www.oecd.org/en/topics/sub-issues/learning-in-the-digital-world/pisa-2025-learning-in-the-digital-world.html

OECD. (n.d.-c). Website: *Survey of Adult Skills (PIAAC)*. https://www.oecd.org/en/about/programmes/piaac.html

United Nations. (2024). *Global Digital Compact*. https://www.un.org/global-digital-compact/sites/default/files/2024-09/Global%20Digital%20Compact%20-%20English_0.pdf

UNESCO Institute for Statistics. (2018). *A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2*. https://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf

UNICEF. (2020). Digital Literacy for Children: Exploring definitions and frameworks. DOI:10.13140/RG.2.2.33394.94407

Vuorikari, R., Jerzak, N., Karpinski, Z., Pokropek, A. and Tudek, J., Measuring digital skills across the EU – Digital skills indicator 2.0, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2760/897803

Chapter 6: Measuring what matters: Strengthening national data ecosystems

A strong system for statistical measurement of digital development is essential to design effective, evidence-based policies aligned with the principle of universal and meaningful connectivity (UMC) outlined in Chapter 1.

Despite their critical role in achieving UMC, many national data ecosystems suffer from persistent resource constraints, leading to a self-perpetuating cycle of limited demand for data results amidst even weaker supply. This chapter first introduces the UMC measurement framework, before reviewing the key challenges in collecting data and compiling the relevant indicators. It then explores ways to improve these ecosystems, including through institutional reforms, capacity-building, and use of new methods and data sources.

6.1 The development of a statistical framework for UMC

The year 2024 marked a turning point in the measurement of progress towards universal and meaningful connectivity. The Global Digital Compact (GDC), adopted in September 2024, emphasized the need to strengthen national statistical systems, particularly through digital inclusion surveys. The GDC recognized the pivotal role of ITU in advancing UMC and called for the development of harmonized targets, indicators, and metrics aligned with SDG 9. The GDC also called for increased overall investment in data and statistics, as well as in capacity-building in data skills.

In 2024, under Brazil's G20 Presidency, ITU served as a Knowledge Partner to the G20 Digital Economy Working Group, collaborating with the Presidency on the report "Universal and meaningful connectivity: A framework for indicators and metrics" (G20 Digital Economy Working Group, 2024). This document highlighted the importance of harmonized indicators, assessed G20 countries' statistical capacities, showcased innovative measurement methods, and provided recommendations to strengthen national statistical systems. In 2025, South Africa's G20 Presidency continued this focus, advocating for innovative data systems and sustainable financing for household surveys in support of evidence-based digital inclusion policies.

These efforts build on earlier recognition of ICT statistics in the SDG framework, which includes seven ICT-related indicators[25] across SDGs 4, 5, 9, and 17, for which ITU serves as custodian or co-custodian. The international community, through the Partnership on Measuring ICT for Development, a consortium of 14 international and regional organizations, continues to coordinate methodological work and maintain a core list of ICT indicators, including 23 household and individual indicators essential for measuring the different dimensions of UMC.

For a comprehensive understanding of the connectivity conditions of a population, it is essential to adopt a multidimensional perspective that encompasses the various aspects of UMC such as access to and use of the Internet, the devices used, the quality of connections, the financial feasibility of acquiring the necessary resources for smooth navigation, as well as the opportunity for use in different environments and with the desired intensity. A multidimensional approach also provides valuable insights into the diverse pathways countries take toward achieving UMC, as well as the different connectivity challenges they face.

A measurement framework was therefore proposed by ITU and adopted by the G20

25 See https://www.itu.int/en/ITU-D/Statistics/Pages/intlcoop/sdgs/default.aspx.

(see Table 6.1) using the definition of universal and meaningful connectivity, including six dimensions: quality of connectivity, availability, affordability, devices, digital skills, and safety and security. For each dimension, it outlines key policy questions and measurement concepts along with concrete statistical indicators, drawing on previous and ongoing efforts in ICT statistics.

Table 6.1: Indicators for measuring UMC

Dimensions	Proposed indicators
Connection quality	Households with broadband connections; Household broadband connections by technology and speed; Mobile connections by technology (e.g. 4G or 5G)
Availability for use	Frequency of Internet use; Perception that the use intensity meets their needs; Internet use by type of location (e.g. home, workplace, educational institution, public areas, community centres, on the move)
Affordability	Cost of fixed-household Internet connection; Cost of mobile data plan; Cost of mobile and fixed devices; Availability of unlimited data package
Devices	Ownership of a smartphone; Availability of devices in the household (number and type); Diversified use of devices (e.g. smartphones, computers)
Digital skills	Information and data literacy; Communication and collaboration; Digital content creation; Problem solving
Safety and security	Adopting security measures; Adopting privacy procedures; Perception of online safety
Demographic indicators	Priority: Age; Gender; Household size (number of residents). Additional: Ethnicity or race; Migration status; Belonging to traditional communities or groups.
Economic indicators	Priority: Education level; Household income. Additional: Individual income; Workforce status (employed, unemployed, student, retired).
Location indicators	Priority: Rural/Urban; Location (the more disaggregated the better, e.g. region, state, city, district). Additional: Municipality size (number of inhabitants); Hard-to-reach territories.

The UMC measurement framework, used in Chapter 2 to present the global status of digital development, focuses on measurable enablers of connectivity, such as infrastructure, affordability, access, and skills, that can be consistently monitored across countries using official statistics. The indicator list is neither exhaustive nor definitive and it does not cover other aspects of digital transformation, such as the policy and market environment, or the impacts on well-being. Other frameworks have been developed to compile quantitative evidence. For example, ITU has developed the ICT Regulatory Tracker to assess the maturity of ICT regulatory environments, to reflect the shift from monopoly-era regulation to integrated, collaborative regulation of the broader digital ecosystem. The OECD has also developed a framework to define digital well-being and guide the compilation of statistics as part of its "How's Life?" reports (see Box 6.1).

Box 6.1: OECD conceptual framework for digital well-being

The OECD 2024 working paper "The impact of digital technologies on well-being" (OECD, 2024), highlights that while digital tools and platforms can enhance mental and physical health, for instance through AI-powered assistive care and telemedicine, they can also contribute to rising rates of anxiety, loneliness, and behavioural issues.

Recognising this complexity, the OECD Centre on Well-being, Inclusion, Sustainability and Equal Opportunity (WISE) has developed a framework to assess the effects, using both subjective and objective indicators. The framework distinguishes between passive digital exposure (e.g. screen time) and active engagement (e.g. social media communication) and links these experiences to core dimensions of the OECD Well-being Framework. It also compliments other OECD work such as *Measuring the Digital Transformation: A Roadmap for the Future* (OECD, 2019).

The OECD Digital Well-being Hub together with Cisco, developed a crowdsourcing polling tool that gives everyone the opportunity to share their experiences of how new technologies have affected their wellbeing, and a dashboard that presents key statistics across nine dimensions of well-being. The tool is directly based on the OECD Well-being Framework for three main reasons: first, the key dimensions of well-being are relevant in the context of digital transformation as they capture the most visible and relevant aspects of people's lives; second, the alignment with the dimensions of well-being allows for greater comparability with related research focused on specific dimensions such as mental health (OECD, 2023); and third, the Framework is recognised by governments and other stakeholders as an international standard for measuring well-being, and is increasingly used in national policy processes (e.g. the OECD-WISE Knowledge Exchange Platform).

By triangulating the findings of the polling with insights from the academic literature reviewed (OECD, 2024), the polling tool allows for a comprehensive analysis of how the technology influences people's lives across different dimensions of well-being. It highlights not just the benefits of digital connectivity, but also the importance of mitigating the associated risks by fostering digital literacy, managing screen fatigue, and addressing mental health concerns in a digitised society.

The socioeconomic dimensions considered in the UMC statistical framework are oriented towards the adult population. To observe the conditions of children, it is necessary to adapt to the reality of this population group by considering other dimensions, such as the appropriation of technology in educational programmes, recommended dynamics for the use of specific technologies for children, suitable devices for activities, parental mediation, and appropriate places for use and non-use. The collection of data on children also has its own specificities (see Box 6.2).

Box 6.2: Measuring Kids Online: Technical measurement issues relating to children's digital lives around the world

Measurement of children's digital lives is essential to understand how Internet access and use affect their well-being and life opportunities, identify opportunities to improve inclusion, education, and harm mitigation, and provide benchmarks to evaluate policies, programmes, and future innovations over time.

Over the past two decades, key organizations, including ITU, UNICEF, UNESCO, OECD and the academic community have developed methods to measure children's digital lives. The EU Kids Online programme launched in 2006 with European Commission support, laid foundational work, and was further expanded into Global Kids Online in 2015, with funding from WeProtect and UNICEF.[1] The Disrupting Harm project (implemented by UNICEF, ECPAT and Interpol) has focused on technology-facilitated child sexual exploitation and abuse, collecting data across 40 countries on children's online access and use, risks and opportunities, and digital skills and forms of safety provision (ITU 2022). This work combines robust and cognitively tested measures; a comparable core with optional country-specific modules; open-access toolkits for transparency and reuse; periodic analyses to inform international policy-making; as well as ethical procedures and other research (Livingstone *et al*, 2016; CO:RE, 2023).

Despite progress, challenges in measurement remain only partly resolved and will require greater effort from researchers and NSOs as technology continues to evolve. While global evidence has grown, significant gaps remain, especially concerning very young children and disadvantaged or marginalized groups including children with disabilities or those without parents. In high-income countries, there is extensive research on well-being, vulnerabilities, social relationships, gaming, identity, learning, and creativity allowing for robust statistical analysis of both populations and subgroups. However, in middle- and low-income countries evidence is scarce due to limited resources for household surveys.

Surveying children demands specialized training and adherence to additional ethical protocols which add time and cost (Berman, 2026). Clear terminology is essential, and cognitive testing shows many children do not count social media apps or games as "using the Internet" unless specified. Social desirability effects are pronounced: if a parent is present, children may under-report risks, whereas conversely, parental support can improve confidence and comprehension.

Children count, in every society, and so they must be counted. It is hard to imagine policy-making for children's digital lives without acquiring knowledge about their online experiences.

1 ITU has adopted 11 key indicators from the Global Kids Online questionnaire.

6.2 The capacity to measure progress towards UMC

The promotion of evidence-based policy-making, in digital development as in other domains, requires strengthening the capacities of national administrations to compile and use statistics, in line with the United Nations 2.0 "quintet of change"[26] and the Global Digital Compact (GDC). The GDC further underscores the urgency of building robust statistical systems and enhancing data collection to ensure that no one is left behind in the digital era.

26 The "Quintet of Change" is a framework within the UN 2.0 initiative that focuses on five key areas: data, digital transformation, innovation, strategic foresight, and behavioral science.

ICT statistics are relatively new in the official statistics landscape, having been collected by NSOs only from the early 2000s, and so much later than established statistical domains such as industrial or labour statistics, or demographic or agricultural statistics. Consequently, countries vary in their experience and capacity to compile these statistical data. The ICT domain has unique characteristics, including the rapid evolution of technologies, new applications, shifting digital behaviours, and the need to collect information from multiple sources encompassing both supply-side and demand-side data (see Table 6.2).

Although there is no single definition of statistical capacity, it generally refers to the institutional arrangements, technical skills, and data-use practices that enable a national statistical system to produce and apply quality statistics., The Partnership in Statistics for Development in the 21st Century (PARIS21), a consortium aiming to improve the production and use of statistics for informed decision making by the United Nations, the European Commission, the OECD, the IMF and the World Bank, defines it as "the process through which national statistical systems and their institutions strengthen their ability to collect, produce, analyse, and disseminate high-quality data that meet user needs[27]".

There is a strong, positive correlation between a country's overall statistical capacity as measured by the World Bank Statistical Performance Index (SPI)[28], which is not specific to ICT statistics, and its GNI per capita (see Figure 6.1), indicating that poorer countries tend to have weaker statistical systems. Considering the very close relationship between economic development and digital development (see Chapters 1 and 2), this situation is obviously problematic: those countries that stand to benefit the most from high-quality data to inform more efficient policies, are those with the least capacity to produce this data.

Using the availability and timeliness of ICT data submitted by countries to ITU as an indication of national capacity to produce ICT statistics, ITU analysis reveals that this capacity is closely linked to the level of development.

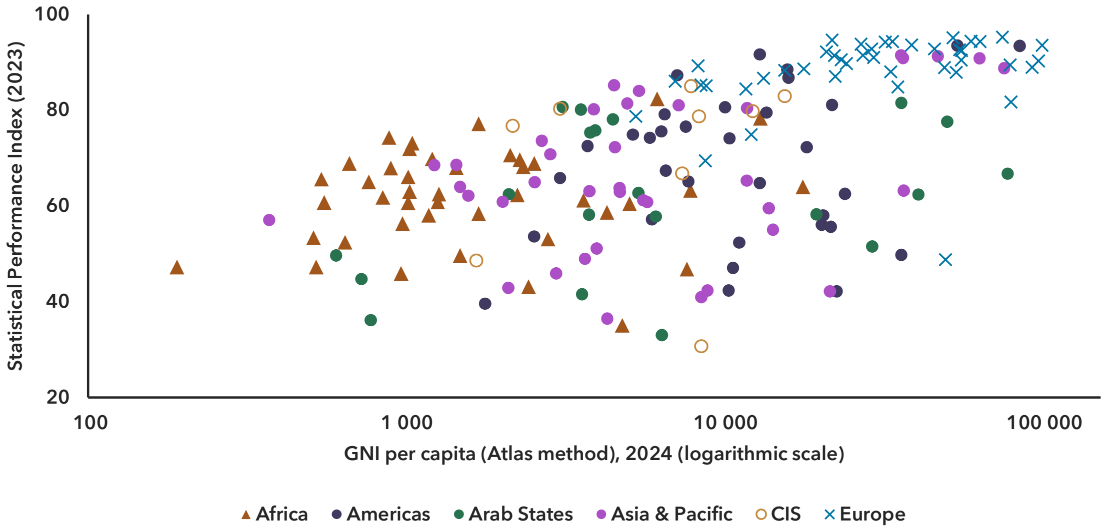
Table 6.2: Sources of ICT statistics

Data type	Source	Collected by
Demand-side data	Household surveys Budget/expenditure surveys Labour surveys ICT surveys	National statistical office Digital agency
Supply-side data	Administrative data on telecom-munications Big Data from telecom operators/ ISPs	Ministry of Telecommunications Regulatory Authority
Price data	Retail prices for mobile-cellular and fixed broadband services	Ministry of Telecommunications Regulatory Authority

27 See https://nsdsguidelines.paris21.org/en.

28 The SPI assesses the maturity and performance of national statistical systems in five key areas: data use, data services (including the dialogue between data users and producers), data products (considering the statistical quality), data sources (including the use of administrative data, geospatial sources and even citizen-generated data), and data infrastructure (legislation, governance, standards). and soft infrastructure (skills, partnerships) as well as the financial resources to deliver useful, and widely used, data products and services.

Figure 6.1: Statistical performance index and GNI per capita

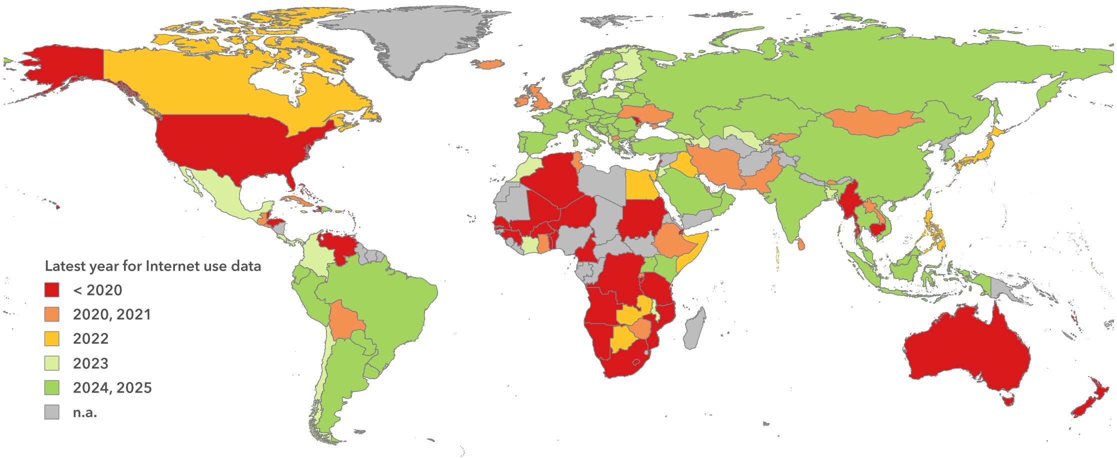


Note: Based on ITU regions, markers represent countries.

Source: Own elaboration based on World Bank SPI (2023) and GNI per capita, Atlas method, 2024.

High-income countries typically produce more frequent, timely household data on ICT access and use, approximately one survey every two years, whereas lower-middle and low-income countries often produce only one survey every five years. Regional patterns also emerge (see Figure 6.2). The Europe region and the Commonwealth of Independent States (CIS) region demonstrate the strongest capacity for ICT statistics, regularly reporting a consistent set of six to seven core indicators, mainly on Internet access, use, ICT skills, and online purchases, with data typically available within one to two years. This reflects robust institutional frameworks and the harmonization achieved through European Union regulations and standardized questionnaires. The Asia and the Pacific region, the Americas region, and the Arab States region report on average about four to five indicators annually, though data collection tends to be irregular and less timely, with some countries, such as Brazil, performing notably well. Countries of the Africa region lag behind, reporting on average only one ICT indicator per year, with long delays often exceeding four years and major data gaps. The weakest levels of availability and timeliness are observed in small island developing States (SIDS), least developed countries (LDCs), and fragile or conflict-affected States, where ICT data often depend on non-standard sources or sporadic surveys, resulting in extremely limited coverage and significant time lags.

Figure 6.2: Data availability on SDG indicator 17.8.1 - Proportion of individuals using the Internet



Note: The designations employed and presentation of material in this publication, including maps, do not imply the expression of any opinion whatsoever on the part of ITU concerning the legal status of any country, territory, city or area, or concerning the delimitations of its frontiers or boundaries. The base map is the UN map database of the United Nations Cartographic Section.
Source: ITU

A robust institutional foundation underpins effective ICT statistical systems, linking national statistical offices (NSOs), telecommunication regulators, ministries responsible for digital development, and private data holders such as mobile network operators. The following actions can strengthen the institutional setting:

- Legislation should be established[29] to ensure sustainable, regular and systematic collection and dissemination of ICT statistics through household surveys by national statistical offices (NSOs), as well as through administrative data collected from operators by the regulators. This can involve amending existing statistical laws (e.g. ensuring the presence of ministries for digital development in the established forums for official statistics) or creating new regulations specifically for ICT data, especially in the case of sensitive data for the analysis of the telecommunication market.
- The legal framework should align with the United Nations Fundamental Principles of Official Statistics, ensuring the autonomy of the NSO and ICT data agencies, coordination across government entities, and cooperation with international bodies such as ITU. Formal data-sharing agreements, standardized methods, and consistent statistical standards are essential. Clear distribution of roles in the compilation of data must be established, so for instance, ICT infrastructure data may come from the telecommunication ministry or regulator, business ICT use data from NSO business surveys, school ICT data from the education ministry, and household ICT data from the NSO.
- The legal and budgetary setting should provide for multi-annual programming of statistical operations. For example, in the context of scarce resources a full-scale household survey on ICT access and use can take place every three years, while selected indicators are collected through the inclusion of modules in other social surveys. The list of indicators to be collected is routinely revised to maintain the relevance to users.
- Ongoing, formalised dialogue between data users and producers of ICT statistics is essential. Equally important is collaboration between subject-matter experts in regulators and ministries, with specialized international organizations, such as ITU, as well as with users from the private sector, to develop and adapt data collection instruments, and

[29] EU Member States already have a strong legal basis for annual statistics on ICT (https://ec.europa.eu/eurostat/web/digital-economy-and-society/legislation).

to elaborate and disseminate analytical studies. Developing a data-driven culture is crucial but often lacking. Policy-makers do not always recognize the value of statistics and therefore may not encourage their production or use. ITU capacity-development tools are designed to support both data producers and data users.

6.3 Financing the production of digital development statistics

The cost of digital inclusion surveys

Investing in data infrastructure is essential for the efficient collection, storage, and analysis of ICT statistics. This implies not only upgrading IT systems in NSOs, but also ensuring the availability of qualified staff, such as survey methodologists, survey coordinators, IT specialists, and data analysts. However, due to the high demand for quantitative skills in the private sector, NSOs often face shortages of skilled staff.

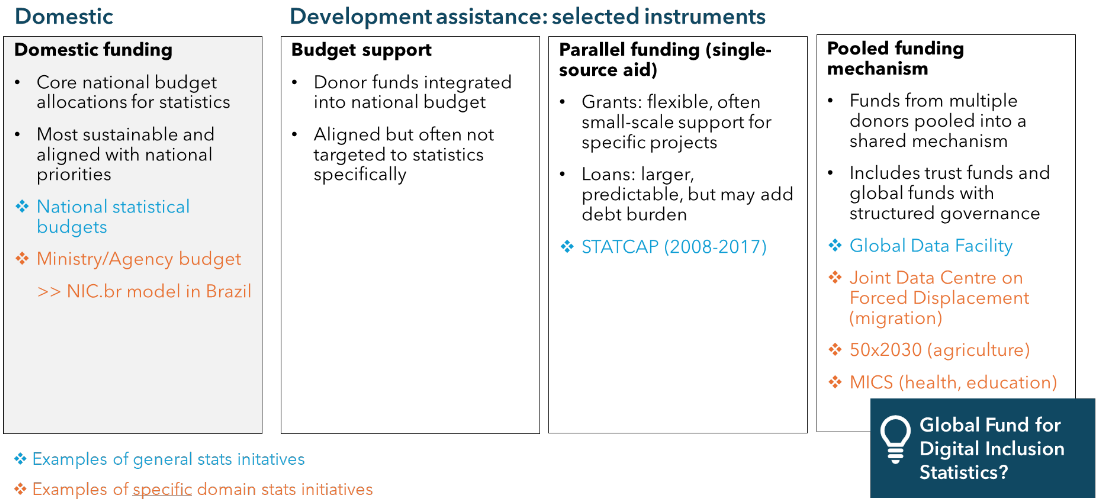
However, having the infrastructure in place and skills available is not enough. While supply-side information, such as subscriptions, traffic, or prices, obtained from operators, are relatively inexpensive to collect for the regulators, demand-side information requires conducting household surveys, which is very costly, and often out of reach for the poorest economies.

The estimated cost of conducting a 15 000-household national digital inclusion household survey is approximately USD 2 to 2.5 million per country.[30] This includes about USD 1.85 million for implementation (e.g. fieldwork, staffing, data processing) and USD 0.65 million for technical assistance (e.g. design support, quality assurance, analysis). There is a negative correlation between sample size and unit cost: for every 1 per cent increase in sample size, unit costs decrease by approximately 0.4 per cent, due to economies of scale. Larger samples not only enhance disaggregated analysis, which is much needed to assess digital gaps (e.g. by gender, age, geography), but also reduce per-household costs by spreading fixed costs, such as training, logistics, and survey tool development, over more units.

Statistical systems in low- and middle-income countries rely on a mix of national and international financing models that differ in scope, alignment with national priorities, and potential for long-term sustainability. Essentially, they can be grouped into domestic financing resources and development-assistance instruments (see Figure 6.3).

30 Based on comparative research and cost modelling by ITU. The figures assume a sample size of 15 000 households and account for a baseline annual inflation rate of 1.5 per cent from historical cost data (2010–2014) to 2025.

Figure 6.3: Main funding instruments for statistics



Source: ITU

Domestic financing for statistical systems and data collection can be provided through a combination of ordinary government budgets, universal service funds (USF) and eventually from government revenues from ICT-related operations. An innovative example of domestic funding ICT statistics is found in Brazil, where a successful model has been implemented (see Box 6.3).

Box 6.3: Self-financed model for sustainable production of ICT statistics in Brazil

Brazil offers a unique, self-financed model for the sustainable production of ICT statistics through the Brazilian Network Information Centre (NIC.br). Unlike most national systems reliant on public budgets or international donors, NIC.br funds data production entirely from revenues generated by managing the ".br" country-code top-level domain. These funds, derived from domain registration fees and related Internet services, provide a stable, autonomous revenue stream for statistical activities, without reliance on government or external financing.

Through this model, NIC.br supports Cetic.br, a specialized department responsible for producing national ICT indicators. Currently, Cetic.br conducts nine regular, nationally representative surveys on topics such as digital inclusion, Internet access, and ICT use across households, businesses, and institutions. This dedicated and recurring funding enables annual data collection cycles, ensuring high-quality time series and policy-relevant insights.

Oversight is provided by the Brazilian Internet Steering Committee (CGI.br), a multistakeholder governance body that brings together government, private sector, academia, and civil society. This structure ensures strategic alignment with national priorities and reinforces stakeholder trust and transparency.

The Brazil model demonstrates how a financially autonomous mechanism, rooted in Internet governance and digital infrastructure management, can deliver reliable, high-frequency ICT statistics while promoting innovation and capacity-building. It is often cited as a practical example of sustainable financing for digital inclusion data systems..

Source: Cetic.br

Many countries, however, face financing gaps due to limited fiscal space and competing priorities, which must be filled, at least temporarily, by external resources. Several international financing models for statistics have emerged, including budget support, bilateral grants, concessional loans, and technical-assistance facilities (see Box 6.4).

At the Fourth International Conference on Financing for Development, governments and partners reaffirmed their commitment to sustainable financing statistical systems: 1) overcoming fragmentation and short-term approaches; 2) investing in modern tools and technologies; and 3) ensuring commitment and involvement of ministries of finance, planning, and statistics, as well as external partners (United Nations, 2025).

Pooled mechanisms overcome fragmented funding from multiple donors by aggregating into a single fund, often managed by multilateral organizations such as the World Bank or United Nations agencies. Compared to parallel funding, pooled funds are better suited to comprehensive statistical capacity building, as they encourage alignment with national strategies and promote institutional development.

There is currently no dedicated pooled financing mechanism to support the regular implementation of digital inclusion surveys across countries. As a result, data collection on ICT access and use often depends on ad hoc funding or one-off technical-assistance projects, leading to irregular time series and gaps in global comparability. Establishing a sustainable, coordinated mechanism, similar to those described above, would help ensure regular, harmonized surveys and provide the evidence needed to monitor digital inclusion and progress towards universal and meaningful connectivity.

Box 6.4: Examples of financing models for statistics

Four large-scale programmes illustrate different models of international financing for statistics, particularly relevant for countries seeking to build or renew digital inclusion data collection efforts:

Blended and incremental domestic ownership: UNICEF Multiple Indicator Cluster Survey (MICS). This programme combines financing from UNICEF, national governments, international organizations, and foundations. UNICEF provides financial and technical support, especially in low-income countries, while many middle-income countries increasingly cover a larger share or even all survey costs. This gradual shift promotes country ownership, supported by a flexible cost structure adapted to national capacity and survey complexity.

Trust fund–based financing: Joint Data Centre on Forced Displacement. The Centre operates through a World Bank-managed trust fund, with contributions from bilateral donors, multilaterals, and foundations. With a four-year indicative budget of USD 32 million, it supports survey operations, staffing, and innovations in over 35 countries. The trust fund model ensures centralized fiduciary oversight, flexibility, sustainability, and alignment with humanitarian and development priorities.

Cost-sharing via loans and donor contributions: 50x2030 Initiative. This initiative applies a cost-sharing model in which countries finance about 70 per cent of costs, primarily through World Bank IDA/IBRD loans, while donors provide the remaining 30 per cent via trust funds and bilateral channels. With a projected investment of USD 500 million by 2030, this model blends credit-based national contributions with grant-funded technical assistance and capacity building, enabling countries to assume full responsibility for agricultural data systems within 5-8 years, reinforcing sustainability.

Pooled financing: Global Data Facility. Launched by the World Bank in 2021, this facility is a pooled funding platform to strengthen data systems in low- and middle-income countries. It finances upgrades to data infrastructure, institutions, and governance, through: (1) grants to national or subnational governments for priority statistical initiatives; and (2) activities carried out by the World Bank and its partners for strategic global or regional work. Guided by a donor Partnership Council and a Technical Advisory Group, the GDF offers flexible, demand-driven support, and promotes coherence and long-term sustainability. The joint ITU/World Bank project on using mobile phone data is one of its funded activities (see Section 6.3).

Efficiency gains through international collaboration in ICT statistics

The fixed costs of survey administration can be reduced by using off-the shelf tools, especially open-source solutions, across the various phases of the survey process (see Box 6.5). Further efficiencies can be achieved by avoiding duplications (i.e. collecting the same information twice), revising periodically the list of indicators to be collected (limiting the response burden and the data processing costs), taking advantage of the, often free, capacity development tools and activities available from international organizations and promoting knowledge and resource sharing among institutions, including at the regional level, through regional statistical commissions and similar bodies.

Incorporating modules on ICT access and use into other social surveys such as living conditions surveys, or labour force surveys, allows for collecting of selected ICT indicators, while remaining subject to the constraints of the vehicle survey design, such as the target population or the disaggregation level.

Using new statistical methods and data sources can also enhance the availability of granular data at a lower cost but requires advanced data science skills that are not always available in NSOs.

Box 6.5: International survey tools

There are successful examples of common tools used by NSOs of different countries that cut costs, accelerate production, and improve the quality and comparability of official statistics. For example, the Survey Solutions suite from the World Bank offers an integrated platform for questionnaire design, data collection, and case management. Built-in features such as automated validation rules, GPS capture, and real-time supervisor feedback streamline operations and reduce data cleaning time. Similarly, the Multiple Indicator Cluster Surveys (MICS) toolkit from UNICEF standardizes the entire survey lifecycle, from model questionnaires and sampling templates to data processing syntax and analysis tabulation plans (using a widely spread commercial software). The Statistical Information System – Collaborative Community (SIS-CC) "Stat-suite" provides a modular, open-source set of tools for data documentation, dissemination, visualization, and exchange.

In the field of ICT statistics, ITU provides manuals, model questionnaires (or modules to be integrated into other questionnaires) for ready use or adaptation, thereby removing the need to develop new tools from scratch.

Emerging technologies, fast-changing markets and blended services complicate indicator design and survey development, while statistical cycles require time for testing, tool creation, and capacity-building.

International collaboration in ICT statistics provides further efficiency gains by sharing experiences and leveraging on the specialised knowledge of United Nations agencies that set and maintain statistical standards in their respective domains, as it is the case of ITU and other members of the Partnership on Measuring ICT for Development (see Box 6.6).

Through its standardization and capacity-development work, ITU helps countries address these challenges through two international expert groups: the Expert Group on ICT Household Indicators (EGH) and the Expert Group on Telecommunication/ICT Indicators (EGTI). These groups unite representatives from national statistical offices, regulators, ministries, academia, international organizations, and industry. They determine *what* to measure and *how* to measure it by developing sound, implementable methodological standards. Each year, EGH and EGTI organize thematic subgroups to update or develop indicators, ensuring that measurement keeps pace with rapid technological change. They collaborate online throughout the year and meet annually to adopt recommendations and plan future work.

The indicators and standards produced are consolidated in ITU key reference manuals, including the *Manual for Measuring ICT Access and Use by Households and Individuals* (ITU, 2020a), the *Handbook for the Collection of Administrative Data on Telecommunications/ICT*, (ITU, 2020b) and the *ICT Price Basket Statistics Manual 2025* (ITU, 2025).

Complementing its standard-setting role, ITU also builds national capacity through regional workshops, online courses via the ITU Academy, and direct technical assistance to developing countries.[31]

[31] See https://www.itu.int/en/ITU-D/Statistics/Pages/capacitydev/ for more information.

Box 6.6: Measuring cyber-enabled and cyber-dependent crimes

The United Nations Office on Drugs and Crime (UNODC) provides a comprehensive framework to harmonize the production of statistics on crime including cybercrime. Cybercrime can be divided into cyber-dependent crimes (e.g. hacking, malware, denial-of-service attacks), which can only be committed through an ICT infrastructure, and cyber-enabled crimes (e.g. online fraud, harassment, child exploitation), where ICT facilitates traditional crimes.

The International Classification of Crimes for Statistical Purposes (ICCS), supports the statistical classification of data on crime, including cybercrime. Nonetheless, as with most crime, cybercrime is often unreported to justice systems due to factors such as victim stigma, low awareness, or lack of trust in authorities, undermining the reliability of statistics based on administrative data from the criminal justice system. Crime victimization surveys complement these gaps by collecting information on security perceptions and victimization experiences though a description of criminal acts rather than relying on legal codes. Survey modules on cybercrime have already been implemented (e.g. Chile 2023, and Colombia 2023 under the LACSI initiative), with questionnaires available for re-use in multiple United Nations languages.

Challenges remain with respect to the measurement of cybercrime, including those due to new technologies (AI, cryptocurrencies, darknet markets) and to the cross-border dimension of cybercrime.

One particularly challenging area for measurement due to a lack of available data (UN General Assembly, 2024) is technology-facilitated gender-based violence and violence against women (TF VAW)[1]. Some of the forms of TF VAW, such as sexual harassment or doxing, are not always criminalized, which further complicates data collection. Most data on TF VAW is generated through population-based surveys that are specifically about violence, or that are about something else, such as the Demographic and Health Surveys (which are at risk of discontinuation due to the interruption of financial support) where a "violence module" is added to the survey tool (UNFPA, 2016). In addition, a growing evidence base, building on decades of independent research, complements prevalence data with data generated insights on incidence, trends and perceptions notably through administrative and social media data.

Ongoing United Nations efforts aim to expand the ICCS and establish a statistical framework to measure cybercrime and TF VAW.

[1] Defined as "any act that is committed, assisted, aggravated, or amplified by the use of information communication technologies or other digital tools, that results in or is likely to result in physical, sexual, psychological, social, political, or economic harm, or other infringements of rights and freedoms" (UN Women and WHO, 2022).

Innovative and cost-effective methods for collecting disaggregated data

Because many countries either do not conduct household surveys at regular intervals or lack the financial resources to do so, measuring ICT access and use through traditional surveys can be challenging. Although household surveys provide representative and comparable data across population groups, they are costly, resource-intensive, time-consuming, and often fail to keep pace with the rapid evolution in digital connectivity. For instance, the percentage of individuals using the Internet (SDG indicator 17.8.1) can change substantially within just a few months, yet in many countries ICT surveys are conducted only every three to five years (see Figure 6.2).

To address this limitation, NSOs and other national agencies are increasingly exploring the use of new data sources and methods that can complement, enhance, or, in some

Box 6.7: ITU work on mobile phone data

Since 2014, ITU has been exploring the use of mobile phone data (MPD), conducting pilot projects in several countries between 2016-2021, and actively developing methodologies and tools to enable countries to leverage MPD responsibly and effectively. A central resource is the set of programming scripts, *ITU Jupyter Notebooks,* that provides a collection of detailed, ready-to-use scripts for cleaning and analysing MPD. These enable national statistical offices (NSOs) and regulatory agencies to adopt best practice methods and tools without having to build systems from scratch. Complementing these tools, ITU has published a detailed *Methodological Guide on using MPD* to calculate Internet use data, addressing issues of data quality, validation, and privacy protection. Through regional workshops, hands-on training sessions, and country-specific technical assistance, ITU continues to support NSOs, regulators, and ministries in developing the skills and workflows necessary to securely process MPD and use it in policy contexts.

ITU also plays a leading role in the UN Committee of Experts on Big Data and Data Science for Official Statistics (UN-CEBD) Task Team on Mobile Phone Data, bringing together global expertise to develop international guidance, foster data access partnerships, and harmonize methodologies for the use of MPD in official statistics.

In 2024, to accelerate MDP adoption across countries, ITU and the World Bank have also launched a joint programme, supported by the GDF (see Box 6.4), to assist at least 30 countries in integrating MPD into their national statistical and policy frameworks by 2030.

cases, partially substitute traditional survey approaches.

Mobile phone data (MPD), derived from call detail records (CDRs), Internet protocol detail records (IPDRs), and signalling data, provides near real-time, geographically detailed insights into connectivity and user behaviour. It allows disaggregation of statistical estimates, for example of the percentage of individuals using the Internet (SDG indicator 17.8.1), to small areas and can be cost-effective once operator agreements are in place. Typical datasets include subscriber counts, traffic volumes, and technology diffusion (3G–5G), though privacy and access constraints remain significant. ITU is actively exploring the use of MPD to produce ICT statistics, recognizing its potential to complement traditional data sources and improve the timeliness and granularity of ICT indicators (see Box 6.7).

Satellite imagery and remote sensing technologies, such as night-time lights data or built-environment imagery, offer global coverage and serve as proxies for economic activity and infrastructure. These tools are particularly useful where survey data are limited, but provide only indirect measurement indicators of ICT access.

Social media and platform analytics offer timely indicators of digital adoption and engagement, sometimes revealing demographic trends, but suffer from representativeness issues and dependence on platform cooperation.

Crowdsourced data, including speed-test apps and mapping initiatives, deliver granular insights on network quality and service gaps, but may be biased toward more connected populations.

ITU is also experimenting with small-area estimation and machine learning techniques that combine layers of national household or census data on ICT use with geospatial big data such as Earth observation variables, ICT infrastructure, and demographics data, to identify unconnected areas within countries.

While the cost of data collection is decreasing significantly, efforts must be continued to enhance data science skills in NSOs and other institutions to benefit from new data sources and advanced analytical methods.

6.4 The road ahead

Achieving universal and meaningful connectivity will depend on sustained investment in the statistical foundations of digital development. Many countries still face gaps in data, capacity, and financing that constrain evidence-based policy-making. Strengthening national data ecosystems should therefore be a central objective of the global digital agenda.

Governments need to treat ICT statistics as a strategic public good and integrate them into national development and statistical strategies. Strong institutional arrangements, linking national statistical offices, regulators, and digital ministries, are essential to ensure regular data collection, stable financing, and the effective use of statistics in policy design.

At the international level, current support for data systems remains fragmented, and few mechanisms focus specifically on ICT and digital inclusion. Establishing a coordinated, multi-partner financing facility could provide predictable resources, align donor efforts with national priorities, and promote sustained, comparable data production.

Innovation will also be key. The use of mobile-phone, geospatial, and other alternative data sources can complement traditional surveys, offering timelier and more granular insights. To harness these opportunities, countries must invest in data literacy, privacy safeguards, and modern infrastructure.

Finally, continued international cooperation and standardization are essential. ITU will continue to lead global efforts to harmonize definitions, methodologies, and tools for ICT measurement, while supporting capacity development and providing technical assistance. Strengthened collaboration across the United Nations system, development partners, and the private sector can ensure that all countries are equipped to produce and utilize high-quality digital-development statistics, establishing data as a cornerstone for inclusive and effective digital transformation.

References

Berman, G. (2016). *Ethical considerations for research with children*. Global Kids Online. www.globalkidsonline.net/ethics

CO:RE. (2023). *Methods Toolkit and Handbook. Child Online: Research and Evidence*. https://core-evidence.eu/methods-toolkit

G20 Digital Economy Working Group. (2024). *Universal and meaningful connectivity: A framework for indicators and metrics. Digital inclusion, universal and meaningful connectivity*. Report prepared under the Brazilian Presidency of the G20. https://www.gov.br/mcom/pt-br/acesso-a-informacao/governanca/governanca-de-tic-1/documentos-g20/p1-g20-dewg-brasil-2024-umc.pdf.

ITU. 2022. *The Global Connectivity Report*. https://www.itu.int/itu-d/reports/statistics/global-connectivity-report-2022/.

ITU. (2020a). *Manual for Measuring ICT Access and Use by Households and Individuals*. https://www.itu.int/en/ITU-D/Statistics/Pages/publications/manual.aspx.

ITU. (2020b). *Handbook for the Collection of Administrative Data on Telecommunications/ICT*. https://www.itu.int/en/ITU-D/Statistics/Pages/publications/handbook.aspx

ITU. (2025). *ITU ICT Price Basket Statistics Manual: Methodology for the compilation of internationally comparable ICT service price statistics based on retail price data*. https://www.itu.int/en/ITU-D/Statistics/Documents/ICT_Prices/ITU_IPBQManual_2025.pdf.

Livingstone, S., Byrne, J., Stoilova, M., and Kardefelt-Winther, D. (2016). *The Global Kids Online research toolkit*. http://globalkidsonline.net/tools/

OECD. (2011., *How's Life?: Measuring Well-being*. OECD Publishing, Paris, https://doi.org/10.1787/9789264121164-en.

OECD. (2019). *Measuring the Digital Transformation: A Roadmap for the Future*, OECD Publishing, https://doi.org/10.1787/9789264311992-en.

OECD. (2023), *How to Make Societies Thrive? Coordinating Approaches to Promote Well-being and Mental Health*, OECD Publishing, Paris, https://doi.org/10.1787/fc6b9844-en.

OECD. (2024). *The impact of digital technologies on well-being: Main insights from the literature*. OECD Papers on Well-being and Inequalities by J. Lee and Z. Zarnic, No. 29, OECD Publishing, Paris, https://doi.org/10.1787/cb173652-en.

United Nations. (2025). *Sevilla Commitment Outcome Document adopted at the Fourth International Conference on Financing for Development, Sevilla, Spain (30 June - 3 July 2025) (A/RES/79/323)*. https://financing.desa.un.org/sites/default/files/2025-08/FFD4%20Outcome%20Booklet%20v4_EN%20-%20spread.pdf.

UNFPA. (2016), *Measuring prevalence of violence against women: Survey methodologies*. https://asiapacific.unfpa.org/sites/default/files/pub-pdf/kNOwVAWdata%20Methodology.pdf.

UN General Assembly. (2024). *Intensification of efforts to eliminate all forms of violence against women and girls: technology-facilitated violence against women and girls*. Report of the Secretary-General. a-79-500-sg-report-ending-violence-against-women-and-girls-2024-en.pdf.

UN Women and WHO (2022). *Technology-facilitated Violence against Women: Towards a common definition*. https://www.unwomen.org/sites/default/files/2023-03/Expert-Group-Meeting-report-Technology-facilitated-violence-against-women-en.pdf.

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