The State of Broadband:
Accelerating broadband for new realities

September 2022

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The State of Broadband 2022: Accelerating broadband for new realities

ITU/UNESCO Broadband Commission for Sustainable Development

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Executive Summary

The importance of broadband connectivity was brought into sharp focus with COVID-19. The pandemic accelerated the uptake of broadband and the adoption of digital services by individuals and businesses, the digitalization of governmental services and spread of e-commerce. Evidence suggests that much of this will be sustained post-pandemic with consequences for the design and quality of broadband networks.

In 2020, the first year of the pandemic, the number of Internet users grew by over 11 per cent, the largest increase in a decade; in low- and middle-income countries (LMICs) Internet use went up 15 per cent. According to the latest ITU data, Internet use grew to 66 per cent of the population in 2022, reaching 5.3 billion people, up from 54 per cent in 2019. A significant part of this growth was driven by the need to use quarantine related applications such as videoconferencing for work and education as well as online shopping, access to public services and remote health consultation. At the same time, the pandemic sharply magnified the consequences of the digital divide and today 2.7 billion people are without broadband and not able to access public services or learn from home.

Networks withstood the huge explosion in data traffic triggered by COVID-19. After a blip following the onset of the pandemic, average broadband speeds increased despite the giant jump in demand. Traffic patterns shifted with peak times reversing from night to day and uploads increasing due to more people working from home and the two-way nature of videoconferencing. Network traffic patterns observed during the pandemic are likely to persist as some of the changes induced will at least partly remain in place, mainly flexible work.

There is a mixed picture in regard to progress towards the Broadband Commission's Advocacy Targets. The number of economies with a broadband plan has slightly decreased over the past year to 155, with plans having expired and not being renewed in some countries. Beyond having a broadband plan, what is in the plan is just as important. This includes concrete strategies for boosting broadband investment, particularly in the wake of COVID-19.

After years of improvement, affordability of broadband services worsened in 2021. This is largely due to a sharp drop in incomes as a result of COVID-19 rather than an increase in service charges, which continued to drop. Just 96 countries met the target for mobile broadband, down from 103 in 2020, while 64 countries met the target for fixed broadband, down two from 2020.

Measurement of digital skills and literacy continues to pose a challenge. Most digital skills indicators are based on self-assessment. However one study finds that digital skills among youth are much below their perception, highlighting that the productivity skills that young people need for their studies and future work remain poor.

The pandemic led to an increase in digital financial services: four in 10 people in developing economies (excluding China) made a digital payment for the first time after the start of the pandemic. The target has been reached on a global basis with 64 per cent of people aged 15 years and older making or receiving digital payments in 2021 up from 52 per cent in 2017.

The target for micro, small and medium enterprises (MSMEs) has become particularly relevant due to the pandemic. Many MSMEs, particularly in low- and middle-income nations, were caught off-guard following the introduction of quarantines. With no broadband Internet access, they were unable to pivot swiftly to online operations to sell products and services.

Gender equality in access to digital services is improving. According to the latest ITU estimates, 69 per cent of men were using the Internet in 2022 compared to 64 per cent of women. Some regions and income groups have reached gender parity in Internet use, including developed countries and the Americas, while small island developing States (SIDS) and Europe have almost achieved it. The substantial gender gap in mobile Internet use in LMICs had been improving, driven primarily by South Asia where it decreased significantly; this progress has stalled however—and in some countries the mobile Internet gender gap has even increased.

Greater use of digital technologies during COVID-19 led to an increase in electricity use. Electricity use increased in 2020 among ICT companies, despite a 0.9 per cent global drop in electricity generation, the first decline since 2009. GHG emissions in the ICT sector also grew but at a slower rate than previous years implying that grids are increasing their share of renewable energy. Further widespread use of digital technologies had an enabling effect for users through the avoidance of emissions. Broadband enables emission reductions across different sectors. GSMA has estimated that the use of mobile technology enabled a reduction of GHG emissions of around 2 135 million tonnes in 2018.

To transition smoothly to a more connected post-pandemic world, two things need to occur. First is a conducive regulatory environment for broadband services to attract the vast investment needed to support a more digital world. Second are strategies and policies to enable broadband adoption and accelerate digital inclusion. The pandemic brought into sharp focus the digital divide with many unable to work from home or take part in remote education due to a lack of adequate skills, Internet access, appropriate devices and the means to pay for it.

1 The broadband landscape: the new normal

This chapter provides an overview of the latest trends in digital connectivity, including access, adoption and use in the new post-pandemic world. COVID-19 is arguably the biggest event to ever impact the nature of broadband with implications for speeds, data usage and affordability. The pandemic sharply magnified the consequences of the digital divide by concretely demonstrating how millions of people without broadband could not access public services or learn from home. The chapter highlights how the pandemic has accelerated the uptake of broadband and the adoption of digital services by individuals and businesses, the digitalization of governmental services and more services moving online. It explores how much this will be sustained post-pandemic and what the consequences are for the design and quality of broadband networks. The chapter also considers some of the challenges resulting from COVID-19.

1.1 Pandemic induced take-up of online activities

Quarantine measures due to COVID-19 resulted in an acceleration in the adoption of digital services and broadband infrastructure. With the COVID-19 pandemic, broadband—for those who had it—became a vital necessity for working, learning, accessing basic services and keeping in touch.

The latest ITU data show that uptake of the Internet accelerated during the pandemic. In 2019, 54 per cent of the world's population were using the Internet with this figure growing to an

estimated 66 per cent in 2022, representing 5.3 billion people. In 2020, the first year of the pandemic, the number of Internet users grew by over 10 per cent, the largest increase in a decade; in LMICs Internet use went up 15 per cent. A significant part of this growth was driven by the need to use quarantine-related applications such as videoconferencing for work and education as well as online shopping, access to public services and remote health consultation.

1.1.1 Work from home

It is estimated that over 550 million people around the world were working from home in the second quarter of 2020—equivalent to over 17 per cent of the global workforce—due to lockdown measures related to the pandemic.[1] Findings also suggest that the potential to work from home is linked to country income level.[2]

Work from home triggered a large increase in videoconferencing. While there are no precise figures on the number of individuals who use videoconferencing for work, available data suggest it is in the hundreds of millions and increased sharply as a result of the pandemic (bearing in mind that many people use more than one videoconferencing package). In October 2020,[3] Microsoft Teams had more than 115 million daily active users, Zoom had 300 million daily meeting participants, Google around 100 million participants and Cisco's Webex almost 600 million participants during the month of September 2020.[4]

The shift to working from home has had an impact on broadband connectivity. This includes greater uploading from videoconferencing, a shift in network peak times to daytime from the evening, increased demand for faster speeds and higher data consumption.

1.1.2 Remote learning

The pandemic forced millions of students to learn from home. According to the United Nations Children's Fund (UNICEF), there were school closures in 188 countries as of April 2020 with around 90 per cent introducing digital or broadcast remote learning (Figure 1.1).[5] Latin America was the worst affected with the region's students missing an average of 170 days of school, over four times the world average.[6]

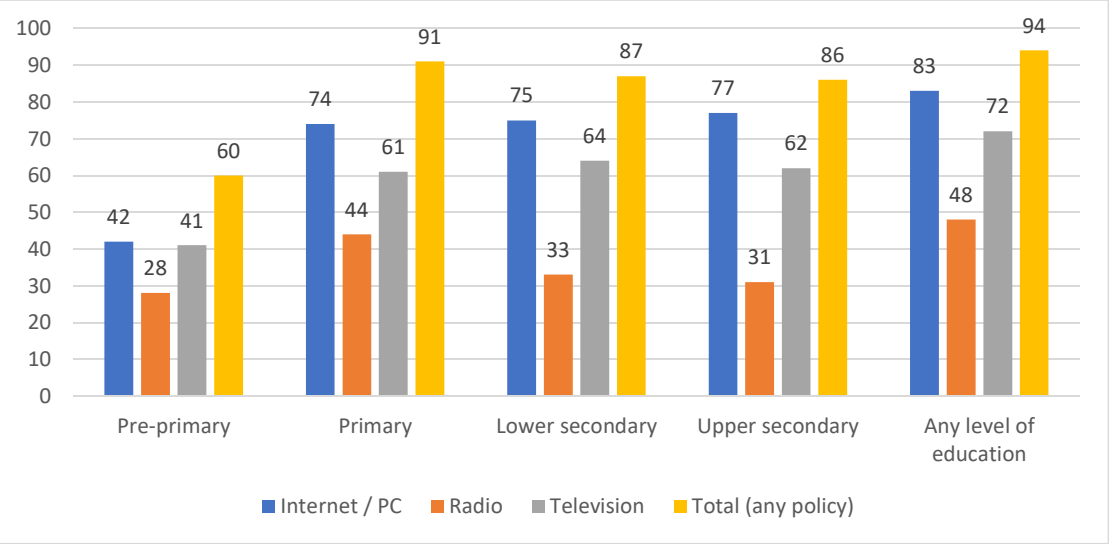
Measures taken by governments to enable remote learning reached around 70 per cent of school children from pre-primary to secondary education. Over 80 per cent of countries introduced online learning during school closures, reaching around a quarter of school children around the world—or more than 350 million primary and secondary school students.

Though there were hiccups, the unparalleled experiment in remote learning demonstrated that education could be delivered at scale. Educational experts predict it will remain in place to some degree and like flexible working, there will be hybrid learning.[7]

1.1.3 Online shopping

The pandemic created millions of new online shoppers. Quarantine measures restricting people to stay at home and closure of retail outlets led to a notable increase in online shopping. According to the United Nations Conference on Trade and Development (UNCTAD), the share of Internet users who made purchases online increased from 53 per cent before the pandemic (2019) to 60 per cent following the onset of the pandemic (2020/21), across 66 countries with available statistics.

Figure 1.1: Share of countries that implemented digital and broadcast remote learning policies, by education level



Note: Figures are estimated using simple averages across countries.

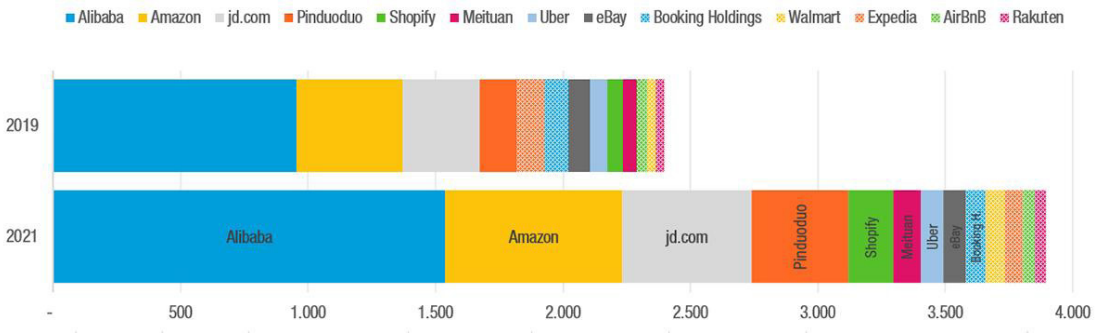
Source: UNICEF. August 2020. "COVID-19: Are children able to continue learning during school closures?". https://data.unicef.org/resources/remote-learning-reachability-factsheet/

UNCTAD also notes that there has been a greater take-up in LMICs as a result of COVID-19, given many high-income countries already had a high level of online shoppers prior to the pandemic.[8] In Thailand, there was a 16-percentage-point increase in online shoppers in 2020 to more than of half of Internet users (56 per cent). Lockdown measures led to business and consumers turning to the Internet to sell or buy products online. Retailers quickly shifted to e-commerce and increased engagement on digital platforms and marketplaces. The country had one of the highest e-commerce growth rates in Southeast Asia in 2020.[9]

The share of online retail has risen sharply since the outbreak of the pandemic. Official statistics, available for seven countries that together comprise around half of global GDP, indicate that online retail sales increased substantially in these countries from around USD 2 trillion in 2019, immediately prior to the pandemic, to USD 2.9 trillion in 2021 with share of online sales in total retail sales growing from 16 per cent in 2019 to 19 per cent in 2020. As a result of steep increases following the onset of the pandemic, the United Kingdom joined the Republic of Korea in having the highest overall online retail share in 2021, at 28 per cent.

The top consumer-focused e-commerce businesses increased their sales by over USD 1.5 trillion following the start of the pandemic (Figure 1.2). In 2019, these companies made sales worth USD 2.4 trillion rising to USD 2.9 trillion in 2020 following onset of the pandemic in 2020 and a one-third increase in 2021, taking sales to USD 3.9 trillion. The shift towards online shopping has further deepened market concentration of online retail and marketplace businesses. While services-based platforms such as Expedia, Booking Holdings and Airbnb saw gross bookings decline by up to two-thirds in 2020 as restrictions reduced demand for travel and accommodation services, growth returned in 2021 as controls were eased.

Figure 1.2: Sales by major consumer-focused e-commerce businesses before and during the pandemic, USD billions



Source: https://unctad.org/news/covid-19-boost-e-commerce-sustained-2021-new-unctad-figures-show

One study finds that online shopping growth was higher in undeveloped e-commerce markets.[10] Now that many new shoppers had to go online to buy goods due to the lockdowns, and experienced the convenience of online shopping, it is likely they will continue doing so as the pandemic recedes with long-run implications for the retail segment.

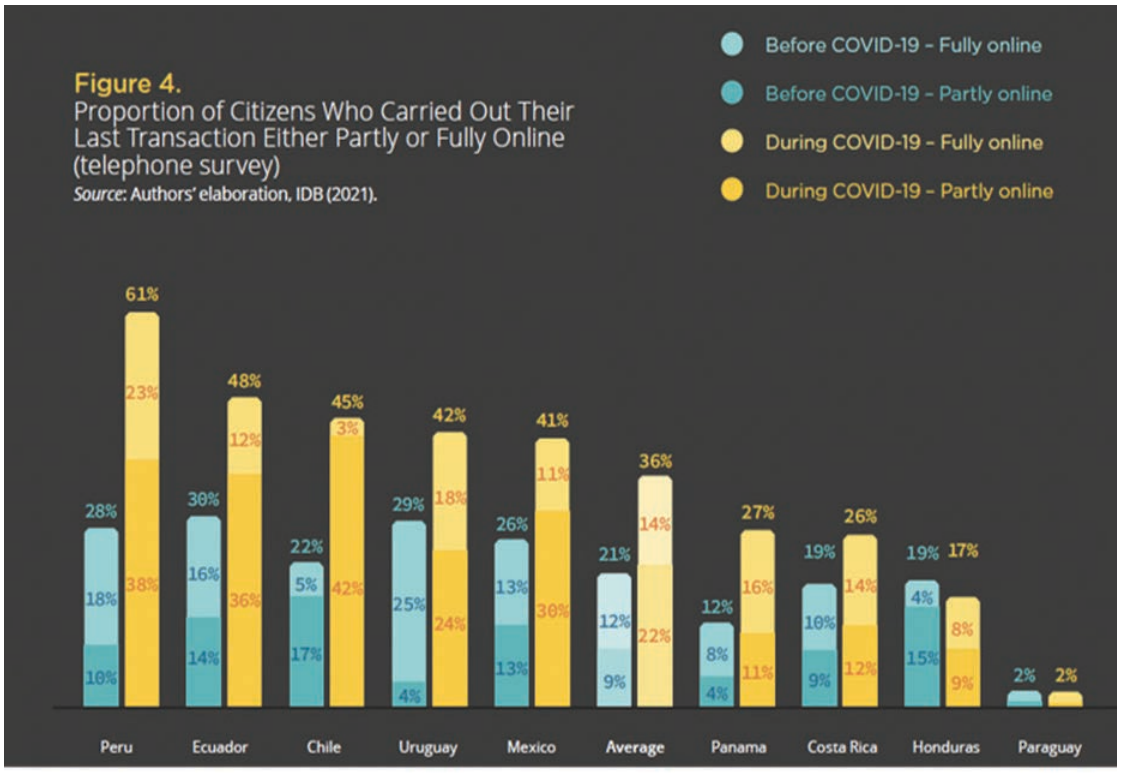
1.1.4 Online public services

Governments accelerated the transition to online service delivery during COVID-19, particularly applications related to the pandemic. Online health information about the pandemic was posted on government web pages and social media sites. Some made use of automated contact tracing and others adopted digital COVID-19 passports containing vaccination information.

Based on internal data from the United Nations Development Programme (UNDP), out of the countries that it serves, 580 digital solutions have been adopted in 82 countries in response to COVID-19 within a one year time-frame (September 2020 – September 2021), including 96 data collection systems, 71 e-commerce systems, 61 e-learning platforms, and 149 e-governance systems. It is also clear that the countries who made more investment in digital infrastructure before the pandemic managed to respond more quickly.

Evidence from Latin America shows that the pandemic drove governments to quickly digitize a range of services that normally would have taken months or years.[11] Use of online public services almost doubled in the region from 21 per cent before COVID-19 to 39 per cent (Figure 1.3). The pandemic also accelerated the move to digital financial transactions (Broadband Commission Target 5). In Panama, the government launched a Digital Allowance program in April 2020, less than a month after the first COVID-19 case was detected. The innovative initiative uses the citizen's national identity card as a prepaid debit card for government transfers. By November 2020, more than 1.2 million citizens were benefitting from the program. In Paraguay the government adopted Millicom Tigo's financial inclusion tool (tigo money) to distribute subsidies to about 500 000 families.

Figure 1.3: Proportion of citizens using online public services, Latin America



Source: Inter-American Development Bank (IDB).

Box 1.1: Working Group on AI Capacity Building

The Broadband Commission Working Group on AI Capacity Building was established to achieve the following objectives:

1. Enhance foresight and awareness by civil services to engage with confidence in national digital transformations
2. Contribute to trustworthy use of AI and emerging technologies aligned to inclusive Sustainable Development Goal (SDG) achievement
3. Add value through global foresight and evidence-based policy guidance and recommendations for action in AI and digital transformation of civil service
4. Provide a knowledge platform through which to enhance broader impact and capacity building tools

Through a multistakeholder leadership model, the Working Group has conducted ground-breaking research to assess human capacity needs for digital transformation in the public sector, paying particular attention to the Global South perspective. This process included four regional consultations in Southeast Asia, Africa, Latin America and the Caribbean. It was complemented by a series of interviews with regional policy-makers and the collection and assessment of good practices globally.

Box 1.1: Working Group on AI Capacity Building (continued)

The "Digital Transformation & AI Competency Framework" identifies three core competency areas for civil servants for digital governance and transformation:

1. Digital perspective for decision-making – combination of skills and attitudes allowing civil servants to understand the complexity of today's problems, anticipate unexpected events and recognize strategic opportunities to use digital solutions to develop strategies and vision. This category of competencies also includes the understanding of digital leadership and the ability to lay the foundations for digital teams to work effectively;
2. Data use and governance – combination of skills and attitudes allowing civil servants to understand the fundamental role and value of data and its inherent risks but also the ability to use, analyse and share it taking into consideration ethical, privacy and security concerns. This category of competencies is fundamental for civil servants to be able to address today's challenges and meet citizens' growing expectations while at the same time using data effectively and responsibly.
3. Digital innovation management – combination of skills and attitudes allowing civil servants to understand new and innovative practices on project management and collaboration. This involves the ability to apply a new set of working methods, approaches, and tools to use data and technology to address complex problems and to engage citizens by fostering new modalities for civic participation.

1.1.5 Virtual health and care

While telemedicine has been discussed as a breakthrough technology for over two decades, until COVID-19, growth has been slow. A group of medical researchers remark "a crisis provides an opportunity" with quarantine restrictions combined with advances in digital technology (e.g. Internet of Things (IoT) with next-generation 5G networks, artificial intelligence (AI) that uses deep learning, big data analytics, and blockchain and robotic technology) providing the perfect environment for telemedicine to progress.[12] A recent report from the Broadband Commission's Working Group on Virtual Health and Care found that the pandemic triggered a giant uptake in virtual health and care services.[13] In the US, the share of telehealth claims was 25 times greater in January 2022 compared to October 2019. In India the number of consultations on the e-Sanjeevani health platform was four times higher in February 2022 compared to October 2020. In Argentina there was a 230 per cent increase in telemedicine calls after the onset of COVID-19.[14]

1.1.6 Network resiliency

Networks withstood the huge explosion in data traffic triggered by COVID-19. After a blip following the onset of the pandemic, average broadband speeds increased despite the giant jump in demand (Figure 1.5).[15] Traffic patterns shifted with peak times reversing from night to day and uploads increasing due to more people working from home and the two-way nature of videoconferencing. Network traffic patterns observed during the pandemic are likely to persist as some of the changes induced will at least partly remain in place, mainly flexible work.

Figure 1.4: Growth in virtual health and care since the COVID-19 pandemic

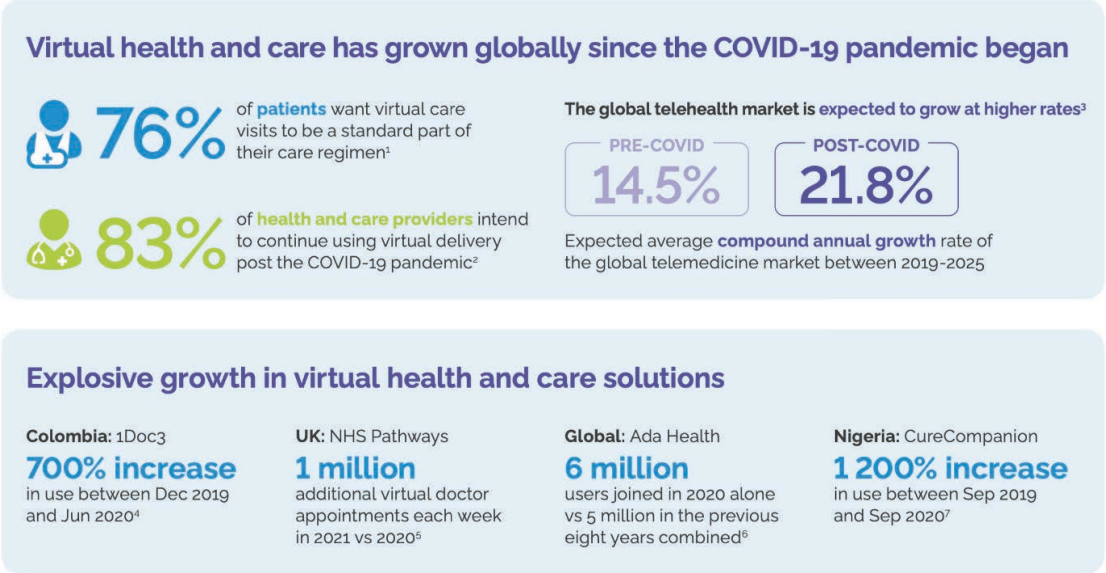
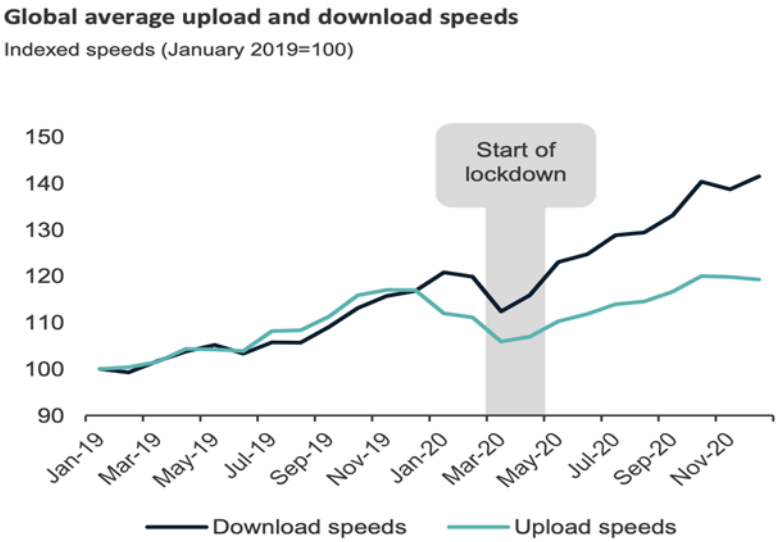


Figure footnotes: 1 McKinsey · 2 GoodRx · 3 Accenture · 4 Health Transformer · 5 GPonline · 6 TechCrunch, Ada · 7 CureCompanion

Source: Broadband Commission Working Group Report on the Future of Virtual Health and Care, 2022.

Figure 1.5: Global average upload and download speeds



Source: GSMA (https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=60621335&file=290921-How-networks-stayed-the%20course.pdf)

Internet Exchange Points (IXPs) demonstrated their resiliency during COVID-19 in many parts of the world by keeping the Internet working and handling huge increases in traffic. According to the Organisation for Economic Co-operation and Development (OECD), IXPs saw record net increases of up to 60 per cent in total bandwidth between December 2019 and March 2020.[16] A number of IXPs reported breaking their traffic records during lockdown periods. Traffic exchanged at peak times grew by more than 10 per cent at the world's third largest IXP, DE-CIX in Frankfurt, with videoconferencing applications doubling in traffic, and gaming increasing by 50 per cent.[17]

One study of IXPs in North America and Europe found traffic increasing by 15-20 per cent almost within a week of restrictions driven by applications used at home such as videoconferencing and gaming.[18] The Norwegian Internet Exchange did not witness a significant increase in traffic but rather a shift in patterns. Daytime traffic grew whereas before the pandemic, the traffic peak was in the evening. Traffic also went from being mainly inbound to outbound as a result of uploaded videoconferencing traffic due to working from home.[19]

The Asia Pacific Internet Exchange Association (APIX), the organization for IXPs in the region, surveyed members in June 2020 about the impact on their traffic due to COVID-19 quarantine measures. All experienced growth which ranged from 8-40 per cent. Although there was no downtime for IXP traffic operations, their physical technical support, maintenance, and upgrade work suffered as a result of government-imposed lockdowns. There were no changes in peering policies, but some of the emergency policy actions such as the national broadband network (wholesale L2 network provider) in Australia gave a 40 per cent uplift on all traffic, for the same price.

In Africa, IXP traffic dropped in countries that experienced government-imposed shutdowns and then gradually increased when the shutdowns were lifted. During the COVID-19 pandemic period, Uganda experienced low traffic while others observed high traffic. The initial drop in traffic witnessed at the Uganda Internet Exchange Point (UIXP) was attributed to the abrupt change of location, where people traditionally accessed Internet from offices. However, as people transitioned to working from home, traffic rose.[20] In Afghanistan, Nepal and Sri Lanka, Internet speeds declined due to traffic surges during the COVID-19 lockdown period.[21]

Spectrum resources made available by governments during the crisis helped to handle the surge in capacity in specific cases.[22] For instance, in Panama the government awarded temporary access to AWS spectrum for free for nearly two years. Multistakeholder collaboration mechanisms such as open dialogues and roundtables proved to be effective in identifying challenges and proposing rapid response solutions amid this challenging scenario.

1.2 Challenges highlighted by the pandemic

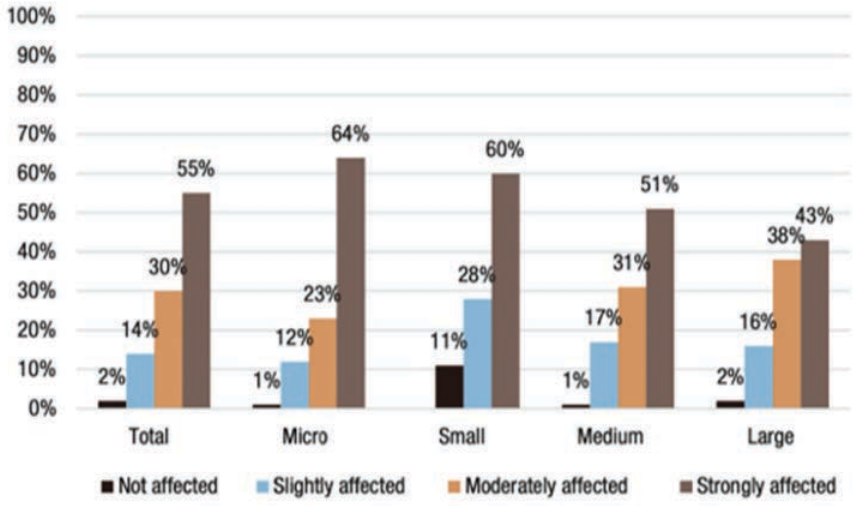
COVID-19 magnified existing digital gaps. While the divide in broadband connectivity between developed and developing countries has existed for years, the pandemic put this into sharp focus as many people, mainly in low- and middle-income nations, were unable to work or learn from home. Further the quality of broadband networks has taken on new importance. Businesses were caught off guard—particularly micro and small enterprises—as they had no online presence. Governments made pandemic-related support payments adding to their debt with implications for future support for access to broadband infrastructure. There were also environmental consequences from the pandemic induced growth in digital activity.

1.2.1 MSMEs

According to an UNCTAD survey of businesses in over 100 countries, the vast majority were strongly affected by COVID-19 (Figure 1.6).[23] The disruption was especially hard for micro and small enterprises where over 60 per cent were impacted. Some micro, small and medium enterprises (MSMEs) have been successful in shifting online. Evidence from business surveys worldwide suggest that up to 70 per cent of small- and medium-sized enterprises (SMEs) increased use of digital technologies due to COVID-19.[24] One study found that small business

with contactless payment technology were not only more resilient, increasing sales amount on average by 8.3 per cent compared to merchants without this technology, but also attracted new customers.[25] However many MSMEs lack awareness and digital skills, resources to purchase the necessary equipment and services, or a lack of broadband Internet access.

Figure 1.6: Impact of COVID-19 on companies, by size



Note: Repondents were asked 'How have your busines operations been affected by the corona virus (COVID-19)' and 'How many full time employees does the business have?'

Definitions: Microenterprises up to 4 employees; small firms, 5-19 employees; medium-sized firms, 20-99 employees; large firms, 100 or more employees. Data on 2170 businesses in 121 countries. Response rates vary across countries and regions

Source: ITC calculations based on ITC COVID-19 Bussiness Impact Survey. Data collected 21 April – 2 June 2020

In Pakistan almost 60 per cent of retailers surveyed moved to social media to advertise their services and about half offered home delivery.[26] However over a quarter reported there was no online platform available for them to use. Another problem preventing some retailers from shifting online was the availability and quality of broadband services, particularly in rural areas.[27] As a result many could not take advantage of services such as e-commerce and digital payments.

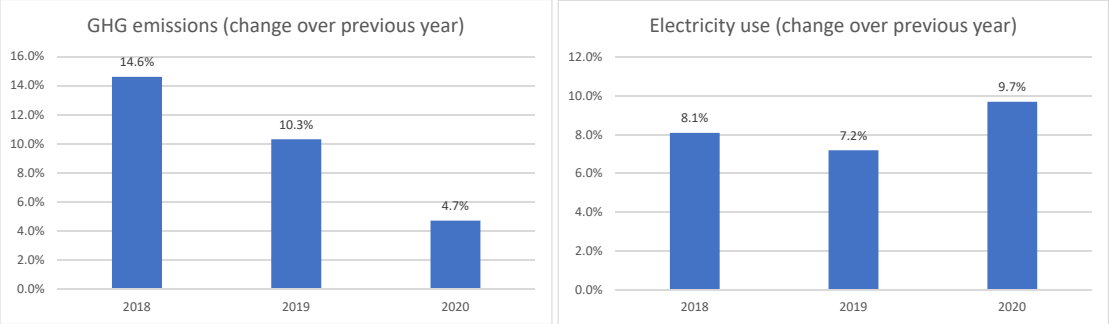
In Uganda, where 3 000 MSME vendors were onboarded to an e-commerce platform during the pandemic, the daily sales were doubled for the majority of vendors, from USD 10 per day to USD 22 per day.[28] However, in countries like Uganda where the digital gender gap is high (women are 43 per cent less likely than men to leverage ICT for basic purposes[29]), it takes intentional effort to include women in the transition, including providing basic online training for them. A study by UNDP Indonesia also demonstrated that, once prepared, female MSME owners are more keen than male MSME owners to apply new strategies, including joining digital platforms, developing a marketing plan or expanding their market orientation.[30] To minimize the constraints caused by the pandemic and to ensure Cambodian MSMEs and small farming households have access to participate in the digital economy, UNDP, with support from the Australian Government, initiated the "e-Commerce Accelerator Program", aiming to support MSMEs and small household farmers to digitalize and sell online in order to overcome the strains COVID-19 has put on their businesses.[31] UNDP has partnered with the Ministry of Commerce and Enhanced Integrated Framework (EIF) to support Cambodia's e-commerce ecosystem development through the project "Go4eCAM", aiming to provide the necessary

conditions for MSMEs to go digital and to gain access to much-needed finance for e-commerce uptake and business formalization to support export readiness.

Environment

Greater use of digital technologies during COVID-19 led to an increase in electricity use. According to World Bank data, electricity use increased in 2020 among ICT companies, despite a 0.9 per cent global drop in electricity generation, the first decline since 2009. Greenhouse gas (GHG) emissions in the ICT sector also grew but at a slower rate than previous years, implying that grids are increasing their share of renewable energy. Further widespread use of digital technologies had an enabling effect for users through the avoidance of emissions. While there was an increase in household energy usage these emissions were far less than those that would have occurred from transportation to work.

Figure 1.7: Change in ICT sector GHG emissions and electricity use



Note: GHG emissions refer to Scope 1 and 2 location-based.

Source: World Bank.

According to one report, growing data traffic will drive higher energy use.[32] Newer infrastructure is more energy efficient per unit of traffic. For instance 5G is up to seven times more energy efficient per unit of data than 4G, and fibre optic cable emits far fewer emissions per unit of data than coaxial cable or hybrid fibre coaxial (HFC) cable.[33] However some argue that the increased data traffic from 5G due to greater bandwidth and Internet of Things/machine-to-machine (IoT/M2M) devices will result in growing energy consumption.[34]

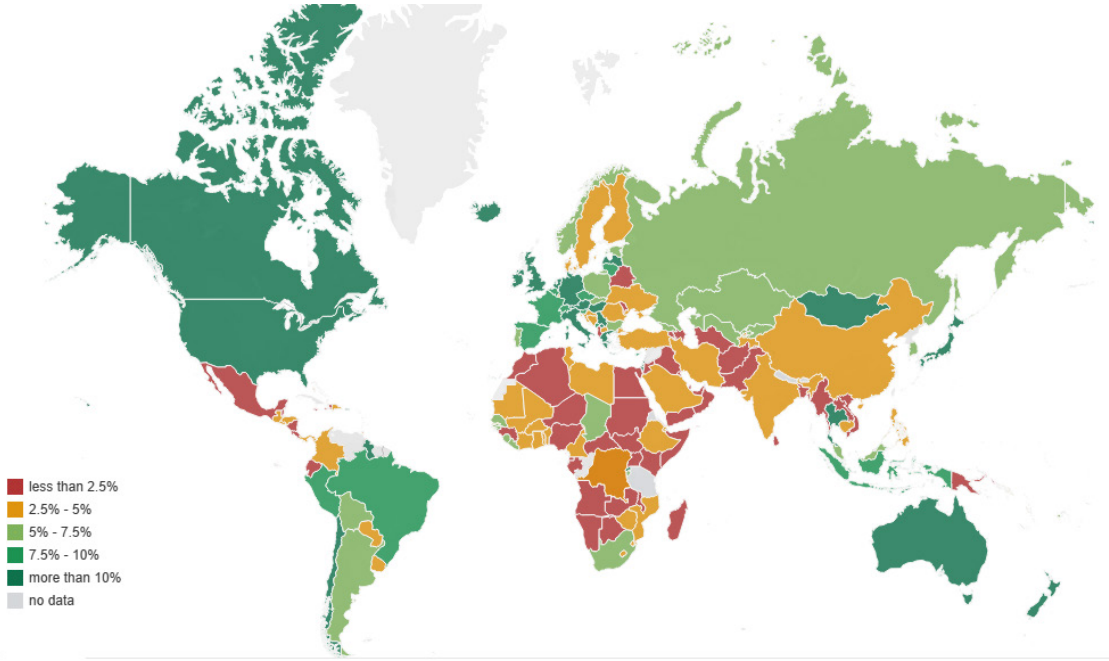
ITU estimates that by 2025, at a global scale, mobile networks will be responsible for an energy consumption of 170 terawatt-hour (TWh), and fixed networks will add another 100 TWh.[35] Considering that 5G networks are expected to be 10 times more efficient, a shift of mobile traffic onto 5G networks would lead—in a steady-state situation—to an overall reduction of total energy consumed and carbon emissions. Nevertheless, the telecommunications industry faces a challenge financing the roll-out of 5G networks, in particular in emerging economies.

1.2.2 Pandemic induced government debt

Practically every government in the world incurred large expenditures during COVID-19 (Figure 1.8). Apart from support for the health-care sector, there were disbursements for stimulus, unemployment and payments to companies in some key sectors among others. According to International Monetary Fund (IMF) estimates, governments around the world spent around USD 16 trillion in response to COVID-19 (excluding health care).[36] Implications of this extra

indebtedness for broadband infrastructure, where over USD 400 billion is required to connect the remaining billions of unconnected people to the Internet by 2030,[37] coupled with an already high level of debt in many low- and middle-income nations, remain to be seen. It could leave less funding available for supporting digital inclusion for underserved groups such as those living in rural areas and the poor.

Figure 1.8: Additional government spending and forgone revenue in response to the COVID-19 pandemic (per cent of 2020 GDP)



Source: https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19

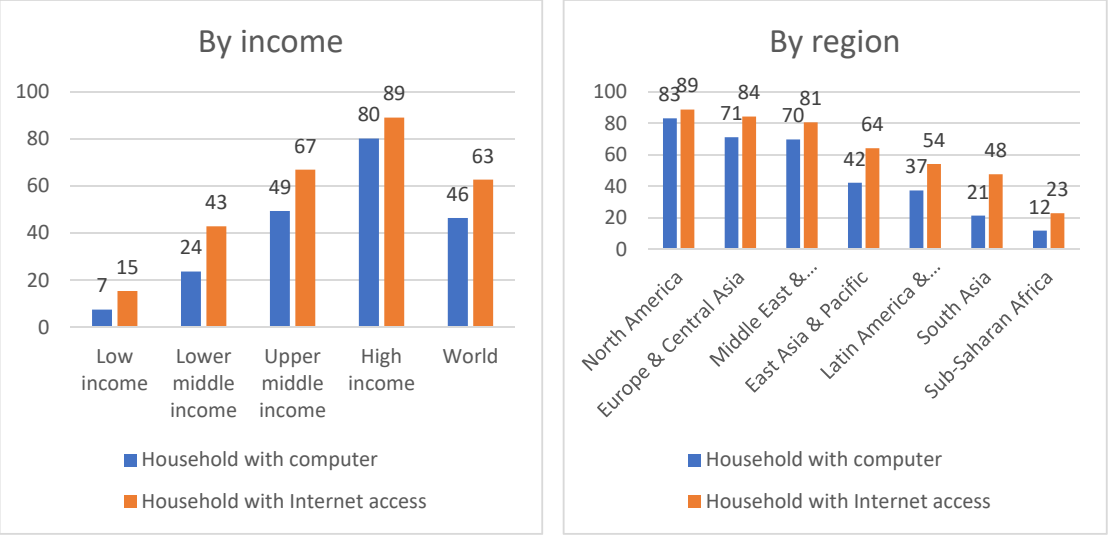
1.2.3 Redefining broadband: availability and quality of home connections

The pandemic has demonstrated that household Internet access and computer ownership is as important as individual Internet use, marking a "turning point" in the universal connectivity strategy.[38] While some around the world quickly adapted to the unprecedented shift to home working and learning, others struggled due to a lack of the necessary equipment or insufficient capacity.

Home working requires an adequate broadband connection and for higher productivity a big screen, minimally a tablet and preferably a laptop or desktop PC. Yet only two-thirds of households around the world have Internet access at home and less than half have a computer (Figure 1.9). Low and lower middle-income countries are particularly disadvantaged with less than half of households with an Internet connection; computer ownership is extremely low at less than a quarter of households in LMICs on average, and less than 10 per cent in low-income nations. The situation is particularly dire in Sub-Saharan Africa where only 12 per cent of households have a computer and less than a quarter access to the Internet.

Apart from the availability of the basic equipment needed for home working and learning, there is also a need for quality. Some applications such as videoconferencing and streaming require higher bandwidth and the size of the household also affects bandwidth requirements. Videoconferencing in particular requires sufficient upload speeds to operate effectively. A

Figure 1.9: Households with a computer and Internet access (%), 2020 or latest available data



Note: Country averages.

Source: ITU.

family of four needs around 100 Mbit/s download speed and 35 Mbit/s upload to support good quality simultaneous videoconferencing whereas a single person requires 25 MB/s download and a minimum of 5 MB/s upload.[39]

Many households had insufficient bandwidth during the pandemic. Sixty per cent of lower-income households in the United States reported experiencing problems with their broadband connection during the pandemic making it difficult to carry out tasks;[40] the country's telecom regulator–the Federal Communications Commission (FCC)–experienced a 176 per cent increase in complaints about broadband speeds when the first wave of the pandemic hit.[41]

As a result of the need for more upload capacity and simultaneous family use, broadband speeds–in both directions–have resurfaced as an important policy topic. In the US, the FCC defines broadband as 25 Mbit/s download and 3 Mbit/s upload or a ratio of 8/1. The asymmetry between download and upload merits revisiting in light of the pandemic experience where upstream speeds have become important from the widespread use of videoconferencing. It has been argued that a user is now better off with a symmetrical 20 Mbit/s in both directions yet that would not meet the FCC definition.[42] The European Union (EU) did not specify whether its Digital Agenda goal of broadband speeds of at least 30 Mbit/s with at least half of households with 100 Mbit/s by 2020 were symmetrical.[43] Its new goal calls for 100 Mb/s in all households by 2030 without specifying symmetry as well as full 5G coverage in all urban areas.[44]

As digitalization of our society is ongoing, new value-added services, including those offered by over-the-top (OTT) players, will continue to develop, calling for improved connectivity to be provided by EU network operators.[45] This is highlighted, for example, in the European Commission's "2030 Digital Compass: the European way for the Digital Decade":

"By the end of this decade, new digital communications features and capabilities such as high-precision, holographic media, and digital-senses over the networks, are expected to provide a whole new perspective to a digitally-enabled society underpinning the need for gigabit connectivity. Well before the end of the decade, businesses will need dedicated Gigabit

connections and data infrastructures for cloud computing and data processing, in the same way as schools and hospitals will need this for eEducation and eHealth. High performance computing (HPC) will require terabit connections to allow real-time data processing."[46]

To meet these objectives and provide better quality of service to consumers, telecom operators must invest heavily in upgrading their network infrastructure and develop 5G and fibre-to-the-home (FTTH) networks. OTT service providers note that emerging services will not be possible if there are no drastic improvements in today's telecoms networks (Box 1.2).[47] A key concept is the importance of quality infrastructure and corresponding investment in the long term. The latter needs the right environment and conditions for operators to invest, and to encourage collaboration in long-term deployment of quality infrastructure.

Box 1.2: OTT and Internet traffic

A report by Axon Partners[48] identified that video, social and gaming platforms alone account for over 70 per cent of global Internet traffic, as illustrated below:

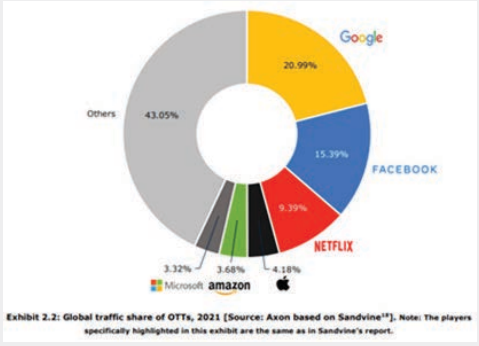


Exhibit 2.2: Global traffic share of OTTs, 2021 [Source: Axon based on Sandvine[49]]. Note: The players specifically highlighted in this exhibit are the same as in Sandvine's report.

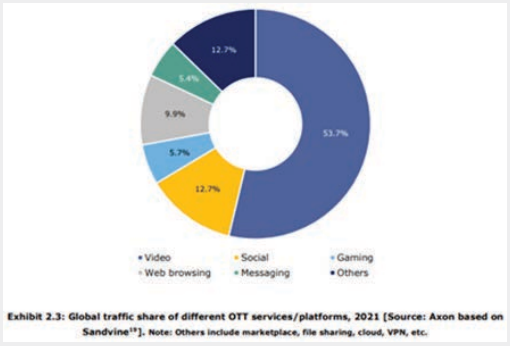


Exhibit 2.3: Global traffic share of different OTT services/platforms, 2021 [Source: Axon based on Sandvine[49]]. Note: Others include marketplace, file sharing, cloud, VPN, etc.

The report notes: "[D]ata growth is not expected to stop. The average mobile user is expected to use 16.2 GB/month in 2023, compared to 8.5 GB/month in 2021, while a fixed broadband line is expected to use 454 GB/month in 2023 compared to 293 GB/month in 2021. There are a number of reasons behind this trend:

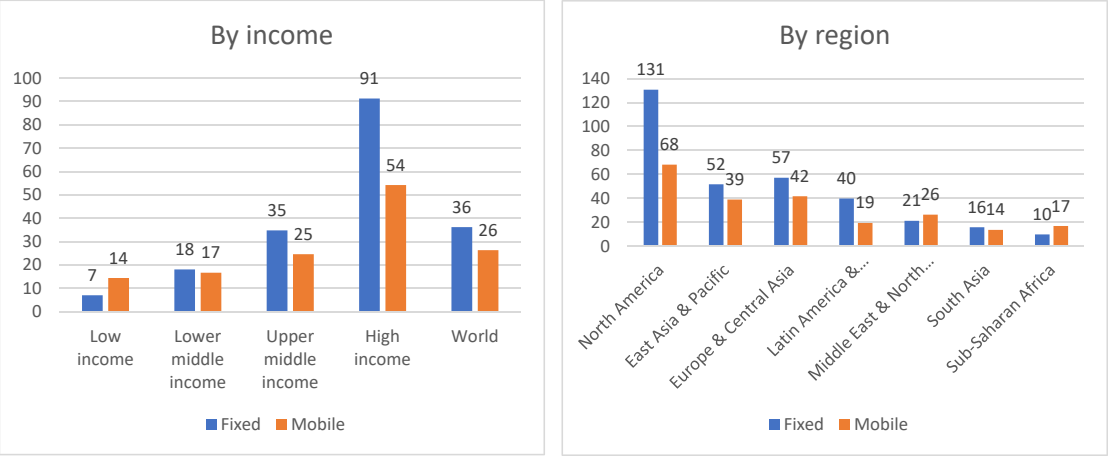
- Increasingly data-intensive content, such as higher-quality video streaming and online gaming;
- Proliferation of high-speed access networks including, in particular, fibre-to-the-home (FTTH) and 5G;
- Rise in smartphone subscriptions, with improved device capabilities (e.g. 5G-ready devices);
- Digitalization of the European society, with emergence of various new applications and services using the Internet (e.g. AR/VR, metaverse)."[49]

The report also notes that there was an extraordinary growth in data traffic following the introduction by Facebook and other OTT providers (including Netflix and YouTube) of video auto-play across OTT platforms. It observes that without any monetary incentives for OTTs to ensure an optimal generation of traffic (i.e. traffic that is essentially demanded by the end user), OTTs perceive traffic offloading to telcos as being free of charge, thus generating a "tragedy of the commons" problem. It proposes the establishment of a price signal that will, on the one hand, allow telecom operators to increase their investment in very high-capacity networks and, on the other hand, create incentives for OTTs to optimize their traffic volumes, especially by reducing inefficiently generated traffic.

Globally, median mobile broadband speeds were 30 Mbit/s down and nine up in March 2022 while fixed broadband stood at 63 Mbit/sdown and 27 Mbit/s up.[50] The median mobile speeds

would just be sufficient for one person videoconferencing while the fixed speeds would be the minimum for a family. Bearing in mind that these are global medians, over half of households with broadband have insufficient quality for acceptable videoconferencing. There are wide differences in median download speed performance depending on income group and region (Figure 1.10). Notably median mobile broadband speeds are faster than fixed in low- and lower-middle-income nations, the Middle East and North Africa, and Sub-Saharan Africa.

Figure 1.10: Median download speeds, March 2022



Note: Upload speeds not available.

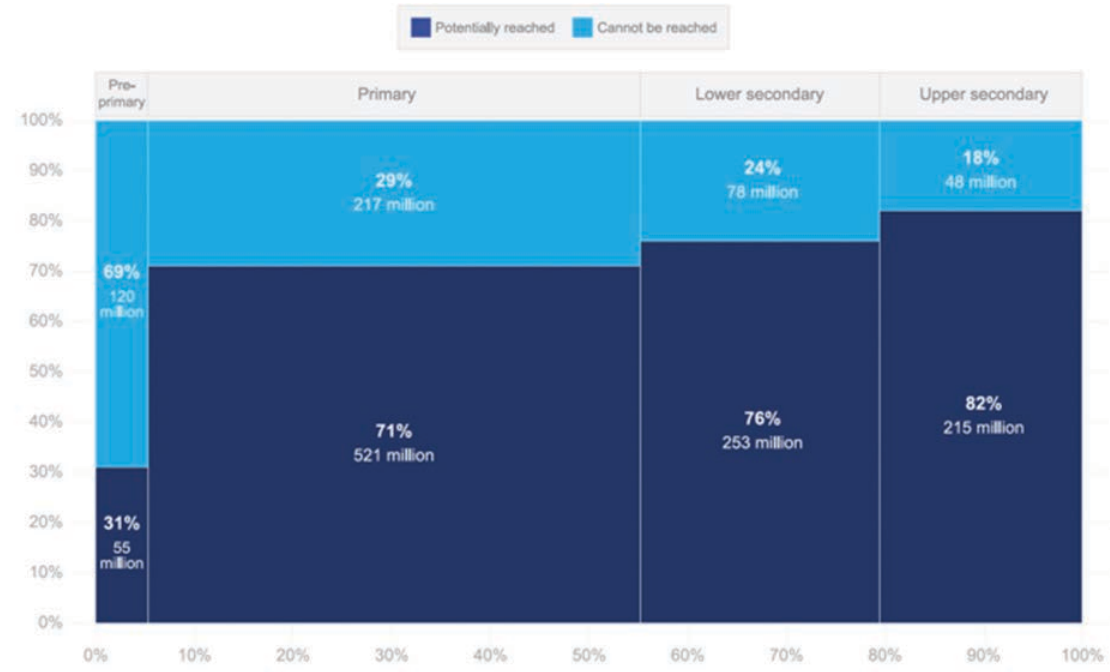
Source: Ookla (https://www.speedtest.net/global-index).

1.2.4 Online learning

There were widespread school closures due to the pandemic with many children around the world not able to participate in remote learning. According to ITU and UNICEF, two-thirds of the world's school-age children have no Internet access at home.[51] UNICEF's Remote Learning Readiness Index shows that half of the 67 countries with available data are poorly equipped to support online education.[52] This means that over 200 million schoolchildren in LMICs are unprepared to use remote learning in future emergency school closures. There was also a "remote learning paradox" where governments introduced remote learning but many could not use it because they lacked the necessary devices or they could not afford it because of the data charges.[53]

Consequences from the disruption in learning due to COVID-19 for households without technologies for home learning are severe. There is a risk that those cut off from schooling for a prolonged period may never return. Rural areas as well as other regions traditionally affected by the digital breach are exposed to further aggravation.

Figure 1.11: Share and number of students potentially reached and not reached† by digital and broadcast remote learning policies, by education level



Source: Authors' calculations using MICS, DHS and other national household surveys.
Notes: i) Figures are calculated using weighted averages based on countries' student populations.
ii) The high potential reach in Latin America and the Caribbean does not indicate that children in this region had more access to communication assets in the household – access is shown in Figure 5. Rather, it reflects that the policies in this region targeted technologies that are available in most households.
† "Reached" indicates potential maximums; "Cannot be reached" indicates minimums, which are likely much higher.

1.2.5 Security, data privacy and social media

As more people moved online during the pandemic, information security incidents and misinformation rose. Europol reported a rise in organized criminals exploiting the pandemic particularly using phishing, online scams and the spread of misinformation to sell items claimed to prevent or cure COVID-19.[54] The Swiss National Cyber Security Centre reported a doubling of cyberattacks (phishing, fraudulent websites, direct attacks on companies, etc.) after COVID-19 struck with the increase in working from home a major cause since individuals do not have the same level of Internet security at home as they have in the office.[55] Videoconferencing was also attacked; between February and May 2020 more than half a million people were affected by breaches in which the personal data of videoconferencing users was stolen. The spread of misinformation rose with the World Health Organization (WHO) noting that the spread of misinformation about COVID-19 is "proving to be as much a threat to global public health as the virus itself".[56]

With an estimated 1.6 billion people—or 20 per cent of the global population—living in places at discernible risk of armed conflict, the global community must recognize the risks and compounding complications that highly inflammatory online information pollution constitutes for human rights and peaceful co-existence. In these areas, as well as in many other slightly less volatile contexts, institutions of governance are fragile, and freedom of expression and the media are already facing enormous pressure. This is further complicated by rampant

information pollution being used as a smokescreen to harass advocates, as well as fuel conflict, polarization, and populism.

Measures to address these challenges should be carefully balanced against protections for the free flow of information to ensure that users get access to the accurate content, services, and applications that they want.

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2 Measuring progress towards achieving the 2025 targets

This chapter reviews progress made towards achieving the seven Broadband Advocacy Targets. It highlights challenges of measuring some of the targets in terms of data availability and conceptualization.

2.1 Target 1: Making broadband policy universal

Target 1 Making broadband policy universal: By 2025, all countries should have a funded national broadband plan or strategy or include broadband in their universal access and service (UAS) definition

One hundred and fifty-five countries had a national broadband plan or other digital strategic document emphasizing broadband in 2022. The number of economies with a broadband plan has slightly decreased over the past year as plans have expired and haven't been renewed in some countries. While a plan is a useful starting point, it is important to know how well they are operationalized. For instance, around 100 countries call on the use of universal service and access funds (USAFs) to deploy infrastructure in unserved areas. Many funds have been unsuccessful in extending coverage, suffering from poor design, mismatch between funds collected and disbursed, political interference, and not incorporating sustainability factors such as training and education, maintenance, energy supply, etc. An ITU report on financing universal access highlights the need for a change in thinking including alternative funding models as a way forward to "USAF 2.0".[1] The scope of such funding could also extend beyond

infrastructure to digital transformation including targeting underserved groups such as women and girls, people with disabilities and the elderly regardless of where they live. Additionally, the technology funded by USAFs should depend on the specific area and complementary connectivity solutions, not be a single, one-size-fits-every person, area and situation. A mix of fibre, terrestrial wireless and satellite technology should be available for funds as is most appropriate.

Box 2.1: The 21st Century Financing Models for Bridging Broadband Connectivity Gaps

The Working Group for 21st Century Financing and Funding Models for Sustainable Broadband Development published the report "21st Century Financing Models for Bridging Broadband Connectivity Gaps" in October 2021. It sets out policy recommendations to foster innovative funding, financing and investment strategies to empower new business models for broadband connectivity and adoption in order to reach the global goal of connecting the unconnected.[2] The report's recommendations include (i) broadening the base of contributors; (ii) ensuring that all who derive benefits from the digital economy, as consumers or as producers contribute objectively, equitably and fairly towards connecting the unconnected; (iii) for such contributions to be made by all ecosystem players, taking into account the new realities of the disaggregation of digital service provision and, therefore, revenue generation from underlying network infrastructure investments; (iv) making such contributions sustainable and predictable; and (v) for such contributions to be managed efficiently and disbursed in a timely and prioritized manner.

The report notes that "Network operators are facing significant pressure on their traditional sources of revenues given the weakened link between service revenue and network cost recovery through the disaggregation of the revenue-generating service platforms from the underlying network. The Asian Infrastructure Development Bank has concluded that '[t]he telecommunications industry – which is the main funder of 5G, fibre expansion, and other digital infrastructure developments – cannot independently raise the financial resources needed for network expansion over the next decade'."[3]

As regards broadening the base of contributors, the Working Group report also referred to the conclusion of the Florence School of Regulation that "if online platforms are allowed to side-line traditional network operators, it may mean that vital investment in building and maintaining the infrastructures on which these markets are founded becomes unsustainable in the long term."[4] In a similar vein, the Commission's 2019 Digital Moonshot for Africa report published in October 2019 recommended that governments should review the sources of USAFs and "develop innovative models to ensure the contribution base is broadened to encompass all those who derive economic benefit from the investment".[5] The report identifies the Australian News Media and Digital Platforms Mandatory Bargaining Code as a potential model under which digital platforms and network operators could agree commercial terms of partnerships under regulatory supervision.

Box 2.1: The 21st Century Financing Models for Bridging Broadband Connectivity Gaps (continued)

Following the publication of the 21st Century Financing, Funding, and Investment Models WG Report in October 2021, many advocacy activities have been undertaken to promote the four strategic recommendations put forward in the report. The four recommendations are as follows:

1. Broadening the base of contributors to ensure that all that participate in and benefit from the digital economy and its broadband infrastructure can contribute to it.
2. Earmarking proceeds from ICT sector participants to be spent on initiatives supporting the BBCom's connectivity and adoption goals, including proceeds from existing mandatory contributions, fees, regulatory levies, or digital taxes.
3. Reforming universal service and access funds (USAFs), where they have been found to be ineffective, with a focus on new, incremental infrastructure deployment and demand-supporting initiatives aimed at securing affordable connectivity to many, as well as recognizing various types of contributions from the broader base of stakeholders as identified in recommendation 1.
4. Creating an international fund to support the sustainable development of broadband, which could be hosted by an existing international or multilateral development bank in coordination with the relevant UN organizations. This fund would be open to investors and non-governmental organizations that could make voluntary contributions for the provision of low capital-cost, long-amortisation-period financing.

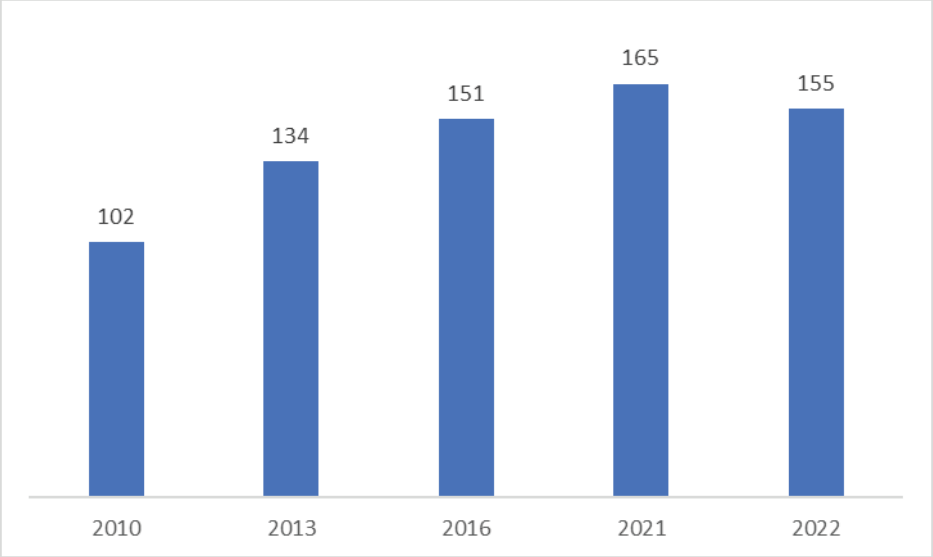
These strategic recommendations act as a foundation for driving connectivity and shine a light on a growing narrative around connectivity – one that emphasizes the shared benefits we all enjoy, our collective responsibility, the commitment required, the reform we must face, and the opportunity to enable global connectivity for all.

SAMENA together with many WG members and fellow Commissioners has advocated these recommendations during many events in 2021 and 2022, including SMART Africa's Digital Economy Financing Roundtable in September 2021, ITU's Industry Roundtable on 8 October 2021, MBBF 2021 in October 2021, the ICC Conference 2021 in October, at WTPF in November 2021, at the MWC 2022 together with fellow Commissioners in Barcelona and others. SAMENA Council congregated many Commissioners during its annual flagship event SAMENA Leaders' Summit in May 2022, where the outcomes of the report were also promoted.

To ensure that recommendations are put into actions, SAMENA during WTDC 2022 at the P2C Roundtable announced its joint pledge together with Smart Africa, which targets the implementation of the first recommendation in 30 Smart Africa member countries of the BBCom's 2021 WG Report on 21st Century Financing, Funding and Investment Models to close the connectivity gap, as follows:

- Encouraging mobile network operators to adopt data-driven business models;
- Facilitating the collaboration between mobile network operators and non-network operators in the investments related to digital infrastructures;
- Improving the taxation models of the government to adapt with the current trends of the digital economy;
- Alleviating burdens of the operators with some incentives such as in the area of spectrum allocations;
- Encouraging the implementation of blended financing models where all players can contribute to the investments of digital infrastructures;
- Facilitating new contributions models that can go beyond the traditional models with more impact in the ecosystem.

Figure 2.1: Number of countries with a national broadband plan, or emphasis on broadband in a digital agenda or strategy



Source: ITU.

2.2 Target 2: Making broadband affordable

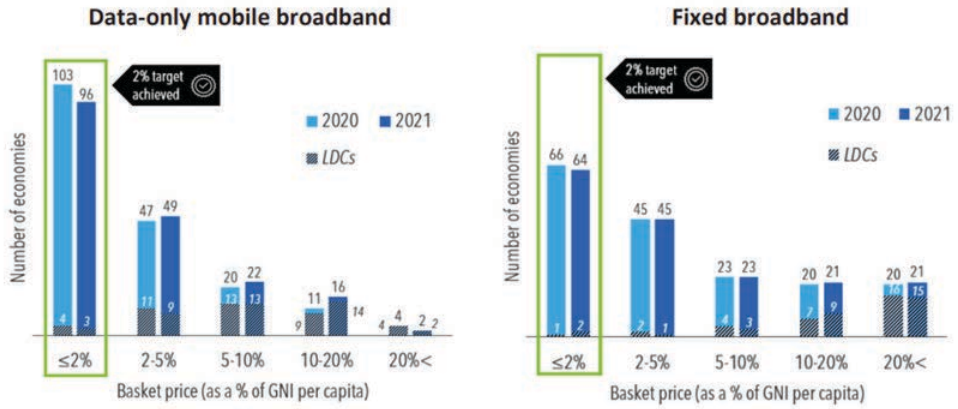
Target 2 Making broadband affordable: By 2025, entry-level broadband services should be made affordable in developing countries at less than 2 per cent of monthly gross national income (GNI) per capita

An ITU report carried out in partnership with the Alliance for Affordable Internet (A4AI) finds that after years of improvement, affordability of broadband services worsened in 2021.[6] This is largely due to a sharp drop in incomes (i.e. per capita income) as a result of COVID-19 rather than an increase in service charges, which continued to drop. Just 96 countries met the target for mobile broadband, down from 103 in 2020 while 64 countries met the target for fixed broadband, down two from 2020.

The report highlights that demand for broadband services grew despite becoming less affordable, illustrating that Internet access is not a luxury but a necessity. It also found that in developed countries, advertised speeds doubled for fixed broadband, suggesting operators catered to the demand for better quality as result of working from home.

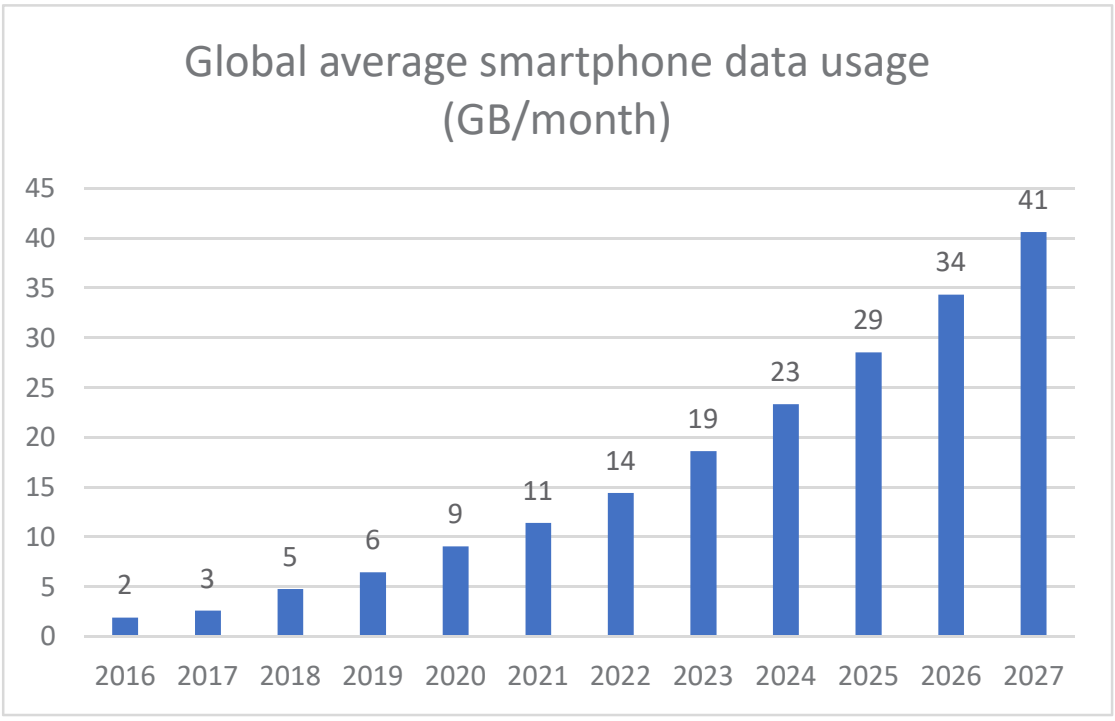
Data consumption trends and COVID-19 have impacted the measurement of Target 2. ITU price baskets are used to track this target based on 2 GB of data per month for mobile and 5 GB for fixed. Yet data from Ericsson show that average mobile data usage per smartphone has been growing steadily reaching 11 GB per user in 2021 and forecast to more than triple by 2027, driven by 5G technologies. Global figures on fixed broadband data consumption is less complete. In the United States fixed broadband was over 500 GB per subscription in the last quarter of 2021.[7] In Bahrain fixed broadband traffic per subscriber was 183 GB in 2019.[8] In Malaysia fixed broadband traffic was 281 GB per subscriber per month in 2021 compared to 21 per mobile broadband subscriber.[9] These figures suggest that both mobile and fixed broadband actual usage is far higher than the data allowances used in the ITU basket.

Figure 2.2: Number of economies by price of broadband services (% of GNI per capita)



Note: The chart shows the distribution of economies by affordability class, defined by the price of the broadband basket in % GNI per capita. Only those economies that had basket data available for both years for mobile broadband (185 economies) and fixed broadband (174 economies) are considered. The LDC component in each class is shown hatched, with the number in italics.
Source: ITU and A4AI.

Figure 2.3: Global average smartphone data usage (GB/month)



Source: https://www.ericsson.com/en/reports-and-papers/mobility-report/mobility-visualizer

Data traffic has grown significantly due to COVID-19 and widespread use of videoconferencing. One hour of videoconferencing alone uses between 225 MB -1.6 GB depending on the quality and number of participants.[10]

A recent study estimates that the amount required for foundational online activities (i.e. online public services, health information, shopping, learning and news) to be 660 MB per user per month.[11] If common recreational online activities such as social media use are included it adds an extra 5.2 GB for a total of approximately 6 GB per month.

The policy debate on whether the current structure of cost recovery is optimal and whether OTT platforms should contribute to these costs is gathering pace. The key issue is that telecommunications operators have invested to ensure that their networks can support the exponential growth in OTT traffic but are, to date, only able to recover network costs from end users despite the two-sided nature of infrastructure markets. Frontier Economics has estimated that in the EU the weighted average incremental cost of carrying OTT traffic is EUR 11-29 per subscriber on fixed networks and EUR 20-33 per subscriber on mobile networks.[12]

In May 2022 Axon Partners published a report commissioned by the European Telecommunications Network Operators (ETNO) that examined the benefits of contributions by leading OTT players to the cost of building telecommunications networks in the European Union.[13] The report concludes that annual contributions by leading OTTs could increase the EU's GDP by as much as EUR 72 billion by 2025, with a parallel increase in employment of up to 840 000 jobs annually; positive effects on both user experience and innovation levels; and a steep reduction of energy consumption and carbon emission levels. The report also recommends new regulation to "define a clear obligation for the OTTs concerned (i.e. only the largest among them) to negotiate the conclusion of a direct agreement with ISPs/telcos upon request, and to accept to pay a fair and proportionate contribution to network usage costs, and other conditions in such an agreement" and regulation that sets out procedures and substantive principles for the conclusion of these agreements, with a relevant supervisory and enforcement body, and the establishment of an effective and compulsory dispute resolution mechanism,[14] similar to the recent innovation in the Australian News Media and Digital Platforms Mandatory Bargaining Code. Under this Code, the Australian Communications and Media Authority is empowered to appoint mediators and, in some cases, arbitrators for the resolution of disputes if news media and digital platforms cannot reach an agreement.

To date OTT platforms maintain their opposition to contributions and the debate in Europe continues. The European Commission also supports the proposition that platforms make "a fair and proportionate contribution to the costs of public goods, services and infrastructures".[15] The outcome in the EU will set an important precedent for the rest of the world.

Finally, while the target looks at service charge affordability, the price of a broadband-enabled device is often a bigger barrier, especially for non-Internet users. A report from A4AI found that that the average world price for a smartphone in 2020 was around one-quarter of monthly income with large gaps among geographical and income groups.[16] In South Asia the figure rises to 40 per cent and in the LDCs it is 53 per cent. Among its recommendations for lowering device prices, A4AI calls for using USF funding to subsidize the cost highlighting the examples of Malaysia and Costa Rica.[17] GSMA published a report with an overview of business models, innovations and policies that are helping to improve the affordability of Internet-enabled handsets in LMICs, particularly for underserved populations.[18] The Broadband Commission also launched a working group to look into device/handset affordability in more detail.

Box 2.2: Working Group on Smartphone Access

ITU estimates that in 2021, 95 per cent of the world population had access to the mobile Internet. However, according to the latest ITU estimates, there are 2.7 billion who remain offline despite most of them being covered by a mobile broadband network. Furthermore, most mobile Internet users, especially in low- and middle-income countries, are still using 2G and 3G which is preventing them from realizing the full benefits of Internet connectivity. One of the major barriers to Internet adoption is recognized as access to smartphones – often driven by cost. The Broadband Commission's Working Group on Smartphone Access, which is co-chaired by Vodafone, ITU and UN-OHRLLS, was launched to study the opportunities and barriers to smartphone access and test the success and impact of different interventions in order to make clear recommendations to policy-makers, industry and international organizations to increase access to smartphones. The Working Group represents the first ever cross-industry/government mobilization on the topic.

During 2022, the Working Group carried out a number of interviews with experts and investigation of numerous case studies across three workstreams – barriers, opportunities, evaluation of interventions:

- **Workstream 1 - Opportunities** – Exploring patterns of connectivity characterized by adoption, usage, and consumption gaps, demonstrating that significant barriers to adoption exist aside from coverage.
- **Workstream 2 – Barriers** – Exploring supply-side barriers (for example, handphone affordability, and last-mile supply chain issues) as well as demand-side barriers (for example, lack of consumer understanding and information, and digital illiteracy).
- **Workstream 3 – Interventions** – Showing that initiatives implemented to address smartphone access can be classified into three categories based on their empirical validation, which are higher priority interventions, interventions that merit further consideration, and lower priority interventions.

The output of the Working Group is a report that empirically explores and analyses initiatives implemented across the globe, targeting improved access to smartphones. The results of the evaluations point to a number of clear, actionable recommendations that can help drive greater smartphone access, and in turn accelerate economic and social development in LMICs. The report offers empirically driven, practical recommendations that can be implemented to promote broader smartphone access. These include **three high priority strategies** (1) smartphone financing schemes, (2) reduction of taxes and import duties on smartphones, (3) improvement of smartphone distribution channels. It also suggests two types of interventions that merit further exploration: (1) device subsidies and (2) increasing use of refurbished/preowned devices.

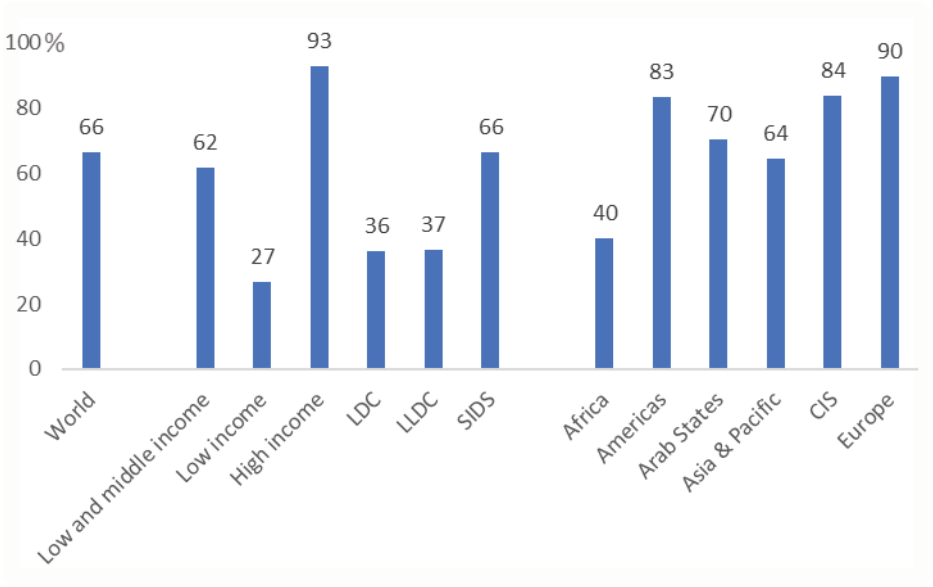
These recommendations require the collaboration of different stakeholders even though some recommendations can be approached unilaterally. As such, the report also recommends a five-point action plan, including establishment of task forces to drive clear policy changes, investments and delivery roadmaps against the recommendations of the Working Group. The report was released in September 2022. For further information, please visit: https://www.broadbandcommission.org/working-groups/smartphone-access/...

2.3 Target 3: Getting people online

Target 3 Getting people online: By 2025, Broadband-Internet user penetration should reach: a) 75 per cent worldwide, b) 65 per cent in developing countries, c) 35 per cent in least developed countries

ITU data find that Internet penetration grew as a result of the pandemic. Internet use grew to an estimated 66 per cent of the population in 2022, up from 54 per cent in 2019. The increase in 2020, the first year of the pandemic, saw use increasing by 11 per cent, the highest growth in a decade. In 2022, Internet use was 93 per cent in high-income countries, 61 per cent in LMICs but just 36 per cent in the LDCs (ITU estimates).

Figure 2.4: Percentage of individuals using the Internet, 2022



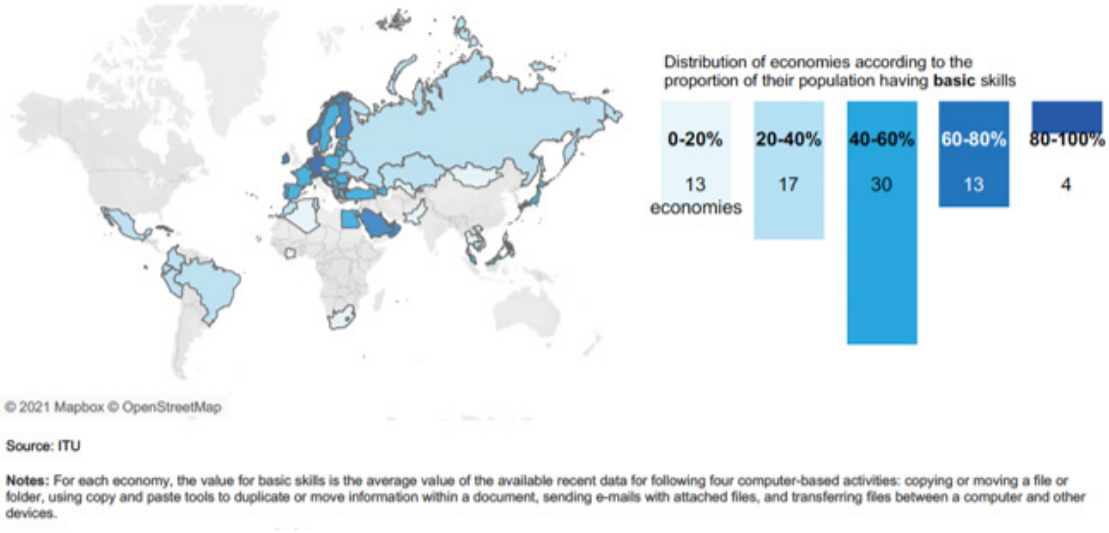
While Internet use is growing, some groups are being left behind such as the elderly[19] and people with disabilities.[20] GSMA published a report with policy recommendations for the digital inclusion of persons with disabilities. It draws on the insights of policy approaches in 28 countries providing a clear framework for action.[21] Special effort is needed to understand and address the specific needs of people in these categories, including content that meets accessibility standards and customized training.

2.4 Target 4: Digital skills and literacy

Target 4 Digital skills and literacy: By 2025, 60 per cent of youth and adults should have achieved at least a minimum level of proficiency in sustainable digital skills

Digital literacy is one of the main causes of digital exclusion and often among the top answers when people are surveyed about why they do not use the Internet.[22] According to the latest available data from the ITU, less than 40 per cent of the population in 45 per cent of the countries reporting carried out at least one of the activities considered a basic skill (e.g. sending an e-mail with an attachment). Only 23 per cent of the countries reported more than 60 per cent of the population report having at least one basic ICT skill.

Figure 2.5: Percentage of people with basic ICT skills, latest year available

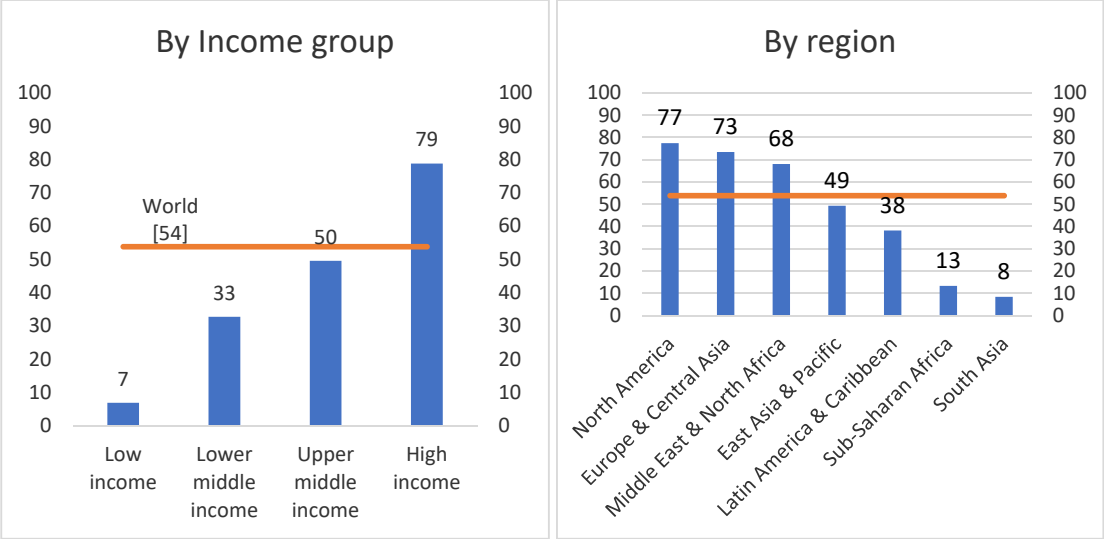


Source: ITU. "Measuring digital development - Facts and Figures 2021".

There are challenges with the coverage and interpretation of this indicator, which implicate the rigour with which claims about global digital literacy can be made. There is a documented gap in government basic facts and figures on young children's access to and use of technology in LMICs.[23] This is reflected in the ITU survey, to which only 88 mainly high-income countries provided data. Another challenge may be the indicator complexity, as a broad range of skills is measured, which complicates assembling the results into one figure. Instead of averaging these figures, the approach UNICEF adopted for its Multiple Indicator Cluster Surveys, in which one activity was chosen as a proxy indicator, is another approach.[24]

One such activity to estimate and interpret digital skills is computer use. Many digital skills involve the use of computer (e.g. moving files, using office applications, etc.) and the level of expertise required is higher than using apps on a smartphone. There is also a strong correlation between using one of the digital skills and computer use. Globally, 54 per cent of individuals used a computer according to the latest available data (Figure 2.6). There are wide differences by income and region. In high-income nations, 79 per cent of the population used a computer in the last three months compared to just 7 per cent in low-income countries.

Figure 2.6: Per cent of individuals using a computer, 2020 or latest available data



Note: Based on simple average of 100 countries with data.

Source: ITU, OECD, Eurostat and UNICEF.

One's digital skills are strongly influenced by one's access to and guidance from digitally literate instructors. As such, digital literacy has a strong socially dependent dimension, as human intervention has been shown to address digital literacy over access to digital technology alone, or the simplification to a question of "have-or-have-not".[25] Age, too, is not an accurate predictor of digital skills, as the concept of the young "digital native" has been debunked in numerous studies.[26] A study of level of digital skills of first-year University Students by ICDL Europe across a number of countries including Singapore, Denmark, Germany, Finland and India has shown that youth do not automatically have the required and sufficient skills to enter the labour market, even if they count as one of the most connected groups. Young people particularly lack productivity skills such as working with spreadsheets, word processing and presentation software. There is no guarantee that frequency of computer use in young people correlates with the development of productive, work or education-related digital skills rather than to play a computer game or scroll through social media. A study by ICDL compares self-assessment with actual digital test results and shows that "digital skills" among youth are much below their perception, highlighting that the productivity skills that young people need for their studies and future work remain poor, and that the validity and rigour of self-reporting digital skills is in question.

Table 2.1: Self-assessment vs actual skills in productivity applications for young people in Denmark, Finland, Germany and Singapore.

Country	Target group		Spreadsheets	Presentation	Documents
Denmark	First-year university students	Self-assessed	89%	84%	76%
		Actual	57%	58%	79%
Finland	First-year university students	Self-assessed	74%	87%	83%
		Actual	37%	60%	63%
Germany	First-year university students and final-year higher-tier secondary education students	Self-assessed	79%	81%	84%
		Actual	38%	66%	60%
India	University students	Self-assessed	64%	86%	85%
		Actual	33%	60%	49%
Singapore	University and polytechnic students	Self-assessed	60%	66%	68%
		Actual	35%	57%	45%

Table 1. *Self-assessment vs actual skills in productivity applications for young people in Denmark, Finland, Germany and Singapore.*

Source: ICDL Europe (https://www.icdleurope.org/policy-and-publications/perception-reality-measuring-digital-skills-gaps-in-europe-india-and-singapore/).).

Further, digital literacy does not, by default, determine data literacy. The question of privacy and security when navigating the Internet remains a related but distinct concept, and such skills regarding personal protection when using digital technology should be taught in addition to skills that support productive use of technologies. Similarly, media and information literacy is a related but significant area, championed by UNESCO and numerous stakeholders around the world. In a digital era plagued by complex interactions that feed misinformation, disinformation, polarization, hate speech and other types of online violence, it becomes necessary to strengthen citizens' capacities to access, search for, critically assess, use and contribute to information and media content, both online and offline; and to improve their understanding of evolving communication technologies, the modalities by which these are governed, developed and used, as well as digital rights.[27]

This is all encompassed by media and information literacy, which therein becomes a *sine qua non* of an informed, resilient and empowered society in the digital age. Advancing media and information literacy for all will be necessary to complement initiatives to address disinformation, avoid shutdowns of the Internet, and build long-term sustainable solutions to such challenges. If individuals are empowered to discern trustworthy and safe information and understand the workings of the information ecosystem and the major players that govern it, it can help mitigate the undesired consequences of insufficient regulation or self-regulation measures aimed at improving the transparency of the operations of Internet companies. At the same time, rights-based media and information literacy is indispensable if people are to cherish and defend freedom of expression and privacy and understand international standards that should inform the development and use of ICTs.

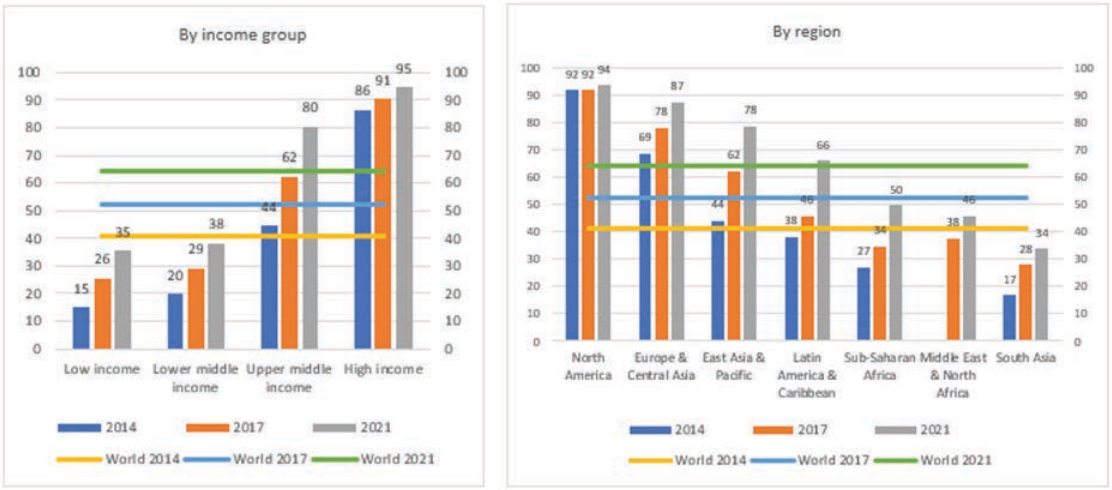
2.5 Target 5: Digital financial services

Target 5 Digital financial services: By 2025, 40 per cent of the world's population should be using digital financial services

The ability to pay with a mobile phone, scanning a QR code or swiping a credit or debit card facilitates greater access to financing, shopping and government services. Not only is it more secure than cash, but digital transactions also reduce close contact with other persons, an important consideration during the pandemic.

According to the latest data from the World Bank's Findex survey, 64 per cent of people aged 15 years and older made and/or received digital payments in 2021.[28] This figure exceeds the target of 40 per cent on a global basis. While low-income, lower-middle income countries and South Asia have not yet reached the target, they remain on track to achieve it by 2025.

Figure 2.7: Made or received digital payments in the past year (% age 15+)



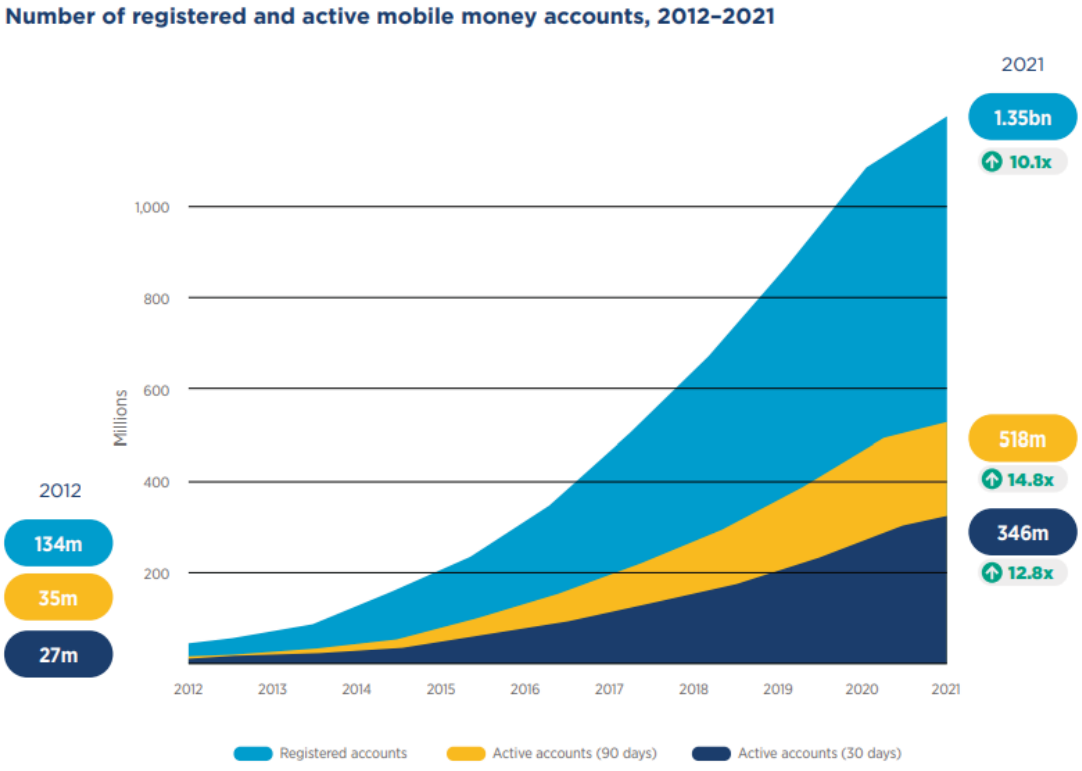
Source: World Bank Global Findex database (https://globalfindex.worldbank.org).

Digital finance adoption has grown sharply since 2017 particularly due to COVID-19. According to the World Bank, the pandemic led to an increase in digital financial services: four in 10 people in developing economies (excluding China) made a digital payment for the first time after the start of the pandemic.[29] The increase was driven by a number of factors. E-commerce led many to making payments online. Cash on delivery, popular in developing countries, was discouraged due to fears about cash spreading the disease. Another factor was the payment of COVID-19 benefits by governments to digital accounts. Almost 60 governments in LMICs used digital payments for COVID-19 assistance.[30] In Paraguay, some 300 000 people were reached with emergency assistance through transfers from the government using telecommunication operators' mobile money platforms.[31] Among adults in Argentina who received government transfers nearly half of recipients received them digitally for the first time during the pandemic; in Mexico, the share was nearly a fifth. In Latin America as a whole, 11 per cent of the population (almost 50 million individuals 15 years and older) started using digital payments for the first time in 2020 amid COVID-19; about half plan to continue to do so after the pandemic.[32] Some countries have also adopted a new regulatory framework to enable the uptake of digital finance, such as Mauritania, which adopted a draft law related to electronic payment services in June 2021.[33] Similarly, in Indonesia, the issuance of Presidential Regulation No. 114 in 2020 on the

National Strategy for Financial Inclusion that covered "improved digital financial products and services" has provided an impetus to accelerate Indonesia's financial inclusion.[34]

In 2021, there were more than 1.35 billion registered mobile money accounts worldwide, a tenfold increase from 134 million in 2012. Year-on-year growth in new registrations continues, defying initial expectations that it would taper off. Demand for mobile financial services is likely to remain high among financially excluded and often marginalized populations. However, even among registered account holders, about 1 billion are not active on a monthly basis, representing an important opportunity for the industry to deepen financial inclusion and economic participation.[35]

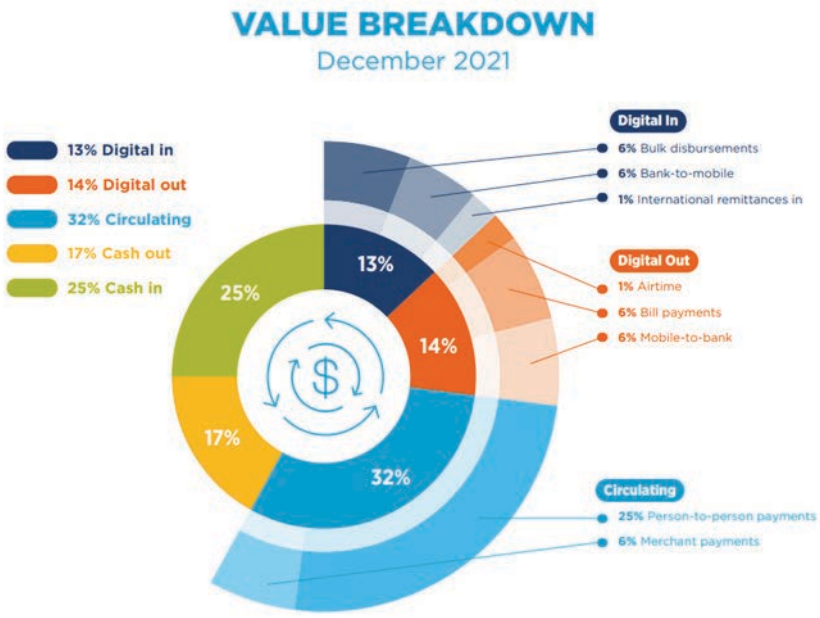
Figure 2.8: Number of registered and active mobile money accounts 2012-2021



Source: GSMA.

The volume of cashless payments rose during the pandemic with contactless payments increasing to its highest rate since 2015 with many card companies raising the daily limit on contactless payments.[36] While demand for large size cash denominations increased, this was more due to the use of cash as a store of value rather than for payments. A European Central Bank survey found that 87 per cent of the respondents who had made fewer payments in cash during the pandemic would continue to do so when the coronavirus crisis is over.[37] The Bank for International Settlements finds that COVID-19 has accelerated the drive among central banks to launch digital currencies.[38]

Figure 2.9: Breakdown of mobile money transactions by value



Source: GSMA.

Even though the COVID-19 pandemic had a negative impact on most economic sectors that require physical interaction, the number of mobile money agents has continued to rise. Between 2012 and 2021, the number of active agents multiplied more than 10 times, from 534 000 to 5.6 million. There is a clear trend towards a more digitized mobile money ecosystem as more cash is converted into e-money and either continues to circulate as such or is spent digitally rather than being cashed out.[39]

2.6 Target 6: Getting MSMEs online

Target 6 Getting businesses online: By 2025, improve connectedness of micro-, small- and medium-sized enterprises (MSMEs) by 50 per cent, by sector

This target has become particularly relevant due to the pandemic. Many MSMEs, particularly in low- and middle-income nations, were caught off-guard following the introduction of quarantines. With no broadband Internet access, they were unable to pivot swiftly to online operations to sell products and services.

Connectivity data disaggregated by enterprise size is widely available for high-income nations, although not always for micro enterprises. For most low- and middle-income nations, even aggregated data on total enterprises with Internet access is not available, let alone by sector. Hence it is difficult to gauge the severity of the problem. The nature of the connectivity is also important. A one-person micro enterprise might find having a smartphone with wireless access sufficient to carry out operations, particularly for social-media based online selling.

A survey of informal enterprises in nine African countries found low levels of ICT use.[40] Use of the Internet for business purposes was 7 per cent on average ranging from 24 per cent in South Africa to 1 per cent in Rwanda. Computer ownership is also low with over 90 per cent of businesses surveyed in Ghana, Kenya, Mozambique, Nigeria, Rwanda, Tanzania and Uganda

reporting not having one. Most cited not having a need for Internet access or computers in their business. A UNDP survey focusing on MSMEs in Kenya revealed that they were adversely affected by the pandemic, with one out of every 10 enterprises surveyed indicating a shutdown of their businesses due to the pandemic. However, MSMEs that have higher digital maturity reflected lower levels of negative impact on income.[41]

Figure 2.10: Use of the Internet for business purposes, information enterprises, Africa

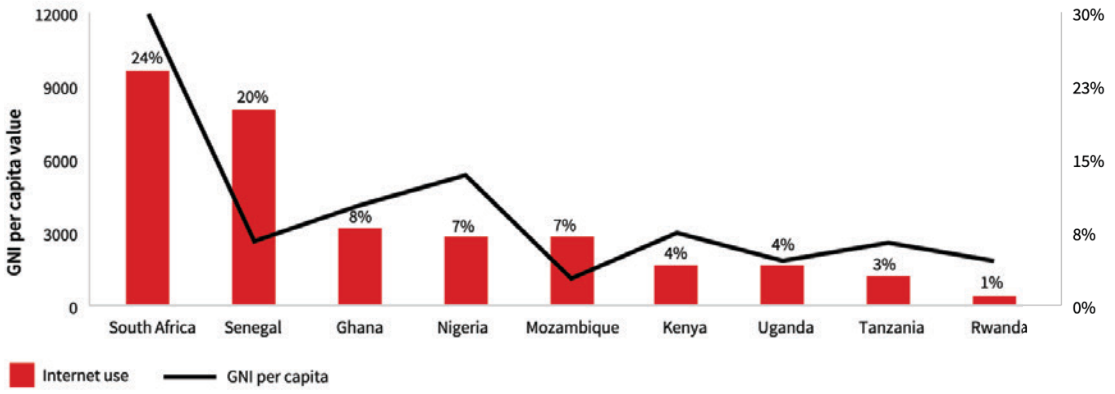


Figure 5: Internet use overlaid on GNI per capita

Source: RIA After Access informal business survey data, 2017

2.7 Target 7: Achieving gender equality

Target 7 Achieving gender equality in access to broadband by 2025: By 2025, gender equality should be achieved across all targets

According to the latest ITU estimates, 69 per cent of men were using the Internet in 2022 compared to 63 per cent of women. Gender parity[42] increased from 0.89 in 2018 to 0.92 in 2020. Some regions and income groups have reached gender parity in Internet use including high-income countries, SIDS, the Americas, CIS countries and Europe. However, notable gender gaps in mobile Internet access persist in LMICs. The substantial gender gap in mobile Internet use in LMICs had been improving, driven primarily by South Asia where it decreased significantly from 67 per cent in 2017 to 36 per cent in 2020, according to GSMA. However, this progress has now stalled across LMICs and in some countries the mobile Internet gender gap has even increased.

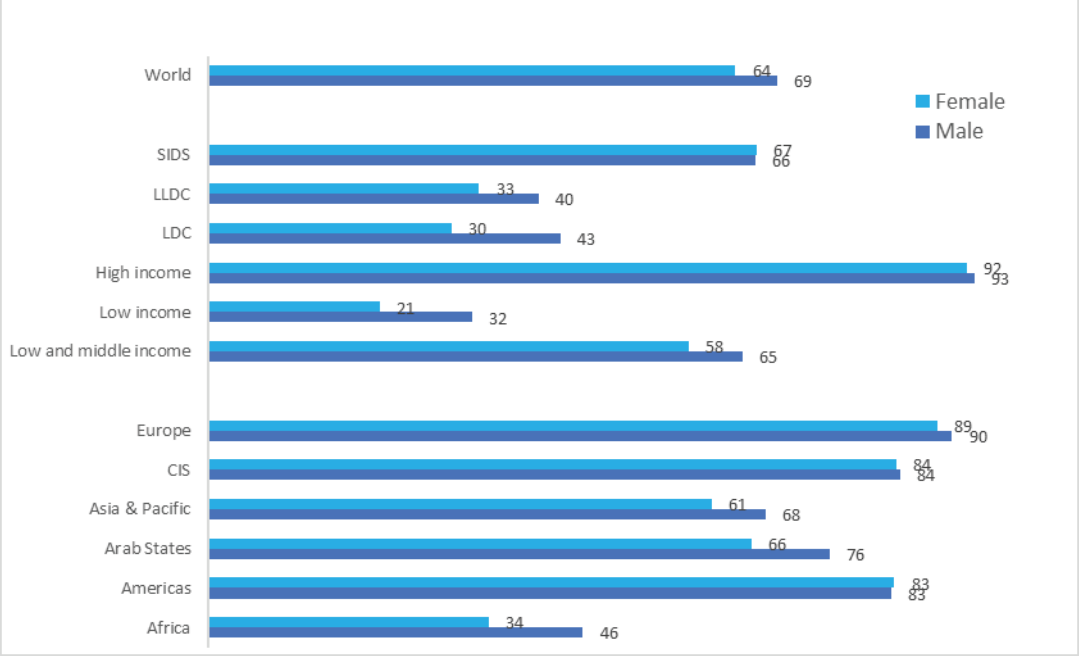
As reported by GSMA, women were 16 per cent less likely than men to use mobile Internet across LMICs in 2021.[43] By comparison, this gender gap was 15 per cent the year before, and prior to that it had reduced every year from 25 per cent in 2017. While more women continue to use the Internet than ever before, and it remains the primary way most people access the Internet in LMICs, their rate of adoption has slowed over the last year. Furthermore, in some countries, men's rates of mobile Internet adoption has been higher than that of women's, driving an increase in the mobile Internet gender gap.

Similar to the story we have seen in mobile Internet use, the gender gap in smartphone ownership had been reducing year-on-year across LMICs–from 20 per cent in 2017 to 16 per cent in 2020–but over the last year this has reversed. Women are currently 18 per cent

less likely than men to own a smartphone. These gender gaps also exist in women's access to and use of mobile money services, which are helping drive financial inclusion for women, can increase their economic independence, and strengthen their role as financial decision-makers. It is important to also ensure that women can access and use mobile money on par with men. Millicom Tigo started the Program Conectadas in 2017 in the framework of the Mujeres Conectadas initiative and is currently implementing the program in the nine Latin American countries where Tigo/Millicom has operations. Its purpose is to train young and adult women, professionals and non-professionals, on the benefits of technology and the Internet including financial services to help close the gender digital gap. To date, over 590 030 women have been trained throughout the region.

Significant gender gaps remain at other levels of the ICT value chain. Among the world's leading tech companies, just 23 per cent of women were engaged in roles such as software development and engineering, and women represented only 26 per cent of board members in 2020.[44]

Figure 2.11: Percentage of female and male population using the Internet, 2022



Source: ITU.

Box 2.3: Universal and meaningful connectivity

Developed by ITU and the Office of the Secretary-General's Envoy on Technology (OSET), the framework for universal and meaningful connectivity and the associated targets for 2030[45] analyse the current state of digital connectivity globally and progress towards reaching the targets by 2030. The framework also considers usage by various stakeholders (universal dimension of connectivity) and the five enablers of connectivity (meaningful dimension of connectivity): infrastructure, device, affordability, skills, and safety and security.

The assessment reveals that the world is still far from universal and meaningful connectivity. Infrastructure needs to be rolled out or improved to bridge the coverage gap. There are still significant differences between and within countries in network availability and quality. Fixed broadband is a costly investment and is not available or is unaffordable for many. Mobile broadband offers greater flexibility and is less expensive, and most rely on this technology to go online.

The coverage gap, currently at 5 per cent, is dwarfed by the usage gap: 32 per cent of people who are within range of a mobile broadband network and could therefore connect, remain offline. Data compiled by ITU make it possible to classify the offline population based on who they are and where they live. These data reveal five divides:

Income divide: The level of Internet use in low-income countries (22 per cent) remains far below that of high-income countries, which are close to universal usage (91 per cent).

Urban-rural divide: The share of Internet users is twice as high in urban areas as in rural areas.

Gender divide: Globally, 62 per cent of men are using the Internet, compared with 57 per cent of women.

Generation divide: In all regions, young people aged between 15 and 24 are more avid Internet users (71 per cent of them are online) than the rest of the population (57 per cent).

Education divide: In nearly all countries where data are available, rates of Internet use are higher for those with more education, far higher in many cases.

Understanding why people and households do not use the Internet is critical for designing effective, targeted interventions. The main reasons cited by people for not using the Internet are the lack of: affordability, awareness about the Internet, and need – as well as inability to use the Internet.

Indicator	Target	Current situation globally[a]	Number of countries meeting the target[b]
Internet users (% of population)			
Aged 15 and above	100%	63%[c]	13/151[c]
Gender parity ratio (1 = parity)	1	0.92	40/112
Households with Internet access (%)	100%	66%	13/126
Schools connected to the Internet (%)	100%	40% (primary)	42/93
		51% (lower sec.)	50/94
		66% (upper sec.)	50/97
Businesses using the Internet (%)			
0 employees or more	100%	n.a.	6/24
> 10 employees	100%	n.a.	23/47
Mobile network coverage (% of population)			
3G	100% for the most advanced technology already in use in the country with minimum coverage of 40%	95%	2/29[d]
4G		88%	66/157
5G		n.a.	n.a.
Fixed-broadband speed (% of subscriptions)			
>10 Mbit/s	100%	91%	25/150
School connectivity			
Min. download speed (Mbit/s per school)	20	n.a.	8/24
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%	1.9% (mobile)	96/185
		3.5% (fixed)	64/174
% of average income of bottom 40 percent of earners	2%	2.5% (mobile)	50/110
		6.0% (fixed)	21/106
Individuals using a mobile phone			
Gender parity ratio (1 = parity)	1	n.a.	29/56
Individuals owning a mobile phone (% of population)			
Aged 15 and above	100%	n.a.	22/78
Gender parity ratio (1 = parity)	1	n.a.	30/72
Population aged 15+ with basic digital skills (%)	70%	n.a.	8/77
Gender parity ratio (1 = parity)	1	n.a.	5/70
Population aged 15+ with intermediate digital skills (%)	50%	n.a.	11/76
Gender parity ratio (1 = parity)	1	n.a.	5/70

Source: ITU. 2022. Global Connectivity Report 2022.

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3 Addressing the post-pandemic missing links

Drawing from the analysis carried out in the previous chapters, this chapter examines approaches that can be taken to address the various digital gaps (demand and supply side) highlighted by the pandemic.

3.1 Access, skills and affordability

Specific categories of people lag the overall population in use and application of digital technologies. These groups include women and girls, people with disabilities, older persons, those with low incomes and people living in remote areas. People with one or more vulnerabilities are at even greater risk of digital exclusion (e.g. low-income women, seniors with disabilities, etc.). The list is not exhaustive as there are other groups at risk of digital inclusion that are often country specific (e.g. migrants, refugees (Box 3.1), ethnic minorities, etc.). Each country needs to identify which underrepresented groups are at risk of digital exclusion to target their support policies.

Box 3.1: Connecting Ukrainian refugees

As communities fled war in Ukraine to neighbouring countries, the response from the telecommunications industry and hosting governments was one of the most extensive and holistic to date, with extensive cooperation between mobile network operators ensuring affected people could remain connected.[1] Special pricing plans were put in place, roaming fees were waived where possible, SIM cards distributed, and free Wi-Fi has been provided at key locations ranging from transit points to areas where humanitarian assistance is also being delivered.[2] UNHCR has helped establish coordination structures bringing together diverse stakeholders in connectivity response efforts. Mobile operators and other industry players have been supportive, with for example Cisco and Ericsson supporting UNHCR and other humanitarian responders to deliver connectivity solutions at support locations for refugees.[3]

To provide access to all, including those in hard-to-reach areas as well as refugee camps, it is necessary to leverage and include all technologies. Satellite technology, for example, has been widely used to reach those in hard-to-reach areas as well as in refugee camps since it can be quickly deployed no matter how remote or hard-to reach the location is.

Box 3.2: Very high throughput geostationary satellites (VHTS)

In those areas, where deploying terrestrial infrastructure is costly and time consuming, new generation of very high throughput geostationary satellites (VHTS), by employing frequency re-use as well as spot beam solutions offer output potential which is order of magnitude higher than that of previous generations of GEO satellites. Electric propulsion and software-defined flexibility extends lifecycles and responsiveness to changing customer needs. In recent years traditional GEO satellite providers have increasingly teamed up with new entrants in LEO and MEO as well as traditional terrestrial telecom providers to combine technologies in order to serve customers in different areas of coverage.

Although traditional global telecommunications infrastructure will continue to have far more capacity (2 000 terabits per second (Tbit/s) than projected space-based infrastructure capacity (estimated at 50 Tbit/s by 2026). Space-based infrastructure currently complements terrestrial networks by "backhauling" (moving data between "access" networks, to include users' devices, and the "core" or "backbone" network where substantive computing happens) for terrestrial network service providers. Satellite capacity will likely steadily increase as multiple large constellations are launched, and data-relay efficiency and satellite-based data processing improve.[4]

Satellite telecommunications remains either the most effective or the only technology capable of delivering connectivity to mobile objects such as commercial aviation, maritime or land transportation in area of low terrestrial penetration.

Access to the Internet is beyond the affordability of many people in LMICs. Nevertheless, there are a number of steps that can be taken to make data more affordable. Community centres and schools could be provided with unlimited broadband access for those who cannot afford it at home. During COVID-19, telecommunication operators in many countries raised data allowances, provided free Wi-Fi or made access to educational and health sites unmetered;[5] this should be retained in some form at least for the poorest, students and those needing medical consultations. This can be achieved by adopting policies and regulations that create an enabling environment for further investments and operational efficiencies for mobile operators and other service providers. Governments could also consider subsidizing data use

for the poorest through social tariffs similar to those for food allowances or by partnering with mobile operators to zero rate certain services such as e-government, education and health sites. Another innovative scheme is charitable data donations where users donate their unused monthly data to those in need.[6]

The price of devices, particularly smartphones, remain a barrier to access. As described in Box 2.2, the Broadband Commission Working Group on Smartphone Access is examining the opportunities and barriers to smartphone access and measure the success and impact of different interventions in order to make clear recommendations to policy-makers, industry and international organizations to increase access to smartphones. Vodafone Group has committed to launching two pilot projects on device affordability as part of this process.[7]

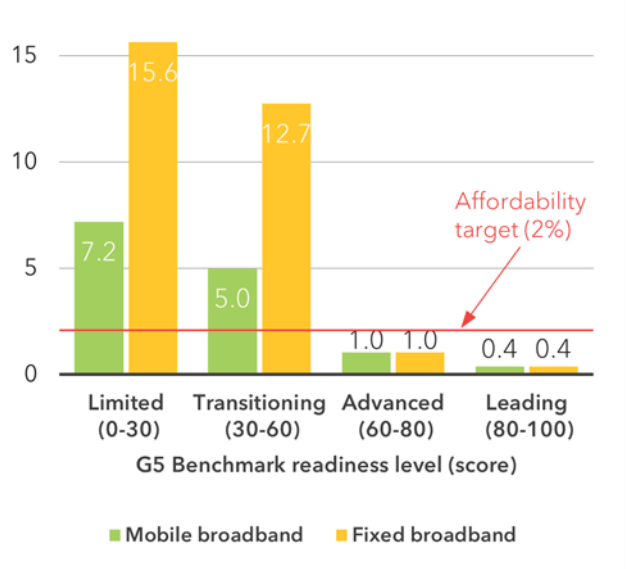
Newer 5G devices may be costlier than 4G ones for LMICs, meaning that initial end users of 5G in these countries may be limited to the wealthier segment of the population and to B2B (business-to-business) verticals. The affordability and connectivity gap may worsen in these countries without focus on addressing the access and device affordability challenges that have been identified in this report. Each country will have to decide, based on its national priorities, the policy tradeoffs of investing in expansion of coverage of existing broadband technologies (e.g. 4G) vs investing in new technologies such as 5G.

Governments wishing to reduce the cost of broadband access can resort to a variety of measures, from incentives for low-cost services through regulatory approvals, to negotiating public-private partnerships balancing investment incentives for network deployment. Governments may also consider reducing taxes or subsidizing access to free or low-priced devices, as well as free connection in public administration facilities such as libraries, hospitals, or schools or at other public hot spots. Measures to ensure affordable access to universal meaningful connectivity will ideally form part of more comprehensive broadband strategies.

Evidence suggests that affordability and the maturity of the regulatory environment go hand in hand. Countries showing the highest readiness levels in collaborative digital regulation and with tailored competition policy have the most affordable broadband service prices. This offers scope for countries to increase affordability as they improve their regulatory policy environment. Average broadband prices (% of GNI per capita) are lower where the regulatory environment is more mature. The G5 Benchmark readiness level measures the maturity of the regulatory environment based on a wide range of indicators. Most affordable broadband prices (for fixed as well as mobile broadband) are found in countries with more mature, collaborative, cross-sector digital regulation.

Overcoming digital illiteracy is critical for meaningful connectivity.[8] There is a long way to go with only eight of 77 countries for which data is available, 70 per cent or more of the population have basic ICT skills. And in just 11 out of 76 countries, 50 per cent or more. These results confirm the importance of ICT skills as an enabler of meaningful connectivity. Effective and large-scale programs are needed to address the challenge. Providing digital literacy as part of the school curriculum is a solution for those at school. However not all countries include digital skills in their school curriculum and many LMICs lack the requisite school connectivity. Many people are learning digital skills without formal training, resulting in shortcomings in acquiring further skills. Often these people are "unconscious Internet users", not knowing what the Internet is or that they are actually using it, and therefore unaware of the variety of uses, benefits and risks it can bring. Informal training often omits important security skills such as protecting privacy, for example, minimizing the digital trail left on social media and elsewhere.

Figure 3.1: Regulation readiness level and affordability



Source: ITU.

Nor does it teach how to distinguish between fact and misinformation. The result is an urgent need to train millions of people formally in using the Internet to ensure they have safe and meaningful connectivity. COVID-19 has seriously hampered the provision of face-to-face digital literacy training. Although programs have moved online, they are not practical for those who have never used the Internet. If there is no other option, courses should be provided in a webinar format with instructors able to interact with students. To truly leave no one offline and behind, there also needs to be a focus on addressing the needs of the 773 million or more illiterate worldwide,[9] of whom the majority are women. Digital literacy needs to be understood also in terms of their needs and challenges.

In regard to skills, UNDP and ITU launched the Joint Facility for Global Digital Capacity Development in 2021 to support those not currently served by existing digital capacity development resources or channels. An online portal[10] has been set up to provide both a database of digital capacity development providers globally and a Multi-Stakeholder Network that serves as a community of practice.

Box 3.3: Maestr@s Conectad@s

On 23 June 2022, Millicom Tigo launched its Maestr@s Conectad@s online portal (www.maestrosconectados.com). The Maestr@s Conectad@s program was first launched in 2020 as the pandemic became a reality, causing the closure of schools and making education become digital.

With the objective of reducing the digital divide, the program initially consisted of online training modules which prepared different groups of educators and mentors to understand and use digital tools to improve educational quality. To date, over 250 000 educators were trained in Guatemala, El Salvador, Honduras, Nicaragua, Colombia, Costa Rica, Panama, Bolivia, and Paraguay. The new portal contains 20 free courses covering topics such as PowerPoint, Canva, Zoom, educational innovation, storytelling, gamification, use of social networks, digital tools for the classroom, and neuroeducation.

3.2 Safe environment

As the Broadband Commission highlighted in the State of Broadband 2019 report, the concept of meaningful universal connectivity "encompasses broadband adoption that is not just available, accessible, relevant and affordable, but that is also safe, trusted, empowering users and leading to positive impact".[11]

Personal data breaches, online harassment, children accessing inappropriate websites, hacking, viruses, pharming and phishing and the spread of misinformation are just some of the negative consequences from being online as experienced in a greater manner during the pandemic. Marginalized communities such as forcibly displaced people are shown to be at heightened risk, with observed links between online safety and physical safety of individuals.[12]

Protecting personal data is critical. Many data protections are inadequate, lacking clear implementation processes such as a data protection authority; often they do not require user consent for personal information to be used nor do they specify controls for transferring personal data abroad. Efforts are needed globally for countries to create adequate data protection laws or update their existing laws to bring them into conformity with best practices.[13]

The EU's new Digital Services Act (DSA) is an example of an approach to reduce illegal and harmful online content by imposing obligations on large platforms.[14] Features of DSA include measures to counter illegal goods, services or content online, new measures to empower users and civil society, and measures to assess and mitigate risks. The DSA will apply throughout the European Union and will be applied 15 months or from 1 January 2024, whichever comes later, after entry into force.

3.3 Cross-sectoral collaborative approaches in the aftermath of the pandemic

COVID-19 provided a sharp illustration of limitations of the online economy in many LMICs. Many struggled due to a lack of online retail platforms for goods and services and ability to make digital payments. This is a reflection of a wider digital malaise in some countries where governments have struggled to diversify and digitize their economies including by adopting digitalization in a meaningful way.[15] One reason is the ICT sector has often been stuck in a silo with a single responsible ministry and little interaction with other sectors. Awareness and expertise about digitalization has remained limited in many sectors.

The pandemic has been a wake-up call and could accelerate digitalization across sectors of the economy similar to the SARS outbreak in China in 2003 which led to a surge in e-commerce. Now that governments are aware of how ICTs helped mitigate the economic disruption caused by COVID-19, it is an opportunity to move rapidly to spur digital adoption across all economic sectors. Another reason to accelerate digitalization is that countries with better broadband infrastructure were more successful in mitigating the economic consequences of the pandemic.[16]

The awareness of and needs for cross-sectoral collaboration and whole-of-society digital transformation is also observed by UNDP in its support for more than 100 countries during the pandemic.[17] The surging demand for nation-wide digital transformation is clearly beyond any single ministry or the government's task alone, but requires the participation and contribution

from various sectors and stakeholders, as illustrated by UNDP's experience in Mauritania[18] and Moldova.[19]

ITU's Fifth Generation collaborative regulation (G5) is an acknowledgement that ICT policy not only needs to keep up with technological change, but it also needs to integrate all sectors. It recognizes that regulation has to be a collaborative process across institutions and stakeholders to foster a digital economy.[20] Not only does this involve cooperation with ICT-related institutions such as broadcasting, data protection and cybersecurity agencies, but also with ministries responsible for sectors such as finance, energy, transport, health, education, environment and economic development. In this way, awareness can be raised, expertise shared and quick movement towards the digital economy accomplished. The huge digital gaps magnified by the pandemic will require large investments necessitating an evolution in regulatory and policy approach.

Mexico is one of the 60 countries at the advanced level of preparedness for digital transformation according to the ITU G5 Benchmark. It has achieved this level through decisive collaborative actions implemented by the ICT regulator, such as interaction with other authorities and involvement of industry in the creation of regulation through a public consultation process. In addition, the digital economy has been a major focus area of ICT regulation, with medium- and long-term planning based on what is required to achieve a digital economy. The ICT regulator is not only thinking about the telecommunication/ICT sector, but also has a more holistic mindset that is clearly focused on the digital economy.[21]

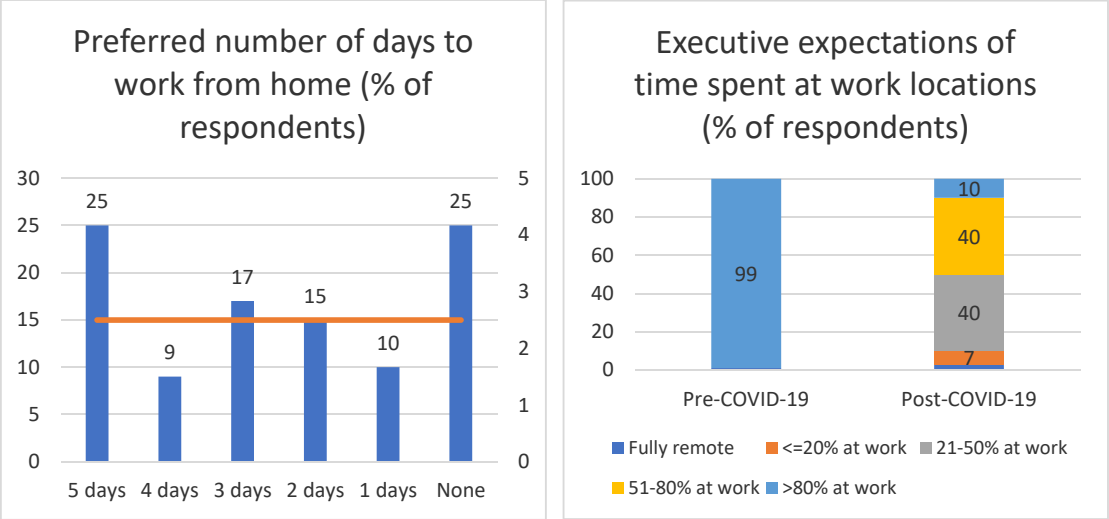
3.4 Flexible work becomes the new normal

As the pandemic recedes, working from home will continue to persist in some form. McKinsey estimates that around one-third of jobs in developed countries could be performed remotely, mainly office workers.[22] Evidence among those who had the opportunity to work remotely during the pandemic finds that the majority want to continue to do so in some form.

An Ipsos survey carried out in mid-2001 of over 12 000 people in 29 countries found that before COVID-19 almost a quarter of people were already working remotely.[23] The figure rose 15 percentage points during the pandemic with around three-quarters saying they were working from home because of COVID-19. In total, this group accounts for over 580 million people working from home. The extent to which people were working mostly or wholly from home varies widely between countries, from at least half of people surveyed in South American countries to 15 per cent in China. In regard to how often people would like to work from home following the pandemic, the average was 2.5 days per week (Figure 3.2, left). Overall, two-thirds surveyed want to work flexibly when the pandemic ends. Almost a third are prepared to quit their job if they are required to go back to the office full time.

Employers are also supportive of post-pandemic hybrid work environments. A McKinsey survey of 100 executives across industries and geographies found that nine out of 10 organizations will move to flexible working.[24] Interestingly, productivity increased during the pandemic. A consensus has yet to emerge with the same study finding most executives estimating the amount of time workers will spend at work ranging from 20-80 per cent (Figure 3.2, right).

Figure 3.2: Number of days people would like to work from home and executive expectations



Source: Ipsos and McKinsey.

Sustainable hybrid working will require broadband capacity upgrades and network engineering adjustments. Although experience during the pandemic suggests that networks handled the increase in traffic generated from households, they were not originally designed for this. It is likely that with permanent flexible working in place, demand will increase for connectivity and bigger screens. While people often work in urban areas, many of them live outside cities and even on islands. Others also work on the move. To address this demand, it will be necessary to leverage different technologies, working together to deliver the best services to all and to enable people to work from anywhere in the world and on the move. It remains to be seen how much of this cost will be borne by employers in order to support remote working by their employees.

3.5 Digital complementation for learning

COVID-19 disrupted educational systems across the world. Millions of school children were unable to continue their studies due to a lack of household equipment for remote learning. However unlike work from home flexibility that will survive post-pandemic, most educators agree that online learning is not an equivalent substitute for the in-school presence of students.[25] Nevertheless home connectivity is an important complement for remote learning in the event of future pandemics, school closures for other reasons (e.g. inclement weather) or pursuing studies and homework outside of school.[26] Even before the pandemic there was evidence that having a computer at home increased school attendance, secondary school graduation rates and school performance.

It is important not to forget all those in rural and hard to reach areas—and again it is important to leverage different technologies to bring access to all. Schools and villages in remote locations can be connected with modern wireless Internet access (WIA), such as 4G and 5G, and fixed wireless access (FWA) solutions. Satellite connectivity offers the geographic ubiquity that will allow students all over the world to access the most advanced teaching and educational opportunities.

Private sector support: Donation of hardware and free or discounted Internet access. These initiatives have taken a turn since the pandemic, switching from providing connectivity to schools to connecting children and teachers to the school. Examples include donating laptops to teachers and school children; expanding data allowances or increasing the Internet connection quality at children's homes; or providing free access to educational websites. While these initiatives have been critical in supporting remote learning during the pandemic, they are only the tip of the iceberg in terms of the efforts needed to reach the magnitude of students and teachers without adequate resources to participate in remote learning.

One major challenge is the lack of schools with Internet. Worldwide only 62 per cent of secondary schools had Internet access in 2017/18.[27] Giga—a partnership between UNICEF, ITU and the private sector—has the goal of connecting every school to the Internet. Its analysis shows that schools can be "anchor tenants" in a community to extend access and digital skills training to those living close by.[28] Financing school connectivity remains a challenge with many low- and middle-income nations struggling to build schools with electricity let alone Internet access. Giga looks to tackle this by highlighting eight business models for school connectivity, dependent on the context of the country.[29]

Box 3.4: Working Group on Data for Learning

A primary objective of the Working Group on Data for Learning is to map the evolving data landscape within a lifelong learning perspective. To explore the many dimensions of data use in learning spaces, the Working Group has focused on three strands: (i) data infrastructure and learning ecosystems; (ii) data skills and competence framework for life and work; and (iii) ethics, governance, national sovereignty, and cross-border data flow regulation. In doing so, the Working Group aims to promote all learners' data protection, advocate for the democratization of data for learning through open data initiatives in education, explore linkages with other related initiatives, and develop scenarios for future development of data-driven learning ecosystems.

In monthly meetings since January 2022, the group has shared experiences and case studies on subjects related to education data ecosystems, such as the development of data-fuelled learning systems, interoperability frameworks, the Open Data Movement, data literacy, ethics in AI-driven technologies used in education and training. The group will continue its monthly meetings for the duration of its unique two-year cycle, releasing an interim report in September 2022 and culminating in a final report in September 2023. For further information, please visit: https://www.broadbandcommission.org/working-groups/data-for-learning/

3.6 Green transition

The ICT sector accounts for 1.4 per cent of global GHG emissions. An inevitable result of growing digitalization is higher electricity usage for networks and data centres. Greater energy efficiency through upgrade of cooling, air ventilation/management, electricity system, and heat recovery along with a continuous improvement in both data storage and processing infrastructure will ensure a cost-effective green transition of data centres. New data centres should also be built with energy efficiency, renewable energy and heat recovery as essential criterion, which in turn can provide large economic and environmental gains

In a perfect world where all electricity use was powered by renewable energy there would be no GHG emissions. However, while a number of the leading ICT companies pay for 100 per

cent renewable energy, they do not receive this due to the grid mix. The UN 24/7 Carbon-free Energy Compact has the goal of changing electrical grids to provide green energy at all times to those that have purchased it.[30] The compact is backed by ICT companies such as Alphabet and Microsoft who are bringing their expertise to bear with the goal of achieving this transition by 2030.

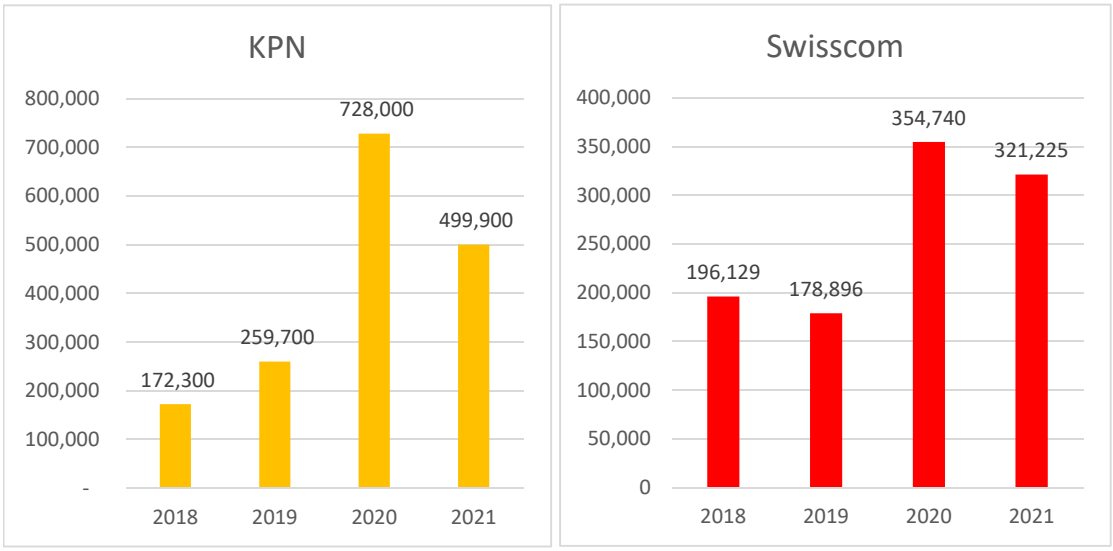
Governments also have an important role to play in lowering ICT emissions by liberalizing energy markets. This includes decoupling grids, allowing independent renewable power producers, and minimizing or eliminating duties and taxes on renewable energy products.

ICT companies need to do everything they can to reduce and eliminate their operational emissions. Ericsson, for example, reduced 71 per cent of emissions from its own activities (fleet, facility, product transportation and business travel) between 2012 and 2020. This includes adopting concrete targets in line with the Intergovernmental Panel on Climate Change (IPCC) recommendations for minimizing the rise in temperature to 1.5°C. Nokia has committed to use 100 per cent renewable electricity by 2025 and its 1.5 degree aligned science-based target (SBT) is to reduce GHG emissions across their value chain (Scope 1, 2 and 3) by 50 per cent between 2019 and 2030, and reach net zero by 2050. ITU has partnered with others to create guidelines for network operators to follow in designing SBTs.[31] Millicom is one of only three telecommunication operators with a presence in Latin America with SBTs, aligned with 1.5°C ambition for their Scope 1 and 2 emissions. The telecommunications sector has shown significant leadership in upholding rigorous emissions reduction commitments. According to GSMA,[32] as of the end of 2021, 44 per cent of telcos measured in connections and 63 per cent in revenue had either a commitment or active science-based target in place. The significance of this methodology is related with its alignment with the crucial UNFCCC Paris Agreement. It is important to note that climate action goes beyond mitigation and that the creation of digital infrastructure and digital inclusion are key for successful adaptation, something crucial in emerging markets.

The multistakeholder platform Coalition for Digital Environmental Sustainability (CODES) has been active since March 2021, focused on harnessing the digital transformation to become a positive and exponential force for sustainability and climate action. It recently released an ambitious action plan during the Stockholm 50+ meeting that proposes a comprehensive and strategic approach to embed sustainability in all aspects of digitalization.[33]

Dutch telecommunications operator KPN and Swiss provider Swisscom compile data on the avoided emissions due to use of their broadband services for home working. There is a notable jump in 2020 due to COVID-19 quarantine restrictions with a slight drop off in 2021 as offices reopened but with many workers still in a hybrid work mode.

Figure 3.3: Estimated avoided tCO2e emissions from homeworking

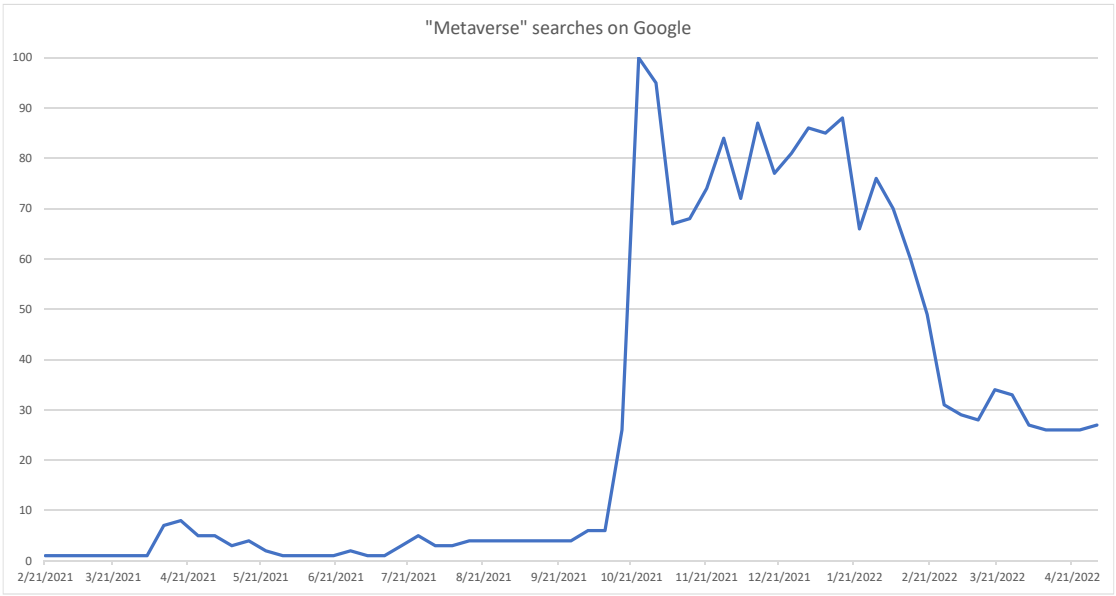


Source: KPN 2021 Integrated Annual Report and Swisscom 2021 Climate Report.

3.7 Changing social interactions: a shift from physical to hybrid to virtual?

In the wake of COVID-19 and a transformation to a hybrid physical virtual work environment, there is now talk of the next evolution being the so-called metaverse. Web searches of the term metaverse rose dramatically in 2021 before peaking in October. A transition to a possible metaverse raises ethical, behavioural, broadband infrastructure and security challenges.

Figure 3.4: Metaverse searches on Google



Note: The scale refers to how frequently a given search term is entered into Google's search engine relative to the site's total search volume over a given period of time.

Source: https://trends.google.com/trends

Many envision the metaverse as use of augmented and virtual reality accessories, an evolution of the experience of today's most advanced online games.[34] With 3D glasses, avatars and an immersive high-quality video environment, users could select their clothing by trying it on a virtual model of themselves or celebrate a virtual birthday party.[35]

Supporting the network environment for the metaverse would require significant upgrades in broadband infrastructure.[36] Speeds would need to be fast and symmetrical. The latter was noticed during COVID-19 where large number of people working and learning from home caused an increase in uploaded traffic. This is a big difference from the way networks have traditionally been configured with download speeds far faster. Latency will have to be very low implying the need to leverage and combine all technologies for last-mile access; bottlenecks could occur in the middle-mile network if national backbones do not have sufficient capacity and there are insufficient national data centres and IXPs. Higher resolution is needed which will increase data traffic and impact volume-based pricing. The high speeds, ultra-low latencies and ability to handle traffic can only be met through 5G connectivity. These upgrades would require massive investments over several years.

5G is scaling faster than any previous generation and is on track to become the dominant mobile access technology by subscriptions globally by 2027. Critically, those subscriptions are forecast to be heterogenous, with, for example, 90 per cent of mobile subscriptions in North America expected to be 5G in 2027, compared to 10 per cent in Sub-Saharan Africa.[37]

This would likely result in a divide between people with "metaverse" enabled network capabilities—high speeds, ultra-low latency and big data allowances—and those without, leading to a two-tier Internet. This speaks to the need to encourage the global roll-out of proven, scalable and affordable connectivity at speed.

Pre-existing security and data privacy challenges with the current Internet could be magnified with the metaverse.[38] Potential for a higher level of financial crimes exist in addition to theft of personal data, authentication challenges, misinformation and harassment. Early indications are that the metaverse would feature financially related activities often linked to blockchain technology. For instance, there is a risk of scams in non-fungible tokens (NFTs) used for among other things digital art as well as theft of or sharp drops in value of users' cryptocurrency wallets.[39] Virtual reality devices could also be prone to malware and theft of biometric information.[40] The sheer amount of data collected for the virtual reality experience magnifies the risk of misuse of personal information.[41]

Some of these risks could be mitigated, particularly data privacy, through effective and appropriate regulatory measures for the protection of data. This includes requiring user consent for processing of personal data. Other harms could be reduced through amplified efforts to train users on protecting their security and distinguishing misinformation from true information.

When considering this shift, it is also important to remember that with fewer people returning to offices and manufacturing facilities following the pandemic, we see greater need for more efficient supply chain logistics. Also, professionals are buying more supplies online and getting it delivered to them. These supplies come from all over the world, which could lead to an increase in greenhouse gas emissions from delivery ships and trucks. While there is plenty of good work under way in the sector to address these challenges with new fuels, ships and engines, simply reducing waste can have a massive impact. Just-in-time vessel arrivals reduce idling at sea. Dynamic, AI-driven route optimization for ships, real-time data sharing to ensure

prompt maintenance, and flawless value-chain collaboration can have a massive impact—and all need superb connectivity. Much of that remote connectivity requirement will come from satellite communication providers given the need for coverage where terrestrial solutions are not available.

3.8 Policy and regulatory measures to incentivize investments

Many governments in LMICs made COVID-related support payments and had increased expenditure for health care. This could be an opportunity for governments operating telecommunication networks to divest to make up for the pandemic-induced shortfall of revenue. In countries with high service costs, governments could adopt competition policy which supports investment in high-quality mobile networks by issuing additional licenses to the private sector for the build-out of broadband networks.

Governments face a dilemma regarding taxation and other levies on telecommunications networks. There is a need for massive investment in broadband to bring it up to speed with the new post-COVID-19 world. Higher capacity and lower latency is needed to support videoconferencing for those who can work from home as well as remote learning in the event of future pandemics or other disruptions to school learning. The pandemic also magnified the existing digital divide and need to build out broadband infrastructure where there is no access. In order to do this, investment costs need to be lowered by reducing both economy wide and sector specific taxes the telecommunications sector pays. Building out and upgrading broadband infrastructure will have significant economic impacts including the stimulation of national supply chains and productivity gains across different sectors. GSMA studies find that demand can be stimulated to the point that government tax revenues also increase in the medium term.[42] According to ITU, for every 10 per cent increase in a country's mobile broadband penetration, GDP increases on average 1.5 per cent.[43]

To facilitate this, governments could allocate sufficient amounts of spectrum on a competitive basis, prioritizing the larger benefits of investment in connectivity rather than the collection of high spectrum fees. In addition, governments could make licensed spectrum available on a flexible use and technology-neutral basis without defining which technologies / architectures are to be used. Moreover, governments can make the deployment of 5G much easier by simplifying and streamlining the licensing process of base stations and connected infrastructure. Reducing red-tape, licensing fees and critically the lengthy processes can have a massive impact on the ability of the mobile industry to deploy the newest and best technology without undue delay. An additional policy to encourage massive deployment and incentivize investment further would be to reduce or eliminate the value-added tax (VAT) on the latest 5G equipment.

In this context the mobile industry has made and continues to make phenomenal technological advances that make it by far the best and most efficient way to provide connectivity around the world. Especially with 5G standalone, the possibilities for consumers and business especially will provide much more flexibility, new opportunities and tailored services to the exact needs of consumers. For example, augmented and virtual reality will require 5G standalone, high capacity and extremely low latency that only 5G can deliver. The use-cases, opportunities in the enterprise sector as well as the consumer segment will largely depend on the capacity of the networks to deliver the connectivity needed for those services. For this reason, it is imperative that policy-makers ensure the quickest and most efficient roll-out of the latest technology.

Investments in infrastructure are further incentivized through standardization. Global standards, which have allowed mobile technologies to compete, succeed and scale globally, have driven-up affordability for consumers in all countries.

Geopolitics and to some extent nationalist thinking has put some political pressure on the future role of global standards like 3GPP, or 3rd generation partnership projects that embody collaborative activity between well-established regional standard organizations. Pursuing and adhering to global open standards, as is the case with 5G, enables continuing economies of scale and affordability.

The nature of capital expenditure for broadband remains uncertain.[44] One hypothesis is that new capacity and other issues identified during the pandemic might result in improving existing infrastructure and combining different technologies to bring connectivity to all. Another is that newer technology with large capacity, fast speeds and low latency is precisely the infrastructure needed to make the world more pandemic proof.

Given that many governments are cash-strapped as a result of the pandemic and now facing new challenges such as rising inflation and energy shortages, there is a risk that governments will fail to prioritize critical infrastructure investments that can underpin long-term, sustainable growth and prosperity. As a priority, policy-makers need to encourage private sector network investment, including ensuring mobile network operators (MNOs) can recoup their investments above the cost of capital, and technology-neutral regulations prevail to spur free market competition, something which requires governments to refrain from protectionist and preferential treatment of domestic suppliers. In addition, deployment barriers need to go: permitting and EMF requirements need to be harmonized, to enable timely deployment.

Development banks could step up to play a larger role, particularly given the potential of broadband for economic growth and poverty reduction.

3.9 Measurement

As noted in the chapter on the advocacy targets, there are measurement, clarity and scope challenges for some indicators. More can be done to collect and publish granular, reliable and gender-disaggregated data related to infrastructure deployments as well as Internet adoption and use in accordance with international guidelines and standards. This can include the disaggregation of Internet use by MSMEs or vulnerable groups such as persons with disabilities or the elderly. Moreover, more research to better understand the context, circumstances and needs of individuals and MSMEs not yet using the Internet can be conducted or supported. These data and insights are key in setting policy priorities, targets and budgets.

Measurement of broadband metrics merits more focus as a result of the pandemic and the likely aftermath. Indicators that were not prominently analysed before have now become more relevant. This includes household indicators such as the percentage with computers and Internet access or Internet-enabled handsets. Both merit additional granularity such as the type of computer the household has as well as the type of Internet access and breakdowns by household demographics. Collection of asymmetrical broadband speed information is also important given the new significance of upload speeds.

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4 Conclusion

Quarantine measures due to COVID-19 resulted in an acceleration in the adoption of digital services and in the expansion of broadband infrastructure. With the COVID-19 pandemic, broadband—for those who had it—became a vital necessity for working and learning. Many predict this will have a notable impact not only on digital infrastructure but also global behaviour going forward. There will be a transition to flexible working for those whose job characteristics allow it. Millions of people got their first taste of digital applications such as online shopping, access to government services and remote health consultation, and this is likely to continue.

However, for a smooth transition to a more connected post-pandemic world two things need to occur. First is a conducive regulatory environment for broadband services that will attract the vast investment needed to support a more digital world. Second are strategies and policies to enable broadband adoption and accelerate digital inclusion. The pandemic brought into sharp focus the digital divide with many unable to work from home or take part in remote education due to a lack of adequate skills, Internet access, appropriate devices and the means to pay for it. Steps to overcome these challenges include:

- As the pandemic recedes, working from home will continue to persist in some form. Although experience during the pandemic suggests that networks handled the increase in traffic generated from households, they were not originally designed for this. It is likely that with permanent flexible working in place, demand will increase for connectivity. It will be necessary to leverage different technologies, working together to deliver the best services to all and to enable people to work from anywhere in the world and on the move.
- Governments wishing to reduce the cost of broadband access can resort to a variety of measures, from adopting policies that incentivize the provision of more affordable services, to promoting public-private partnerships as appropriate and creating an enabling

investment environment. Governments may also consider reducing sector specific taxes or subsidizing access to free or low-priced devices, as well as free connection in public administration facilities such as libraries, hospitals or schools, or at other public hot spots. Measures to ensure affordable access to universal meaningful connectivity will ideally form part of more comprehensive broadband strategies.

- COVID-19 disrupted educational systems across the world. Millions of school children were unable to continue their studies due to a lack of household equipment for remote learning. Unlike work from home flexibility that will survive post-pandemic, most educators agree that online learning is not an equivalent substitute for the in-school presence of children. Nevertheless, home connectivity is an important complement for remote learning in the event of future pandemics, school closures for other reasons (e.g. inclement weather) or studies and homework outside of school. Governments and the private sector need to take steps to ensure that all students have the necessary digital environment to support remote learning.
- COVID-19 provided a sharp illustration of limitations of the online economy in many LMICs. Many struggled due to a lack of online retail platforms for goods and services and ability to make digital payments. This is a reflection of a wider digital malaise in some countries where governments have struggled to diversify and digitize their economies in a meaningful way. One reason is the ICT sector has often been stuck in a silo with a single responsible ministry and little interaction with other sectors. Awareness and expertise about digitalization has remained limited in many sectors. The pandemic is a wake-up call and could accelerate digitalization across sectors of the economy similar to the SARS outbreak in China in 2003 which led to a surge in e-commerce. Now that governments are aware of how ICTs helped mitigate the economic disruption caused by COVID-19, there is an opportunity to move rapidly to spur digital adoption across all economic sectors. Another reason to accelerate digitalization is that countries with better broadband infrastructure were more successful in mitigating the economic consequences of the pandemic.

  The surging demand for nation-wide digital transformation is clearly beyond any single ministry or government's task alone, but requires the participation and contribution from various sectors and stakeholders. ITU's Fifth Generation collaborative regulation (G5) is an acknowledgement that ICT policy not only needs to keep up with technological change, but it also needs to integrate all sectors. It recognizes that regulation has to be a collaborative process across institutions and stakeholders to foster a digital economy. Not only does this involve cooperation with ICT-related institutions such as broadcasting, data protection and cybersecurity agencies, but also with ministries responsible for sectors such as finance, energy, transport, health, education, environment and economic development. In this way, awareness can be raised, expertise shared and quick movement towards the digital economy accomplished.
- Protecting personal data is critical. Many data protection frameworks are inadequate, lacking clear implementation processes such as a data protection authority; they often do not require user consent for personal information to be used nor do they specify controls for transferring personal data abroad. Efforts are needed for countries to create adequate data protection laws or update their existing laws to bring them into conformity with best practices.
- ICT companies need to do everything they can to reduce and eliminate their operational GHG emissions. This includes adopting concrete targets in line with the Intergovernmental Panel on Climate Change (IPCC) recommendations for minimizing the rise in temperature to 1.5°C.
- There is a need for massive investment in broadband to bring it up to speed with the new post-COVID-19 world. Higher capacity and lower latency is needed to support videoconferencing for those who can work from home as well as remote learning in the event of future pandemics or other disruptions to school learning. The pandemic also magnified the existing digital divide and need to build out broadband infrastructure where there is no access. To facilitate this, governments could allocate sufficient amounts of spectrum on a competitive basis, prioritizing the larger benefits of investment in

connectivity rather than the collection of high spectrum fees. In addition, governments could make licensed spectrum available on a flexible use and technology-neutral basis and not dictate technologies/architectures to be used.

- Measurement of global advocacy targets would benefit from greater clarity and scope. More can be done to collect and publish granular, reliable and gender-disaggregated data related to infrastructure deployments as well as Internet adoption and use in accordance with international guidelines and standards. This can include the disaggregation of Internet use by MSMEs or vulnerable groups such as persons with disabilities or the elderly. Moreover, more research to better understand the context, circumstances and needs of individuals and MSMEs not yet using the Internet can be conducted or supported. These data and insights are key in setting policy priorities, targets and budgets. Measurement of broadband metrics merits more focus as a result of the pandemic and the likely aftermath. Indicators that were not prominently analysed before have now become more relevant. This includes household indicators such as the percentage with computers and Internet access or Internet-enabled handsets. Both merit additional granularity such as the type of computer the household has as well as the type of Internet access and breakdowns by household demographics. Collection of asymmetrical broadband speed information is also important given the new significance of upload speeds.

5 Commissioner Insights

Commissioner's insights (contributions from Commissioners)

(Arranged alphabetically by organization)

5.1 Insight from Commissioner Mr. Sunil Bharti Mittal (Bharti Enterprises and Bharti Airtel)

If current rates of Internet penetration were to continue, it will be decades before the world's 2.7 billion unconnected are brought online. New ground needs to be broken to bridge this gap at a much faster pace and catalyse the efforts being made by stakeholders in the digital ecosystem.

A glaring reason for the slow pace of progress is the massive infrastructure cost required to put in place terrestrial networks leading to low returns and short, yet intensive capital expenditure cycles for telecom companies and the regulatory uncertainty and stress that they must endure being the sole underwriters of connectivity initiatives.

The Broadband Commission report on 21st Century Financing Models has some prescient recommendations. While recognizing the historical role of telecom operators in investing in network deployment, it concludes that funds need to be raised through other sources as well.

Furthermore, some inherent regulatory issues faced by telecom companies need to be tackled steadfast. Most urgent is the need for governments to follow a rational spectrum policy which leads to affordable pricing while generating investable surpluses for operators to expand their network to rural areas and convert 2G non-data networks to 4G and 5G.

The universal service and access funds (USAFs) collected from network operators as a percentage of their revenue and administered by governments have ballooned over the years and have not been deployed effectively. While I would argue that this has hampered the otherwise incremental progress that would have been made by network operators to reach rural areas, it may still present a unique opportunity to help leapfrog unconnected areas directly to latest technologies and provide reliable round-the-clock connectivity. Having realized the importance of digital connectivity during the pandemic, the time to deploy these funds is now.

Significant gains can be realized if some of the more ground-breaking suggestions of the report are taken up such as broadening the base of financing contributors to all players across the digital economy and involving multilateral development banks in connectivity initiatives.

Almost every industry today is utilizing the digital market to either reach new customers or serve existing ones more efficiently. In today's digitized world, it behooves all industries to find ways of contributing towards connectivity and adoption; and, for governments to access the mammoth reservoir of the digital ecosystem for funding connectivity.

If we are to make a serious effort to connect the last village and the last community across the world by 2030, bold steps need to be taken.

5.2 Insight from Commissioner H.E. Dr. Mohammed Bin Saud AlTamimi (CITC, Saudi Arabia)

As stated in the State of Broadband 2022 report, there are two key requirements to accelerate the transition to a more connected post-pandemic world: a progressive digital sector regulatory environment to incentivize the required infrastructure investments along with globally aligned efforts and harmonized policies to connect the unconnected.

On the first point, the report highlighted the benefits of cross-sectoral regulatory collaboration to foster a digital economy. CITC plays a leading role in bringing together multiple regulatory bodies in forums such as the National Regulatory Committee, which has been instrumental for creating certainty, and reducing the burden of regulatory compliance. Saudi Arabia's continued advancements in terms of regulatory collaboration and digital transformation, have been recognized by the ITU which has led the country to achieving advanced G5 status in the ITU 2021 G5 Benchmark.

On the second point, CITC has taken an innovative and flexible approach to release more than 23GHz of spectrum for a wide range of uses to empower all wireless technologies, rather than one at the expense of another, through a mix of licensed spectrum, lightly licensed spectrum and unlicensed spectrum. CITC and industry partners also successfully conducted (i) the world's first demonstration of high-altitude platform system (HAPS) to provide 5G services; and (ii) the first low Earth orbit satellite broadband trial in the MENA region.

The emphasis on accelerating the deployment of digital infrastructure has seen more than USD 22 billion invested between 2017 and 2022. As a result, Saudi Arabia was declared as the leading country on government innovation and leadership (GSMA), 6th among the G20 in digital regulations maturity and within the top 10 countries globally on Internet speeds.

In partnership with the ITU, we launched the Digital Regulations Academy (DRA) to support technological innovation through regulation. The DRA demonstrates the depth of Saudi-ITU partnerships and the Kingdom's ongoing commitment to international cooperation to create future-oriented capacity building programs. Bridging the digital gender divide has been a key plank of this initiative as we see digital inclusion providing a route for the economic empowerment of women for the greater benefit of society. We are already beginning to see the impact of our efforts as female digital participation rates in Saudi Arabia have increased from 11 per cent in 2017 to 29 per cent in 2022, surpassing both the EU and G20 averages.

The digital transformation of society is a journey, and we are pleased with progress made so far we aspire to achieve much more and hope to share further achievements with you going forward.

5.3 Insight from Commissioner Mr. Denis O'Brien (Digicel)

Advancing universal connectivity through global thought leadership

Global leadership is at the core of the Broadband Commission's mission to bridge the long-standing digital divide and solve the problem of bringing broadband connectivity to 50 per cent of the world's population.

Our Report on "21st Century Financing Models for Bridging Broadband Connectivity Gaps", published in October 2021, is a ground-breaking contribution to the global debate on funding infrastructure to connect the 3.5 billion unconnected.

A key problem is that the companies that dominate Internet traffic do not contribute to the cost of the networks. Over half of all Internet traffic is accounted for by six Big Tech companies– Google, Facebook, Netflix, Amazon, Apple, and Microsoft–and video over their platforms is driving demand.

Telecom operators are upgrading networks to cater for this traffic and are investing up to 20 per cent of their revenues in networks annually. This is unsustainable and because of this the telecom sector is out of favour with investors. To date, operators cannot secure contributions from Big Tech. For investors, operators are delivering the lowest returns in the Internet value chain. Securing new investment for networks to connect the unconnected is impossible in these circumstances.

This problem has been well signposted over the years. The Asian Infrastructure Development Bank warned that operators "cannot independently raise the financial resources needed for network expansion over the next decade" while the Florence School of Regulation concluded that building and maintaining digital infrastructure will become unsustainable if platforms are allowed to side-line operators.

The Commission's report considered inputs from a broad range of stakeholders and sets out the important principle that all companies who derive benefit from the use of broadband infrastructure should contribute towards the cost of its deployment.

The report's recommendations include earmarking a portion of any new digital service taxes for infrastructure, and adopting a regulatory solution similar to the new Australia Media Bargaining Code which would oblige Big Tech to engage with network operators to negotiate commercial terms.

Big Tech's market dominance is such that they can refuse to deal with operators individually but not collectively. Freeriding on networks enhances their profits but it is having a detrimental effect on public welfare. There is a global policy debate as to how this market failure can be corrected by regulation. Access to broadband is a human right.

The debate has now moved to Europe. The draft "European Declaration on Digital Rights and Principles for the Digital Decade" includes the principle that "all market actors benefiting from the digital transformation assume their social responsibilities and make a fair and proportionate contribution to the costs of public goods, services and infrastructures". Four of the major European operators (Deutsche Telekom, Vodafone, Orange and Telefonica) have called for a regulated mechanism for direct agreements between network operators and the largest digital platforms based on the precedent of the Australian Code.

Everyone must play and pay their part if we are to achieve our 2025 and 2030 targets to get everyone online and we now have a roadmap to bring Big Tech to the table. The Commission's report is an example of how the Commission's collaborative approach to thought leadership can provide actionable policy recommendations for policy-makers around the world. Let us continue to work together in this spirit determined to fulfil our mission.

5.4 Insight from Commissioner Mr. Erik Ekudden (Ericsson)

Connectivity is foundational to digitalization, and digitalization has the potential to help fulfil all 17 of the Sustainable Development Goals (SDGs). Against that backdrop, industries, governments, civil societies, and institutions need to do everything possible to widen access to the high-performing connectivity upon which exponential technologies like AI, VR and IoT flourish.

On the road to the 2030 SDGs, the Broadband Commission's 2025 target "Get Everyone Online" will be a key connectivity milestone. There are less than one thousand days remaining to meet this crucial 2025 target, and the world is not where I hoped it would be.

2.7 billion people remain offline, and it is clear more effort is required to connect them. This is especially true in less developed countries where Internet adoption is at 19.5 per cent, well below the 35 per cent the Commission is seeking in its 2025 target.

Literacy and skills must be a focus area as they continue to represent the single biggest barrier to mobile Internet adoption. Industry can help governments break this barrier through both partnerships and direct initiatives.

At Ericsson this includes, for example, our flagship Connect to Learn program which, with like-minded partners, provides young people with digital skills and has reached 200 000 students in 25 countries.

Another key to meeting the Broadband Commission's 2025 target is building out high-performing networks as fast and as affordably as possible. No country should be left behind in these efforts, and where coverage shortfalls exist, there is a proven, affordable and ubiquitous solution used the world over: radio base stations.

Through selective investment in mature mobile broadband technologies, communications service providers can sustainably expand coverage by upgrading existing 2G (GSM) base stations, as well as targeting un-covered areas with new 4G (LTE) and 5G deployments.

To speed deployments, governments need to foster an investment-friendly environment, where, for example, network operators can recoup their investments above the cost of capital.

Technology-neutral regulations should also prevail to spur free market competition—something which requires governments to refrain from protectionist and preferential treatment of domestic suppliers.

It is also important to make spectrum available in a timely manner and on technology-neutral terms, as well as to streamline site permits and to harmonize electromagnetic frequencies.

If we are to close the connectivity gap and realize the potential of the SDGs, we need to speed up the roll out of at-scale, proven, affordable, modern networks and give people the skills and education to access them.

Let us do that now.

5.5 Insight from Commissioner H.E. Ms. Ursula Owusu-Ekuful (Ghana)

Ghana considers broadband connectivity a basic necessity of life in the 21st century. With about 30 per cent of Ghana's population living in unconnected rural areas, the Government of Ghana has complemented the universal access fund with a EUR 155 million facility in the deployment of 2 016 sites offering voice and data roaming services to all subscribers irrespective of their service provider. A similar EUR 155 million government investment is expected from 2024 when the initial deployments are completed to reduce the digital divide between urban and rural communities. Beyond this, there is a smart devices affordability gap for many citizens who cannot access broadband services.

Ghana supported the creation and participated in the Broadband Commission Working Group on Smart Devices. Ghana is committed to improving digital literacy, especially bridging the gender digital divide. Ghana, in partnership with ITU, the Norwegian Agency for Development Cooperation (NORAD) and Cisco, is pursuing the Digital Transformation Centres (DTC) programs to train over 14 000 people such as school children, youth, women entrepreneurs, teachers, and software developers from basic to advanced digital skills by 2023.

Also, Ghana, in partnership with Smart Africa, the German Agency for International Cooperation (GIZ) and the World Bank, is expected to train over 22 000 people made of policy- and decision-makers, specialized groups, teachers, and youth by 2024. Besides this, with other partners' support, Ghana has upscaled from the annual training of 1 000 to 5 000 Girls in ICT this year. The girls and ladies drawn from the basic, secondary, and tertiary levels are trained to become solution providers and innovators able to use technology to solve socio-economic problems.

Further, Ghana has committed USD 2.6 million to establish two additional innovation centres and train 3 000 people by 2024. Relatedly, the Digital Ghana agenda offers public and private services to the homes of citizens irrespective of location through digital platforms such as the Ghana.Gov portal to reduce travel time, provide efficient services and enhance transparency. As of January 2022, 38.9 per cent of the population aged 15 years and older had a mobile money account in Ghana. Currently there is registration of telecom subscribers with national biometric identities to prevent impersonation and reduce telecom/ICT crimes in the sector to strengthen trust in mobile money services.

5.6 Insight from Commissioner Mr. Mats Granryd (GSMA)

With less than three years left to achieve the Commission's 2025 Advocacy Targets, making our shared ambitions a reality requires us to focus on specific and rapidly evolving elements of the digital economy. We need to capitalize on the lessons learned during the pandemic, understand the implications of the evolving Internet value chain and consider the role of the ICT sector in responding to climate change.

Closing the gender digital divide

During the pandemic, mobile operators ensured vital connectivity by quickly adapting to the additional demands on networks. But existing digital divides persist and can re-emerge: for example, COVID-19 has disproportionately impacted women and, after steadily decreasing from 67 per cent in 2017 to 36 per cent in 2020, the mobile Internet gender gap widened to 41 per cent in the past year.[1]

Since mobile remains the primary and often only way women access the Internet, particularly in lower and middle-income countries, this data represents a clear call for action. GSMA is intensifying efforts to bridge the gender digital divide, and through our Connected Women Commitment initiative, over 40 mobile operators have made commitments to reach a total of 60 million women with mobile Internet and mobile money services by 2025.

Understanding the evolving Internet value chain

While attempting to meet our connectivity and affordability targets, we must also reflect on the economics of the Internet value chain, and consider the viability of traditional financing models to support investment in network capacity, coverage and speed. Over the past six years, average returns for Internet access connectivity providers have been almost flat, while online services and content rights segments have at least doubled investors' stakes and now represent 57 per cent of the entire value chain in terms of revenue.[2]

Through its Working Group on 21st Century Financing Models, the Broadband Commission pioneered global efforts to scrutinize these dynamics, and produced actionable recommendations for new financing and investment approaches to ensure that digital inclusion is not hampered by market distortions or inefficient regulatory mechanisms. This important contribution should be taken as a point of reference by policy-makers and business leaders alike.

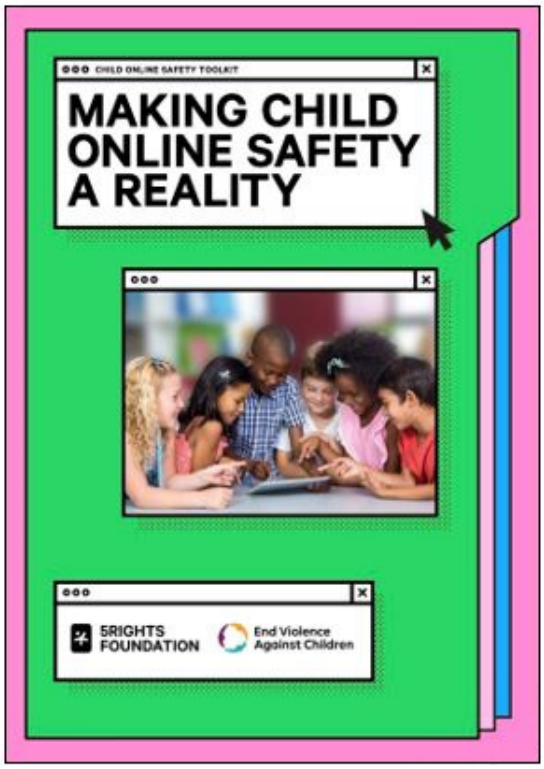
Responding to climate change

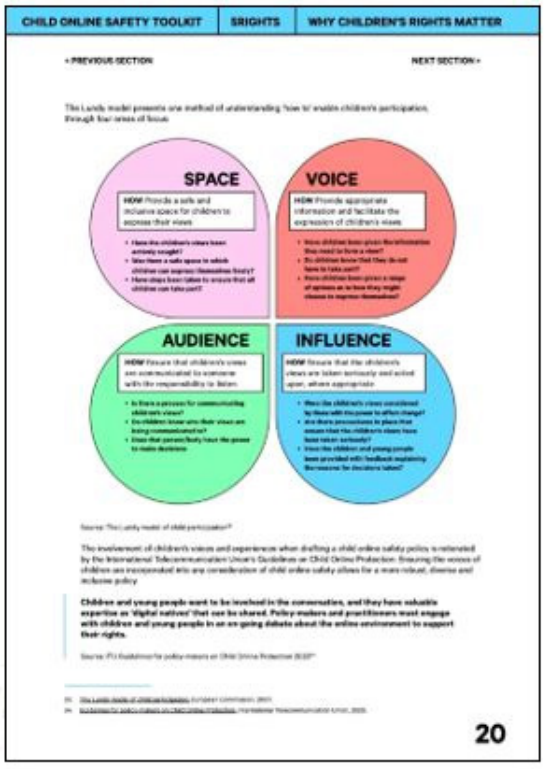
Finally, I believe it is essential that our efforts to make the world more connected embed an imperative to support global carbon reduction objectives. The mobile industry continues to align around the 1.5˚C decarbonization path and, over the past year, has been successful in decoupling data and emissions: in 2021, global data traffic increased by 31 per cent, with electricity usage up 5 per cent, but associated carbon emissions only grew by 2 per cent, even in the face of a double-digit increase in demand for mobile services.[3] A broad and shared commitment to foster climate disclosure is paramount to understand current emissions and track progress in reducing them, enabling a twin digital and green transition.

Achieving the advocacy targets by 2025 will no doubt require an unprecedented effort across our entire community. At the same time, this shared sense of urgency will incentivize new partnerships across governments, international institutions and the private sector, and accelerate the multistakeholder collaboration that is necessary to close the digital divide and face the challenges of our times.

5.7 Insight from from Commissioner Baroness Beeban Kidron (5Rights Foundation)

A model policy for child online protection





As the ambition for universal connectivity becomes a norm, national states and multilateral organizations turn their minds to the protection and participation of children. After working with the Government of Rwanda on the Child Online Protection Policy in Rwanda, formally adopted June 2019, 5Rights Foundation has responded to requests from other States and organizations to provide a model for online safety policy that can serve as a basis for local initiatives.

Generously funded by The Global Partnership to End Violence Against Children, the Child Online Safety Toolkit was launched in May 2022. The Toolkit provides practical tools to help policy-makers from across the world to fulfil their international obligations. For some, it will be a starting point and for others it is to check their current policy against international best practice. It is country-neutral, informed by consultations conducted with Colombia, Brazil, Ghana, Zimbabwe, Cambodia and Sri Lanka as well as individual expert contributions.

It responds to the call for action from the UN Secretary-General in his Roadmap for Digital Cooperation (2020) by bringing together foundational resources: the UN Convention on the Rights of the Child (UNCRC) General comment No. 25 (2021) on children's rights in relation to the digital environment; the ITU Guidelines on Child Online Protection; and WeProtect Global Alliance's Model National Response. It has been endorsed by key international partners, including the European Commission, the World Health Organization, ITU, WeProtect Global Alliance and major international civil society platforms such as Eurochild, Child Rights Coalition Asia, Plan International, Terre des Hommes and ECPAT International among others.

The Toolkit includes:

1. A model child online safety that policy-makers can use or build from
2. Ten policy action areas for policy-makers to use in developing their own policy
3. Checklists and other auditing tools
4. Summaries and guidelines to global foundation documents
5. A glossary and definition of key terms
6. Signposts to international best practice examples
7. Diagrams and other explanatory materials to help communicate policy to other audiences

Already the toolkit has been met with action: ITU is using it in an education campaign across 30 countries and the African Union is using it to build a child online safety policy framework for the continent. The Chair of the United Nations Committee on Rights of the Child called it "a practical tool for policy-makers and the tech sector that we need to promote" and it was broadly welcomed by tech leaders who praised its practical and rights-based approach.

The toolkit is holistic, practical and accessible, intended to support policy-makers and practitioners to build a digital world where all children feel safe and fulfilled; a world that respects children's rights online and off.

5.8 Insight from Commissioner Ms. Sun Yafang (Huawei Technologies)

In 2015, the 193 UN Member States officially adopted 17 Sustainable Development Goals (SDGs) with the aim of balancing the economic, social, and ecological dimensions of sustainable development by 2030. These goals are closely interrelated and provide a clear roadmap for promoting global sustainable development. However, many of the goals are being hindered due to a variety of reasons.

With the rapid development of the digital economy, carbon neutrality has become a shared mission worldwide, with most major economies having set clear timetables and goals for carbon neutrality. These goals raise new requirements for green and low-carbon transformation of the economy and society in a systematic, large-scale, and concrete way. Today, we can be sure that intelligence and low carbon will be two trends in the next three to four decades.

Going intelligent requires digital technologies, while decreasing our carbon footprint requires power electronics technologies. Integrating these technologies into products and solutions is key to green and low-carbon transformation. As a major contributor to both sectors, Huawei is moving in the same direction as its peers around the world. Specifically, Huawei is dedicated to working with global customers and partners to promote clean energy generation, build green and low-carbon ICT infrastructure, and accelerate green transportation, ultimately helping to build zero-carbon buildings, campuses, and cities.

As networks and 5G evolve, sites are greatly increasing their power consumption. The resulting increase in OpEx and carbon emissions represents significant challenges for the communications industry. In China's Zhejiang province, China Mobile (Hangzhou) and China Mobile Group Design Institute teamed up with Huawei to build a converged site in Hangzhou using a simplified solution that replaces rooms with cabinets and cabinets with poles. A single cabinet replaces the original six. This saved 80 per cent of floor space, allowing for the installation of a Huawei Smart PV power system that yields 20 per cent more energy than a traditional one. The project cuts electricity costs by CNY 13 000 per year, equivalent to reducing carbon emissions by 8 tonnes. If the solution is adopted in sites worldwide, carbon emissions would be cut by around 28 million tonnes each year, which is equivalent to planting 38 million trees.

As an engine of the digital economy, data centres are shifting towards low carbon to meet global carbon neutrality goals. In partnership with Huawei, Moro Hub, a subsidiary of Dubai Electricity & Water Authority (DEWA), has built the largest 100 per cent solar-powered data centre in the Middle East and Africa. In phase 1, it took only fifteen months to complete the construction of a data centre covering an area of 2 000 m^2, a record for data centre construction in the Middle East. Carbon emissions are expected to drop by roughly 10 517 tonnes a year, which is equivalent to planting more than 17 000 trees.

These are just two examples of what can be achieved by integrating ICT with power electronics technologies. By working closely with industry partners, we will continue to innovate in scenarios such as ICT infrastructure, new energy vehicles, and clean power generation. Looking ahead, Huawei will continue to leverage technologies to help achieve the UN SDGs with industry partners to create a better and greener future for everyone.

5.9 Insight from Commissioner Mr. Rajeev Suri (Inmarsat)

Working together to deliver affordable broadband and a more sustainable world

To unleash the potential of every person on the planet will require access to connectivity for all. Making broadband affordable is a critical step in achieving that meaningful universal connectivity to drive growth worldwide and is a top priority for the 2025 Broadband Advocacy Targets. We need to work together through innovative partnerships, using a mix of technologies to make broadband affordable. At the same time, we must leverage this connectivity to improve environmental sustainability. Using a **mix of technologies and funding mechanisms** is critical to addressing the issue of affordability. We all have the same goal of bringing connectivity to the hardest-to-connect communities, in the most affordable way, so that no one is left behind. To achieve this, the focus should not be on licensing or providing universal funding for one technology, but instead on the technology that works for the specific situation and environment. There is often too much attention on a single technology or system such as fibre, terrestrial wireless or LEO/GEO satellites. We must remember that all technologies have a role to play. In fact, at Inmarsat we are building a new network, ORCHESTRA, combining and leveraging the most efficient and effective technologies to enable connectivity and change citizens' lives for the better.

While working on making broadband affordable, we cannot ignore the issue of climate change, and we all agree that **improving environmental sustainability** is a necessity. Satellite communications already plays an important and growing role in reducing greenhouse gas emissions in the aviation, maritime and IoT sectors. That is something that Inmarsat knows well given that we provide a primary communications network for the world's maritime industry and 90 per cent of transoceanic airliners, and that we support nearly a million land connections. The aviation industry, for example, emits roughly 2.5 per cent of the world's annual total of CO_2. One way to reduce that impact is with better navigation and satellite technology, based on technology that is available in most commercial aircraft cockpits today. This enables planes to safely fly closer together on optimal routes via more efficient paths through increasingly congested airspace. The shipping industry could also reduce its greenhouse gas emissions by 38 per cent by 2050 through the digitalization of existing vessels and shipping infrastructure alone. One of the most fruitful areas for digital decarbonization is the voyage phase, when ships are at sea and their engines are at their most polluting. The maritime industry is already seeing evidence of the environmental benefits of digitalization, which is being delivered alongside commercial and operational improvements for ship owners and operators using the same technology and satellite communications infrastructure. Without satellite-enabled communications, an industry-wide digitalization strategy would be impossible.[4]

Finally, **innovative partnerships** are key. Through collaboration we can more quickly design meaningful, people-centric solutions focused on making broadband more affordable. While there are partnerships in place already, we need to continue to think innovatively to design further bold solutions. For example, the Partner2Connect (P2C) initiative aims to bring connectivity to the hardest-to-connect communities, and Inmarsat was one of the first donors to P2C, donating USD 1.2 million worth of satellite airtime to P2C with the specific objective of providing connectivity everywhere.

5.10 Insight from Commissioner Ms. Pamela Coke-Hamilton (International Trade Centre)

Advocacy Target 6: Get MSMEs online

The future of "going global" is digital. This is especially true for small businesses: the road to overseas markets will run through digital channels and platforms. The firms who can connect, compete and change will thrive.

The Broadband Commission's Advocacy Target #6 emphasizes the need to get MSMEs connected and performing online. My fellow Commissioners and I set the target of reducing the number who are unconnected by 50 per cent before 2025. During the pandemic, we saw how doing business online went from being useful for business to critical for survival. Now, facing an impending downturn in the global economy, we need an even bigger and more broad-based boost in connectivity. Over the next three years, the resilience—in fact the very survival—of small enterprises will largely depend on how well they manage the shift to digital.

I see three challenges ahead: first, listening and learning; second, walking the talk; third, leaving no one behind.

Our first challenge is one of measuring and understanding the gap in connectivity for MSMEs. Beyond the task of collecting data, we need a more profound understanding of how we can solve the barriers for small firms to get connected. The lessons of the last few years show that the business case for going digital is self-evident—and yet many small businesses continue to remain offline. Others are unable to access or afford this critical capability. We need to look for solutions that could provide lower cost access to bandwidth or innovative financing that could unlock its adoption.

Secondly—to quote an old Apple slogan—those of us working in the development sector really have to "think different". And do so on multiple levels, if digital connectivity is going to really become universal and achieve its potential. As agencies with mandates and budgets and staff, it isn't easy to step back and say that we need to change. But we need a different offer and a different mindset. We need new and better partnerships with the private sector, critical to delivering infrastructure and services.

Finally, we have got to keep focusing on the base of the pyramid—not just those individuals and companies that are already well-connected and have a digital presence. I know from our own projects that selling handicrafts onto a platform such as Etsy from a border town of Guatemala is not the same as selling from Kuala Lumpur. But that's where we need to be—squarely focused on leaving no one behind.

5.11 Insight from Commissioner Mr Lacina Koné (Smart Africa)

Smart Africa is a Pan-African organization entrusted with the Digital Transformation Agenda of Africa with the vision to transform Africa into a single digital market through a bold and innovative multi-stakeholder approach. Smart Africa has been working on a number of initiatives with the support of its stakeholders to achieve its vision and also to support in the achievement of the Broadband Commission 2025 Broadband Advocacy Targets. These initiatives include among others the under listed:

a) Digital Skills Development Through the Smart Africa Digital Academy (SADA): Launched as the driving vehicle for implementing Smart Africa's capacity building and skills development activities across the digital skills spectrum, SADA is a pan-African dynamic learning ecosystem in which African citizens of all ages and social classes can gain or improve their digital skills, gain qualifications, and meet the emerging talent needs of employers, industry or be self-reliant. Thirteen (13) Smart Africa member states are already on board for the implementations of National Digital Academies at various stages and these include Rwanda, Burkina Faso, Benin, Tunisia, Cote d'Ivoire, Congo B, Ghana, Kenya, Tunisia, Morocco, DRC, Ghana, and Djibouti. Within 2022, about 35 trainings have been held (face-to-face and virtual) with 600 plus beneficiaries and more than 25 partners engaged.

b) The Bridging of The Digital Divide Through the Smart Women & Girls Initiative: This initiative is developing a systematic framework for national plans and interventions to connect women and girls to technology based on experiences and emerging opportunities. This is co-created with representatives of Governments, Private Sector, Academia, and Civil Society. These efforts will be enabled and supported by Smart Africa Digital Academy (SADA) and Digital Transformation Centres across Africa.

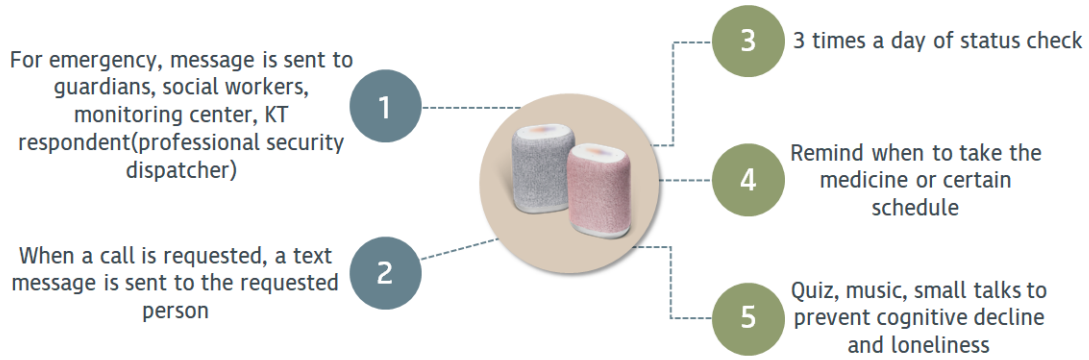
c) Support To Two (2) Smart Africa Member States on Broadband Strategy & Policy: This initiative is part of the Smart Africa Broadband 2025 transformative Broadband Strategy. And currently supporting the Republic of Rwanda to explore the feasibility of, and funding options for, embedding fiber in their new electrification project to extend passive fiber access to reach nearly half of Rwandan households. Smart Africa is also supporting the Republic of Sierra Leone in the development of their new Broadband Strategy which is line with Sierra Leone Digital Transformation Agenda the Smart Africa Broadband 2025 transformative broadband strategy as well as support in the achievement of the Broadband Commission 2025 Broadband Advocacy Targets.

5.12 Insight from Commissioner Dr. Hyeonmo Ku (KT Corporation)

AI Care Service for the Elderly

According to Statistics Korea, Korea is expected to become a super-aged society by 2025. Twenty per cent of the population will be over 65 and 35.1 per cent of the elderlies are predicted to live alone. As the needs for Environmental, Social and Governance responsibility (ESG) is growing rapidly throughout current society, KT is stepping up to fulfil its social responsibility by launching AI Care service provided through KT's AI voice recognition technology.

AI Care Service is built around the AI speaker, GiGA Genie, which operates over LTE network. Users receive the following services:



AI Care Service shows differentiated strengths. First, thanks to the 3 million subscribers of GiGA Genie and 6 200 customer service lines, KT acquires massive voice data. The data is used to improve the recognition rate of regional dialects. Second, KT provides bi-directional service by asking questions first and checking the responses. For example, after the speaker plays an announcement from the welfare service, the speaker will ask "Did you get the message?" The response is then recorded in the monitoring system for welfare services to check message delivery and the user's status.

In quantitative terms, the monitoring system showed that the share of negative speech by elderly living alone fell from 32.98 per cent to 8.91 per cent, social workers who visited 10 households each day can now select 2-3 households by checking the speaker usage status, and positive responses such as "thank you" has continuously increased from 9 per cent to 19 per cent within just four months of service launch.

To meet the increasing demand and changing trends of AI care, KT plans to further develop the service in the following ways.

1. Develop a speaker with camera and touch screen: Will be able to intuitively check the safety of the elderly with the camera, the screen menu will be configured with an easy-to-operate user interface (UI/UX) for the elderly to actively enjoy various services.
2. Expansion of service target: The service was provided only to the elderlies selected by government agencies, but the service will be opened to general customers including the disabled and those who are living alone in need of protection.
3. P-TTS voice synthesis technology and more: To provide stronger emotional care, P-TTS voice synthesis technology will be applied to use family member's voices, add in emotional inflection and informal speech, and develop continuing the conversation rather than giving short answers.

AI Care Service takes care of the health and safety of the elderly and relieves the worries of those who are concerned about their well-being. KT will continue to seek ways to help society and will make sure it proceeds with stronger technology.

5.13 Insight from Commissioner Mr. Pekka Lundmark (Nokia)

What is digitalization? Is it a shadow system that works alongside existing mechanisms for government, business and society? Or is it an entirely new way of doing things?

If we are to unlock digitalization's full potential, we must choose the latter definition. It has the potential to be a new, better, safer way for society and business to operate—but only if digital decision-making is embedded into public and private services, rather than bolted on.

Three simple actions would help that happen.

First, see digitalization as holistic, and based on a shared understanding of how digital value is created and measured consistently across an organization, rather than as something that's left to a Chief Digital Officer or Minister for Digitalization.

All organizations should start by assessing their own digitalization plans and ensuring senior leaders are all singing from the same hymn sheet.

Vendors of digital technologies, such as Nokia, also have a role here. We must ensure we understand our partners' strategies before talking about solutions, and we should be clear about how digitalization can create value for our partners, whether that's better policy-making, better policy delivery, productivity, efficiency or worker safety.

Second, ensure new technologies are secure.

Distributed denial of service attacks related to the ongoing war in Ukraine have targeted networks, banks, media and public sector organizations. This may be the beginning of a longer period of cyberattacks—the US Cybersecurity & Infrastructure Security Agency issued a "Shields Up" warning to businesses, advising organizations of all sizes to "prepare for, respond to, and mitigate the impact of cyber-attacks".

In that context, people must be able to trust the security of digital technologies. Those in charge of buying, installing and running them must never settle for anything less than cast-iron security.

And third, understand what digital skills and literacy actually are.

Shortages in almost all STEM-based (science, technology, engineering and mathematics) professions are well publicized. But fundamental digital skills aren't advanced. They are simple, covering things like knowing what the Internet is and how to access it. Even these most basic skills make it easier for people to access health care, banking and public services.

The 2025 Broadband Advocacy Targets include an ambition that 60 per cent of people should possess these digital skills by 2025. Currently we are nowhere near that figure. The more people appreciate the size and urgency of the shortfall, the easier it will be for digitalization to rise to the top of decision-makers' priorities—and the sooner we can start to bring safe, reliable Internet access to everyone on Earth.

5.14 Insight from Commissioner Dr. Ann Aerts (Novartis Foundation)

Critical action is essential to ensure COVID-driven surge in virtual health and care drives health access and equity, says new WG report

The COVID-19 pandemic triggered a massive surge in virtual health and care delivery across the world, with many countries embracing hybrid virtual and in-person services. This year's report from the Broadband Commission for Sustainable Development Working Group on Virtual Health and Care—co-chaired by the World Health Organization and the Novartis Foundation—analysed these developments in 23 countries, and emerged with a warning that health stakeholders need to act to prevent the increase of health inequities due to digital divides.

The use of virtual health and care is popular: surveys conducted in the US in 2021 show that over three-quarters of patients want virtual services to be a continuing part of their care, and over 80 per cent of providers intend to continue using virtual health after the COVID-19 pandemic has eased.

But many countries have not yet developed coherent frameworks to ensure virtual health services work effectively alongside in-person care. Careful policy-making is essential to ensure that expansion of virtual services happens in an equitable and inclusive way, and existing digital divides do not exacerbate health inequities.

For example, in the US, 99 per cent of people between the ages of 18 to 29 are online. But one in four older people don't use the Internet—the demographic for whom reliable healthcare access is often a matter of life and death. African Americans of any age are almost twice as likely to lack access compared with the general US population. While in India, 67 per cent of people living in urban areas have Internet access compared with 32 per cent of people living rurally. And data collected across 34 countries in Africa show that women are less likely than men to have a smartphone, own a computer, or use the Internet. In Sweden, a country that ranks number one in The Economist's Inclusive Internet Index, up to one in five people with a disability feels excluded from the digital society.

Fortunately, there are pragmatic ways to ensure that virtual technology makes health more equitable rather than less.

The Working Group report, *The Future of Virtual Health and Care: Driving access and equity through inclusive policies*, highlights several policy areas that are emerging to close these gaps and provides the clearest guidance to date on how to ensure virtual technology can help make health and care accessible to all. These core policy recommendations target government decision-makers, and cover governance and regulation; design and processes; data and technology; business models; people and workforce; and partners and stakeholders.

But recognizing that policy-makers alone cannot advance virtual health and care in an inclusive way, the report also provides recommendations for how health and care providers, payers, private sector, advocacy groups, civil society, and researchers can complement policy-maker actions and ensure effective policy development and implementation.

Explore the report at: https://broadbandcommission.org/working-groups/virtual-health-and-care

5.15 Insight from Commissioner Mr. Bocar Ba (SAMENA Telecommunications Council)

We are at a critical point in time, where immediate action is required to eliminate the most pressing issues with regard to the provision of meaningful universal access to connectivity. In this regard, SAMENA Council is exploring innovative mechanisms and instruments to unlock access to capital to support telecom operators.

The BBCom's WG on 21st Century Financing, Funding, and Investment Models for Bridging Broadband Connectivity Gaps, chaired by SAMENA Council, has identified the need for fundamental paradigm shifts that require, among others, to broaden the base of contributors. One innovative way to move forward with implementation of this recommendation is to create new partnerships and bring together the telecom and the banking/financial services industries to create **an innovative instrument** such as a **"Broadband Bond".** Such a Broadband Bond could be built on the general principle of bond-financing, whereby an issuer may raise capital by selling a "low-interest debt instrument" to investors on the open market. Because bond financing carries longer maturity and the risk lies primarily with the issuer (banks), such a risk profile offers an attractive investment profile for telecom operators to carry out infrastructure expansion (e.g. rural areas), Capex debt re-financing or procurement of additional spectrum. The capital market, overall, provides the ability to tap new investors and offers structural advantages. Partnerships with capital market stakeholders, in turn, enable **access to a new class of investors** around the globe. In this context, the Broadband Bond approach is befitting recommendation No 1: Broadening the base of contributors and can serve as a major source of liquidity for ongoing and future financing needs of various industries, including telecoms.

This example of private partnership can be designed to fulfil (i) financing needs for initiatives and telecom projects that are aligned with the SDGs and aligned with the UN Broadband Commission's recommendations, and with the private sector's investment needs; (ii) investor diversification goals within the telecoms and financial services industries; and (iii) common goals of sustainable, "green", and citizen-centric imperatives. In summary, the new instrument is built on the premises of:

a) Using a combination of monetary and non-monetary, or in-kind, contributions, based on project needs and the various strengths of collaborative financing;
b) Making smarter investments and thus a move away from "funding" (out of a moral imperative) to "financing", which is more commercially grounded and relates to making good investments, while contributing to socio-economic development; and
c) Collaboration between governments, commercial banks, development finance institutions (DFIs) and the private sector to meet funding gaps is increasing, including through blended finance or the strategic use of development finance to mobilize additional finance for sustainable development in developing countries.

5.16 Insight from Commissioner H.E. Mr. Roberto Sánchez (Spain)

100 Mbps to 100 per cent of the population by the year 2025: The Spanish approach

Achieving inclusive and broad connectivity is a basic requirement for the economic and social development of our countries. Regardless of the starting point of the regions, there are various economic, geographic or demographic factors common to all of them and where the existence of a digital divide between rural and urban areas is evident—especially in regions with complex orography and large areas with very low population density, as is the case of Spain.

In relation to the above, this "box" summarizes the connectivity policies that Spain has developed over the last few years to achieve the goal of 100 per cent of the population having 100 Mbps coverage by 2025.

An enabling regulatory framework

A regulatory framework that has facilitated deployment and investment by private operators:

– Spain was a world pioneer with the approval of Royal Decree-Law 1/1998, of 27 February, on shared infrastructures in buildings for access to telecommunication services, whereby the infrastructure in newly constructed buildings has facilitated the deployment of the last part of the networks, allowing access to the operators to the households of the same building.

– Also, the various Telecommunications Laws incorporated measures to facilitate infrastructure sharing and suppression of barriers to deployment by simplifying administrative procedures, among others.

A competitive environment

A competitive environment is in place that has favoured competition in operators' own infrastructures in the most populated areas, while maintaining competition in services in the rest of the territory. In this regard, it is worth highlighting the impact of the Wholesale Access Service to the civil works infrastructures offer including ducts and junction boxes (MARCO), which has allowed the use of the dominant operator's passive infrastructures by its competitors.

Deployment incentives

A public aid scheme is also in place, complementing private investment made by operators, with a forward-looking approach that started in 2013, and which has accelerated since 2018. Subsidies are provided for deployment of access networks that offer 300 Mbps, scalable up to 1 Gbps, in those areas that don't have coverage of new generation broadband networks, mainly in rural areas.

In total, since the beginning of the broadband extension programs, EUR 872 million of aid has been granted (EUR 655 million since 2018), mobilizing investments of EUR 1 603 million and covering 7.6 million homes.

Current results

By 30 June 2021, the broadband coverage at more than 100 Mbps is 88.31 per cent of the total population and the prospective is than in 2023 will be 94.13 per cent. Additionally, the digital divide between rural and urban areas at more than 100 Mbps has been reduced by

20 percentage points. With the projects under implementation, by December 2023 this gap will be below 10 percentage points, on the path to its complete elimination by 2025. For this purpose, the resources allocated in 2022 amount up to EUR 250 million and a similar amount is estimated for 2023.

Towards 100 per cent by 2025

Finally, to cover the remaining percentage of the population (≤ 1.5%), several measures are being develop to make it possible to offer such connectivity through wireless solutions (fixed wireless access via 5G) or satellite solutions guaranteeing 100 Mbps.

5.17 Insight from Commissioner Mr. Achim Steiner (UNDP)

Building Inclusive Digital Nations of the Future

The *next era* of development will be defined by how efficiently countries can leverage the immense power of digital. These technologies will be central to driving progress across the Sustainable Development Goals (SDGs) from advancing decisive climate action to spurring new efforts to restore our natural world–creating millions of new opportunities and driving forward human development.

In the space of just one year, the United Nations Development Programme (UNDP) assisted 82 countries to adopt over 580 digital solutions in response to the COVID-19 pandemic–everything from leveraging digital finance to facilitate vital cash transfers to millions of people unable to leave their homes during lockdowns to helping parliaments to hold virtual sessions, boosting accountability. The challenge now is to sustain this new momentum generated by the COVID-19 pandemic by fully bridging the digital divide and ensuring that all people can benefit from access to responsible and safe digital services. To this end, UNDP has identified three key trends through its support to some 35 developing countries on their digital transformation journey to date.

1. First–historically, fragmented, and uncoordinated efforts in the digital space have often led to duplication of resources, wasted time, and high costs. To build inclusive digital ecosystems, there is a need for all actors to have their say, including government leaders, the private sector, civil society, digital innovators, women, and young people. This comprehensive approach is notably being advanced by developing countries such as Mauritania, Dominica, and Moldova.
2. Second–it takes concerted efforts to ensure that digital transformations boost inclusion at a time when 2.7 billion people remain offline. Indeed, digital technologies could exacerbate existing inequalities if countries are left behind in the uptake of frontier technologies such as blockchain and artificial intelligence. Therefore, digital inclusion, founded upon human rights principles, must be *embedded* into the design of digital infrastructure, and services. In this respect, the work of the Broadband Commission to expand access to affordable Internet across the world is more critical than ever. Other initiatives such as the Joint Facility for Global Digital Capacity, led by the International Telecommunication Union and UNDP, and Partner2Connect, a multistakeholder platform led by ITU to foster meaningful connectivity, are critical to promote digital inclusion.
3. Third–digital public infrastructure, supported by robust governance frameworks will be vital to help countries to be better prepared for the *next crisis*. That includes digital systems that enable social protection payments and new e-services–including everything from making it simpler to establish a new business to enhancing access to justice. In this respect, more efforts are needed to advance the use of digital public goods. Together with members of the Digital Public Goods Alliance, UNDP is advocating for new standards to unlock the reusability and interoperability of digital public goods like open-source software and open data sets. This will help countries to build safe, trusted, and inclusive digital public infrastructure at scale and close the digital divide by making digital solutions available faster and at lower cost.

Guided by the clear vision set out in the UN Secretary-General's Roadmap for Digital Cooperation, the United Nations and its many partners are working together to ensure that digital technologies advance progress across the SDGs–serving as our high-speed connection to a sustainable, inclusive, and climate-resilient future for all.

5.18 Insight from Commissioner Ms. Sima Bahous (UN Women)

Expanding broadband safely and inclusively to reach digital gender equality

Online and ICT-facilitated violence against women and girls is evolving and expanding, including sexual harassment, stalking, and zoom bombing.[5] Innovations, including virtual reality and the metaverse, are creating new digital spaces for misogyny and sexual violence. Those relying on an online presence for their work, including women journalists, politicians and activists, are disproportionately affected.[6] And there is growing evidence of the reinforcing connection between online violence and real-life violence against women and girls,[7] acts which often have important consequences for women's and girls' professional and personal lives.[8] Women and girls must have safe and equal access to information, to become part of the next generation of innovators, tech and software engineers and online content creators.

More than half of girls and young women surveyed globally have experienced online violence.[9] One global study found that the majority of girls surveyed were only 14 to 16 years old when they first experienced online sexual harassment. Women belonging to ethnic minorities, indigenous women, lesbian, bisexual and transgender women, and women with disabilities are at even greater risk of online violence.[10]

In line with the work of the Generation Equality Action Coalition for Technology and Innovation for Gender Equality as well as our work with the EQUALS Global Partnerships and the Global Partnership for Action on Gender Based Online Harassment and Abuse, I propose two primary areas of focus to address this.

First, I recommend to **governments** that they ensure strong and clear codes of conduct for law enforcement officials addressing online violence against women and girls and invest in specialized justice officers to address such violence with a human rights and gender-sensitive approach. I ask that they inform Internet users about existing safety protocols and how users can report cases of abuse and access essential services online, and that they actively engage women's rights organizations to develop relevant guidance and good practices.

Governments can also strengthen the evidence base by generating quantitative and qualitative data on the different forms of violence against women and girls in digital contexts, sharing examples of promising and good practices with stakeholders to strengthen prevention and response efforts.[11]

Second, I recommend that **Internet intermediaries** set high-level and clear commitments to uphold women's and girls' safety in online spaces. These include the design and improvement of tools and systems that prevent, detect, respond and monitor online violence as well as filtering, blocking and taking down illegal content on the Internet, in particular non-consensual filming and sharing of intimate images. I also ask that they demonstrate their accountability by generating quantitative and qualitative data on the different forms of online violence against women and girls on digital platforms.[12].

To increase safety online, I call for investment in education campaigns, including on preventing ICT-facilitated violence, sharing online safety advice, and providing accessible and transparent reporting and complaints procedures.

And I ask the **private sector** and **civil society organizations** to work together to develop solutions; strengthen employee capacities to understand online violence; and encourage more

women and girls to pursue education and employment in science, technology, engineering and mathematics (STEM).[13]

We need a renewed drive towards safe, universal and meaningful connectivity[14] more than ever—based on gender equality—and the Broadband Commission aims to achieve this across all targets by 2025. As we invest in proactive measures to make this realization of rights a reality, we must also ensure safety in digital spaces. Only then can we unlock the power of women and girls' contributions.

5.19 Insight from Commissioner Mr. Hans Vestberg (Verizon)

As a global community, we are facing some of the greatest challenges of our lifetime. In this context we have understood as never before the power that technology has for our future. Still, too many people remain unconnected. Verizon's corporate purpose to create the networks that move the world forward has never felt so vital.

Verizon is proud to be a member of the UN Broadband Commission for Sustainable Development and to contribute to its efforts to close the digital divide and to achieve its important 2025 Broadband Advocacy Targets. As part of Verizon's responsible business strategy, Citizen Verizon, we are working in myriad ways that demonstrate the type of action needed to achieve these targets. Our efforts to address the digital divide focus in three key areas: access, affordability, and usability.

Far too many people lack access to connectivity and remain unconnected or underconnected. Verizon is attempting to meet this challenge in the United States through innovative programs that provide resources and support. In 2021, we made a multi-year pledge of USD 3 billion to uplift vulnerable communities, help close the digital divide and contribute to the achievement of the UN SDGs.

We recognize that an important component of bringing people online is affordability. We are working with the US Government and across industry to put the power of technology in the hands of more families across the United States. We have participated since day one in the US Affordable Connectivity Program (ACP), which provides a long-term benefit to eligible low-income consumers to be able to access high-speed, high-quality Internet plans.

We are also placing priority on usability of digital services, including through investment in digital skilling and support for small businesses. We are providing 10 million youths with digital skills training, supporting 1 million small businesses with tech resources and tools and upskilling 500 thousand individuals with tech training, all by 2030.

Solving broadband challenges requires strong partnership. We need big ideas and collective action to accelerate the development of meaningful connectivity for everyone. That's why Verizon is leading the World Economic Forum's EDISON Alliance, which aims to mobilize industry sectors to quicken the pace of digital development and accelerate the opportunity for every person to participate in the digital economy. We also participate in the ITU's Partner2Connect Initiative, and continue to actively engage in the UN Broadband Commission.

We have reached a critical juncture and it is imperative for leaders from all sectors to prioritize these issues. Together we can bring the promise enabled by the infrastructure of the 21st century—mobility, broadband and cloud—to all. This is our moment.

5.20 Insight from Commissioner Mr. Nick Read (Vodafone)

Mobile Internet connectivity provides billions with access to transformational digital services, delivering economic benefits and reducing household poverty. However, an estimated 34 per cent of the world's population—or 2.7 billion people—have still never used the Internet, despite 95 per cent of people in the world having access to a 3G or 4G mobile broadband network. To redress this inequality and achieve the targets of universal and meaningful connectivity, policy-makers must work together to bring everyone online, and address not just the connectivity gap, but also the usage and consumption gap. To achieve this, Vodafone makes three recommendations:

1. **Establishing a long-term solution to 4G device affordability.** As Co-chair on the Commission's Working Group on Smartphone Access, I believe policy reform and investment are needed if we are to reach ITU's 2025 target of 75 per cent broadband-Internet penetration. We can focus on three key actions: to enable device financing schemes to be available to those without formal credit ratings, to reduce import duty on devices, and to subsidize the cost of devices to customers, such as through using universal service and access funds (USAFs).
2. **Strengthening societal resilience in the face of ongoing crises, by accelerating universal access.** The COVID-19 pandemic alongside the climate, food and supply chain emergencies have reinforced the urgency of closing the digital divide. The UN Secretary-General has rightly stated that "the digital divide is now a matter of life and death". To achieve national and global resilience, we need broad-based digitization—particularly for the most vulnerable and marginalized segments of society. Better digital tools by MSMEs and smallholder farmers can play a key role in enhancing food security and improving productivity. This requires every government to establish comprehensive national broadband plans that address barriers to digitization and close gaps in digital adoption and skills.
3. **Building a digital financing Strategy for Africa.** To bring meaningful connectivity to all Africans by 2030 will require USD 109 billion in additional investment. A comprehensive digital financing strategy, led by international financial institutions (IFIs), will help to overcome the digital divide in the short term, while long-term solutions to the digital investment gap are sought. Vodafone has pledged to invest USD 190 million over the next five years to increase our 4G population coverage to an additional 80 million people in Africa. Pledges such as this can be delivered faster if scaled regional investment can be accessed in a timely way, bringing better outcomes for citizens.

5.21 Insight from Commissioner Mr. Ziyang Xu (ZTE Corporation)

Accelerating the affordable broadband access by harnessing the power of commercially sustainable ecosystem

In 2021, only 96 economies met the target with regard to the data-only mobile broadband basket, and only 64 economies met the target with respect to the fixed broadband basket. Both of these figures have decreased compared to the previous year. To put it in a more tangible term, 4.9 billion were connected to the Internet, with around 2.9 billion people were left completely offline. Within these 2.9 billion people, 96 per cent of them lived in developing countries, 390 million of them had no mobile broadband coverage at all.

With those challenges ahead of us, building a sustainable ecosystem to provide affordable access for everyone which is in line with the spirit of "leave no one behind" becomes the connectivity imperative. There is a lot we can do to accelerate broadband access, from space to Earth, technology innovation, 5G, satellite, cable, fibre optics, universal coverage, wider bandwidth, and operator/vender's obligations. In addition, working together with the regulatory bodies and the policy-makers, we can build this positive, sustainable ecosystem driven by a promising new business model alongside conventional approaches. This is, from my perspective, the game changer of offering universal and affordable broadband access.

The ecosystem consists of at least two directions, to reduce continuously the per-bit cost inspired by endless innovations and to make the game profitable for all stakeholders by facilitating the adoption of digital economy. The former one naturally reflects the positive practice of the global ICT industry, in particular, vendors' efforts in pursuit of the state-of-the-art technologies. However, the latter one can only work with the involvement of multiple stakeholders in the fully represented benefit chain.

- Policy-makers are encouraged to set up and safeguard the essential rules for prompting the broadband access, e.g. reasonable ceiling of spectrum auction, more vertical licenses, designated rules for the digital dividend spectrum, and fair competition oriented approaches for regional SME operators.
- Operators are encouraged to deploy infrastructures with well-proven technologies aiming to support diversified services with single platform, to open to the spirit of "sharing" by collectively making their investments more financially healthy and to improve the capabilities of operation and maintenance by embracing the network intelligence.
- Online transaction providers are encouraged to fully take advantage of the broadband access empowered by the ICT industry and to help individuals, specifically, those in low-income zones, to improve their situations and live with financial resilience by running businesses with the assistance of modern broadband access.

I am personally confident that if we work together under the leadership of Broadband Commission, we can make it. Let's work together and win together.

Endnotes

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13 UN Women. 2020. "Online and ICT facilitated violence against women and girls during COVID-19", p.7.

14 ITU and United Nations Office of the Secretary-General's Envoy on Technology. 2022. "Achieving Universal and Meaningful Digital Connectivity: Setting a Baseline and Targets for 2030".

Annex 1: Full list of recommendations presented in the State of Broadband reports 2012 – 2021

Category	Recommendation
ICT Policy and Regulatory Regimes	2012 – 7.4 Consider reviewing and updating ICT regulations 2012 – 7.5 Consider a unified licensing regime; 2012 – 7.6 Consider converged regulation 2012 – 7.11 Incorporate sustainability principles into ICT regulations and policies 2013 – 7.1 Promote market liberalization 2013 – 7.2 Review and update regulatory service obligations 2013 – 7.6 Review licensing schemes 2016 (6.1) & 2017 (5.1) Review and update regulatory frameworks for broadband 2018 – 5.7 Review and adapt legal frameworks to take into account digitalization
Improving Data / Statistics / Monitoring	2012 – 7.10 Monitor ICT developments, based on statistical indicators 2013 – 7.10 Support accurate and timely statistical monitoring 2014 (7.6) & 2015 (6.9) Engage in ongoing monitoring of ICT developments 2016 – 6.12 Benchmark and monitor developments in telecom and ICT 2017 – 5.4 Benchmark trends and developments in telecom and ICTs 2018 – 5.3 Benchmark and monitor ICT developments
Increasing Skills / Human Capital / Capacity-Building	2012 – 7.12 Promote the skills and talents necessary for broadband 2014 – 7.2 Promote Education for All (EFA), including the use of broadband, as well as the skills and talents necessary for broadband 2015 (6.7) & 2016 (6.8) & 2018 (5.2) Promote training and measures to stimulate demand 2018 – 5.5 Strengthen digital skills & literacy
Universal Service Approaches: USFs, USOs	2012 – 7.3 Use Universal Service Funds and other financial mechanisms to develop broadband 2013 – 7.5 Update and utilize Universal Service Funds 2014 – 7.7 Utilize Universal Service Funds (USFs) to close the digital divide 2015 (6.2) & 2016 (6.4) Make full use of Universal Service Obligations (USOs) 2018 – 5.4 Review Universal Service Measures, including RoW regulations
Taxation	2012 (7.7) & 2014 (7.3) & 2015 (6.5) & 2016 (6.7) & 2018 (5.8) Reduce taxes and import duties on telecommunication/ICT equipment and services 2013 – 7.7 Review & reduce taxation
A Focus on Local: Content, Language, Hosting, Entrepreneurship	2012 – 7.8 Stimulate the creation of local content in local languages 2013 – 7.9 Spur demand and introduce measures to stimulate the creation of local content 2014 – 7.5 Enhance demand for broadband services through new initiatives and local content 2015 – 6.8 Invest in the creation of local content in local languages 2018 – 5.6 Support local e-businesses and local entrepreneurship 2016 – 6.9 Encourage local innovation through strategic local hosting

(continued)

Category	Recommendation
Financing and Investment	2014 – 7.4 Accelerate investment in broadband infrastructure 2015 – 6.6 Promote investment in broadband infrastructure 2016 – 6.3 Encourage investment by both the public & private sectors 2016 – 6.11 Promote advanced market commitments for rural broadband access 2017 – 5.3 Encourage investment in Internet infrastructure 2021 – Increase funding levels and address issues of fragmentation
Open Access and Infrastructure Sharing	2013 – 7.3 Consider open-access approaches to infrastructure 2015 – 6.3 Consider infrastructure-sharing and open-access approaches to publicly funded infrastructure 2016 (6.5) & 2017 (5.5) Consider infrastructure-sharing
Spectrum Policy	2012 – 7.1 Explore fresh approaches to spectrum management 2013 – 7.8 Review policy frameworks for spectrum 2014 – 7.1 Monitor, review and update ICT regulations and regulatory approaches to spectrum 2015 – 6.1 Review and update ICT regulatory frameworks, including regulatory approaches to spectrum
National Broadband Plans/ strategies	2013 – 7.4 Introduce and develop a national broadband plan 2017 – 5.2 Develop and enhance national broadband plans 2018 – 5.1 Build National leadership for broadband 2019- Include in broadband plans: Digital inclusion, measures to protect children online, a focus on limiting environmental impacts and addressing climate, public access initiatives 2021 – Adopt a people-centric approach
Additional issues: Rights of Way / Dig Once, E-Government Initiatives, Public Consultation, Affordability, Climate Change, Intellectual Property, Internet of Things and Smart Cities, trust, and Cross-Border Data Flows	2012 – 7.2 Implement 'Dig Once' policies & expedite rights of way and construction permits 2012 – 7.9 Enhance demand for broadband through e-gov initiatives 2013 – 7.11 Consider undertaking public consultations on policy 2015 (6.4) & 2016 (6.6) Consider measures to make broadband More affordable 2014 – 7.8 Review frameworks for Intellectual Property (IP) 2016 – 6.2 Improve policy frameworks for IoT and smart cities 2016 – 6.10 Promote free flows of information 2021 – Address environmental impacts of digital infrastructure and the potential of connectivity's contribution to addressing the climate emergency 2021 –Ensure public confidence in participating online by considering increasing efforts to prevent cybercrime and cybersecurity incidents

Note: Number of the recommendation included as a reference up until 2018, then only text.

Acronyms

3G	Third Generation of Wireless Mobile Telecommunications Technology
4G	Fourth Generation of Wireless Mobile Telecommunications Technology
5G	Fifth Generation of Wireless Mobile Telecommunications Technology
3GPP	3rd Generation Partnership Projects
A4AI	Alliance for Affordable Internet
ACP	Affordable Connectivity Program
AI	Artificial Intelligence
APIX	Asia Pacific Internet Exchange Association
ASEAN	Association for Southeast Asian Nations
B2B	Business-to-Business
BIS	Bank of International Settlements
BWA	Broadband Wireless Access
CAPEX	Capital Expenditure
CIS	Commonwealth of Independent States
CITC	Communications and Information Technology Commission
CNY	Chinese Yuan
CODES	Coalition for Digital Environmental Sustainability
COVID-19	Coronavirus Disease
DEWA	Dubai Electricity & Water Authority
DFI	Development Finance Institution
DRA	Digital Regulation Academy
DSA	Digital Services Act
DTC	Digital Transformation Centres
EIF	Enhanced Integrated Framework
EMF	Electromagnetic Frequencies
EO	Earth Observation
ESG	Environment, Social and Governance
ETNO	European Telecommunications Network Operators
EU	European Union
EUTELSAT IGO	European Telecommunications Satellite Organization
FAO	Food and Agriculture Organization

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FCC	Federal Communications Commission
FCS	Fundación Carlos Slim/Carlos Slim Foundation
FIA	Fixed Internet Access
FTTH	Fibre-To-The-Home
FWA	Fixed Wireless Access
G5	Fifth Generation Collaborative Regulation
G20	Group of Twenty
GB	Gigabyte
Gbps	Gigabyte per second
GDP	Gross Domestic Product
GEO	Geosynchronous/Geostationary Orbits
GHG	Greenhouse Gas
GIZ	German Agency for International Cooperation
GNI	Gross National Income
GSMA	GSM Association
HAPS	High Altitude Platform Station
HFC	Hybrid Fibre Coaxial
HIC	High-Income Country
HPC	High Performance Computing
HTS	High-Throughput Satellite
ICDL	International Computer Driving License
ICT	Information and Communication Technology
IDB	Inter-American Development Bank
IFC	International Finance Corporation
IFI	International Financial Institution
IGO	Intergovernmental Organization
IoT	Internet of Things
IMF	International Monetary Fund
IP	Intellectual Property
IPCC	Intergovernmental Panel on Climate Change
ISOC	Internet Society

(continued)

ISP	Internet Service Provider
ITC	International Trade Centre
ITSO	International Telecommunication Satellite Organization
ITU	International Telecommunication Union
IXP	Internet Exchange Points
KT	Korea Telecom
LDCs	Least Developed Countries
LEO	Low Earth Orbit
LMICs	Low- and Middle-Income Countries
LTE	Long-Term Evolution
M2M	Machine-to-Machine
Mbps	Megabytes per second
MENA	Middle East & North Africa
MEO	Medium Earth Orbit
MNOs	Mobile Network Operators
MSMEs	Micro-, Small- and Medium-Sized Enterprises
NBP	National Broadband Plan
NBPD	National Broadband Plan for Development
NFT	Non-Fungible Tokens
NGO	Non-Governmental Organization
NGN	Next-Generation Network
NORAD	Norwegian Agency for Development Cooperation
OECD	Organisation for Economic Co-operation and Development
OpEx	Operating Expenditure
OSET	Office of the Secretary-General's Envoy on Technology
OTT	Over The Top
P2C	Partner2Connect
P-TTS	Personalized Text to Speech
RoW	Right of Way
SAMENA	Subcontinent, Asia, Middle East and North Africa
SBT	Science-Based Target

(continued)

SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SIM	Subscriber Identity Module or Subscriber Identification Module
SMBs	Small and Medium Businesses
SMSEs	Small- and Medium-Sized Enterprises
SSA	Sub-Saharan Africa
STEM	Science, Technology, Engineering and Mathematics
Tbps	Terabyte per second
TDRA	Telecommunications and Digital Government Regulatory Authority
TWh	Terawatt hour
UCC	Uganda Communications Commission
UIXP	Uganda Internet Exchange Point
UN	United Nations
UNCRC	UN Convention on the Rights of the Child
UNCTAD	United Nations Conference on Trade and Development
UNDP	United National Development Programme
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations Refugee Agency
UNICEF	United Nations Children's Fund
UN-OHRLLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
USAF	Universal Service and Access Fund
USAID	United States Agency for International Development
USD	United States Dollar
USF	Universal Service Fund
USO	Universal Service Obligation
VAT	Value-Added Tax
VHTS	Very High-Throughput Satellite
VoIP	Voice over Internet Protocol

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VR	Virtual Reality
WBA	World Benchmarking Alliance
WHO	World Health Organization
WIA	Wireless Internet Access
WTDC	World Telecommunication Development Conference

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